HEALTH SCIENCE EXTENDED ABSTRACTS
Bacterial contamination in foods and drinks at canteen around campus in Depok, 2008

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Introduction
As important sources for human life, food and drink should be healthy, and means saved to be consumed and free from contamination of dangerous and hazardous elements such as microorganism and chemical. The Ministry of Health Decree no.715/MENKES/SK/V/2003 mentioned that the number of Escherichia coli should be 0/gram sample (negative).

Research method
This research was using cross-sectional design, conducted in canteen in the area of campus in Depok, in the year 2008. The quality of microbiology, E. coli and Salmonella in foods and drinks that served from 13 canteens in the campus were analyzed. It was 49 foods and 24 drinks samples were examined in this research, beside utensils, and hand of the food handlers. It was 49 samples from 4 food categories, and 24 type of drink from 3 categories, beside utensils, and hand of the food handlers.

The sample of foods and drinks were analyzed about the existence of E. coli and Salmonella in the food, drink, utensil and hand of the food handlers, using Most Probable Number (MPN) method.

Result
Totally, there were 49 foods and 24 drinks taken as samples. Positive percentage of E. coli and Salmonella in food calculated per mL, for utensil is per cm², from hand of the food handler is in cm² (Table 1).

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Type of food</th>
<th>n=49</th>
<th>E. coli (positive)</th>
<th>Salmonella (positive)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Food (per mL)</td>
<td>Utensils (cm²)</td>
</tr>
<tr>
<td>Dry meals</td>
<td>Fried rice</td>
<td>7</td>
<td>28,6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Mix rice</td>
<td>3</td>
<td>66,7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Rice + chicken grill</td>
<td>1</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Padang rice</td>
<td>4</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>(rendang)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kweetiauw</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Fried noodle</td>
<td>2</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>55,5</td>
<td>22,22</td>
</tr>
<tr>
<td>Dressing meals</td>
<td>Lamb soup</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(wet food)</td>
<td>Tongseng</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Meet soup</td>
<td>2</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Chicken soto</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Noodle soup</td>
<td>2</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Meat soto</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 1 shows that all category of food found positively contaminated by *E. coli* and *Salmonella* with various percentages, unless utensils for used for dressing foods type. Foods mixture with sambal were 100 % contaminated *E. coli*. Food with dressing had the lowest percentage of *E. coli*, and none in the utensils used for this type of food, but quite high in the hand of the food handlers or waiters. This phenomenon was almost the same for the existence of *Salmonella*.

From 24 sample of type of drinks served in many different canteens, the highest percentage of *E. coli* was in the drink, then in utensil, and the lowest was in the hand of the food handlers. *Salmonella* found in about 12.50 % in the drink. There were no *E. coli* or *Salmonella* existed in capuccino and fruit cocktail (Table 2).

**Table 2. The percentage of ‘positive’ of *E. coli* in type of drinks (per mL), utensil (per cm²), hand of food handlers (cm²), and *Salmonella* in drink (per mL), from 13 canteen around Campus in Depok, 2008**

<table>
<thead>
<tr>
<th>Drink Category</th>
<th>Type of Drink</th>
<th>Total</th>
<th>Drink (per mL)</th>
<th>Utensil (cm²)</th>
<th>Hand of food handler (cm²)</th>
<th>Salmonella (% positive) in (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice</td>
<td>Mango</td>
<td>4</td>
<td>50</td>
<td>0</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sirsak</td>
<td>2</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Jambu</td>
<td>4</td>
<td>75</td>
<td>75</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Orange</td>
<td>2</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Avocado</td>
<td>4</td>
<td>75</td>
<td>75</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Lacy</td>
<td>1</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Melon</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tea</td>
<td>Ice tea</td>
<td>4</td>
<td>50</td>
<td>0</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
<td>Cappuccino</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Cocktail</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>24</td>
<td>62.50</td>
<td>41.66</td>
<td>33.33</td>
<td>12.50</td>
</tr>
</tbody>
</table>

**Discussion**

Microbiology analysis from the sample survey of food and drink that served in the canteen around campus showed that almost all of the foods and the drinks sampled were positively contaminated by *E. coli* and also some of the evil with *Salmonella*, although there were no evidence of water source contamination of bacteria. Swane, et al (2003), mentions that 90% of contamination are by bacteria, and Kurnia (2004) says there are about 35 type of bacteria in food and drink, such as *E. coli* and *Salmonella*. Refai (1979) mentions that the existence of *E. coli* in the food can lead to the possibility of the existence of *Salmonella, Shigella,* and *Staphylococcus*. *Salmonella* is bacteria that can cause thypoid, so the existence of the *Salmonella* in the food becomes quite dangerous. It is very important to develop certificate mechanism from district or provincial health office is important to implement, as mentioned in the Ministry of Health Decree no.715/MENKES/SK/V/2003.
Conclusion
The survey of food and drink that served in canteen in the area of campus in city of Depok showed positive contamination of *E. coli* and *Salmonella*. All samples of food with dressing were found positively contaminated by *E. coli* and *Salmonella*, mostly in the food that mixture with ‘sambal’. food and drink that served in canteen in the area of campus showed positive contamination of *E. coli* and *Salmonella*.

**Keywords**

**References**
Cigarette smoking in Indonesia: Examination of myopic models of addictive behavior in panel data

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Introduction
Economic of addiction consists of three models: (i) imperfectly rational addiction, (ii) myopic addiction and (iii) rational addiction (Chaloupka & Warner 2000). The myopic addiction assumes that individuals recognize the dependence of current addictive good consumption on past consumption, but ignore the impact of current and past choices on future consumption decisions when making current choices. The myopic framework therefore takes into account of consumption history, but do not fully anticipate future changes. This study aims to estimate the demand for cigarette in Indonesia following the myopic addiction model. The goal are (i) to document the process by which one could choose the most appropriate panel data, and (ii) to estimate price elasticities of cigarettes demand in Indonesia.

Methods
In this study, we estimated a dynamic model for cigarette demand equation in the form of:

\[ C_i = \beta_0 + \beta_1 C_{i,t-1} + \beta_2 Price_{i,t} + \beta_3 Price_{a,t} + \beta_4 X_{i,t} + \nu_i + d_t + \epsilon_{it} \]  

(1)

where \( i \) is an individual, \( t \) is time, \( C \) is consumption of cigarettes, \( P_c \) is the price of cigarettes, \( Pa \) is the price of alcohol, \( X \) is a vector of exogenous variable that affect cigarettes consumption (i.e., income, age, employment, the proportion of child under 14 years), \( \nu \) is individual fixed effects that control for the agent time invariant preferences and marginal utility of wealth, \( d \) are time fixed effects to control unanticipated changes in wealth, and \( \epsilon \) is the error term. Significantly positive effect of the previous consumption (\( \beta_1 \)) on the current cigarette consumption (\( Cinder \)) indicating smoker show myopic behavior.

This study used three waves a panel data of the Indonesian Family Life Survey (IFLS), carried out in 1993 (IFLS1), in 1997 (IFLS2) and in 2000 (IFLS3) by the RAND Corporation in conjunction with Indonesian researchers and various international agencies. To estimate (1), we explored two group estimators. Group I consist of estimators that ignore the endogeneity problem of the regresors. Here we considered OLS, fixed effects (FE), and random effects (RE). Group II are used to deal with errors in variables and unobservable heterogeneity, which include two-stage least squares (2SLS), FE2SLS, RE2SLS, and GMM. The drawback of using estimators Group II is that the variance-covariance matrix of the estimator is larger than that of Group I estimators. Thus, if the bias caused by the errors-in-variables not too severe, it may be preferable to use estimators in Group I.

Results and discussion
Model selection
We developed a framework to select the most appropriate panel data techniques. The framework (Figure 1) considers both endogeneity of the regressors and behaviour of the error terms (Hidayat et al. 2009). Investigating endogeneity is a crucial step, and the result is used
to decide whether one have to correct or not to correct for endogeneity problems. First, we checked for the endogeneity of the lags using Durbin-Wu Hausman and Hausman-Wu tests. The tests, distributed as a $X^2$ with 1 degree of freedom, was 7.8 with a p-value of 0.005. We thus rejected the null hypothesis of exogeneity, suggesting OLS results in inconsistent parameter estimates. What would be if the exogeneity tests were accepted? Non-rejection the null hypothesis leads us to choose estimators Group I. Although it is not in our case, we have presented the results of the Breusch-Pagan test--to discriminate OLS vs FE and/or RE--and the Hausman test--to select FE or RE (Baltagi 2005).

Since the null hypothesis of exogeneity was rejected, further consideration is to choose Group II estimators. Pagan-Hall tests for heteroskedasticity were utilized to discriminate 2SLS and GMM. The test rejected the null hypothesis, suggesting GMM is preferable to the 2SLS. Next, we considered RE2SLS or FE2SLS. The Hausman’s test yielded an observed $x^2$ test of 12.9, insignificant at 5% level. We could not reject the null hypothesis of no correlation between $\epsilon_i$ and $X_{it}$ in (1), implying RE2SLS is preferable than FE2SLS (Baltagi 2005).

It has been noted (Staiger & Stock 1996) that if the instruments are only weakly related to the endogenous variable, the resulting parameter estimates will be biased even if the instruments are not correlated with the error term of the demand equation (1). This implies the consistency of the coefficient estimates using Group II, and the test for endogeneity depends largely on the accuracy of the instruments. To deal with this, we employed instrumental variables tests (i.e. relevancy, validity and orthogonality). A reduced form regression of the suspected endogenous variables, $C_{t-1}$, on the full set of instruments was estimated using OLS regressions. The resulting $R^2$ was 12%. A gap between Partial $R^2$ and Shea partial $R^2$ was considerably close, suggesting that the model is well identified (Shea 1997). The relevance of the instruments was also investigated using an $F$-test, and confirmed the null hypothesis of the $F$-test was rejected, indicating the instruments were correlated with the endogenous variable (Bound et al. 1995). The instruments also passed over identification and orthogonality tests, i.e., the Hansen J, Basman and Sargan tests could not reject the null hypothesis of correct specifications, suggesting the models are well specified, and the instruments are valid.

**Estimation results**

Based on the model selection criteria, we opted to the estimation results derived from GMM. Coefficient estimate of the lags consumption was a positive (+0.603) and highly significant, suggesting cigarette is an addictive good. The lags consumption represents a fixed propensity
to addiction, which is carried over from period to period and its coefficient can be interpreted as the speed of adjustment to the stable of consumption. Our finding suggests that Indonesian smokers are myopic addicts, i.e., higher past consumption causes raising the marginal utility of current consumption of the cigarette and leads to higher in current consumption.

Price of cigarette was a negative, whilst it was a positive for the alcohol. Coefficient estimate of price cigarette indicates the short-run price elasticity. The long-run elasticity was computed as: $\frac{\partial \ln \text{CE}_{it}}{\partial \ln \text{PC}_{it}} = \hat{\beta}_{1}(1 - \hat{\beta}_{2})$. A 10% increase in cigarette prices would lead to a 2.8% decrease in cigarette consumption in the short-run and 7.3% decreases in the long-run. Information on the magnitude price elasticities of cigarettes demand is important from the perspective of tobacco control policies. Since additional public health care costs smokers impose on non-smokers, control tobacco policies can be internalised using price mechanisms. The purpose of increasing price can be used to control tobacco use, and at the same time to maximize government revenue. This study detects the demand for cigarettes are price inelastic (the price elasticity, in absolute value, less than one), suggesting the percentage increase in prices would higher than the percentage decrease in consumptions. However, any efforts to reduce cigarette consumption through increasing cigarettes prices (for instance by placing tax) could be an efficient way of raising government revenue since the tax revenue would increase, not decrease. The tax generated from this policy can be used to increase the allocation of public health budgets, which is true as smokers give the negative consequences to non-smokers.

**Conclusion**

Myopic addiction models are employed to investigate cigarette consumption using individuals aggregated data derived from the Indonesian Family Life Survey in the period 1993-2000. The estimations provide evidence on the dependence, reinforcement and tolerance effects of cigarettes consumptions (coefficient of the lags consumption turns out to be a positive). We conclude that addiction of Indonesian cigarette smokers is a result of myopic consumer behavior. The demand for cigarettes is inelastic. The short-run price elasticity was estimated at -0.28, while for the long-run one was -0.73. Any efforts to reduce cigarette consumptions (i.e., tax on cigarette) could be an effective way of raising government revenue.

**Acknowledgments**

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**Keywords**

Cigarette smoking, myopic addictive models, statistical methodology for panel data.

**References**


Hidayat B, Thabrany H, Hu TW. (2009) Myopic addiction of cigarettes demand in Indonesia: panel data approaches [14th World Conference on Tobacco or Health (14WCTOH), Mumbai (India), March 8-12 2009].


Cytotoxicity of chitosan and coral as scaffold on osteoblast

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Introduction
Coral and chitosan are promising biomaterials used in the experiments of oromaxillofacial tissue engineering. These natural materials have been extensively studied due to their properties in the promotion of bone remodeling.

Objective
The purpose of this study was to evaluate the cytotoxicity effect of those materials in osteoblast cell line, MG 63.

Methods
Osteoblast cells line were cultured in alpha minimum essential medium (α-MEM) supplemented with fetal calf serum, penicillin-streptomycine and fungizone. For the trial groups, the cells were grown in medium containing chitosan at concentrations of 1 or 2 mg/ml, without or with the addition of 2 mg of coral powder sized 1 micrometer, whereas the control group was cultured with α-MEM only. In order to evaluate cytotoxicity of these materials, the 3-(4, 5-dimethyl-thiazole-2-yl)-2, 5-diphenyl tetrazolium bromide (MTT) assay was performed followed by determination of the number of viable cells after 4 hours incubation.

Results
Compared to the control, the groups treated with either 1 or 2 mg/ml of chitosan together with coral powder, show a slightly decrease in the percentage of viable cells (85% versus 85.6%, p>0.05). However, when chitosan and coral were separately added to the osteoblast culture, it seem more cells were viable (85.7% and 86.3%, p>0.05). In addition, statistical analysis revealed there was no significance different among the groups of experiment.

Conclusion
We conclude that either Coral goniophora sp or chitosan indicate minimal cytotoxic effect in osteoblast cells line culture and it seem to be compatible to be used as a scaffold in tissue engineering.

Keywords
Chitosan, coral, cytotoxicity, MTT assay, osteoblast, scaffold.

References


Effect of fish protein concentrate biscuit with probiotic as functional food on humoral immune system and nutritional status of underfive-year children

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Effect of Fish Protein Concentrate Biscuit with Probiotic as Functional Food on Humoral Immune System and Nutritional Status of Underfive-year Children

Introduction

Protein energy deficiency among children underfive year remained a main public health problem in Indonesia. Malnutrition is still a big problem for underfive children although many nutrition improvement programs have been done by the Government, NGO’s and other institutions in the community. Many studies were reported that the problems usually started after the baby entering a weaning phase. It is a critical phase, where the parent need to gives full attention by feeding their baby with a nutritious food especially during children’s golden age to be able their baby growing well and healthy.

According to Department of Health (2002), children who suffered from malnutrition are about 27.3 %). Prevelance of malnutrition in Indonesia is in a high rank as compared to other ASEAN countries and diarrhea is a major cause problem for those children. One of eight underfive children suffered malnutrition problem since a baby borned (WNPG, 2004). Malnourished children will cause growth failure, about less than 10 cm for length and 2 kg for weight of children. It was reported that mental retarded may reduced 10 poin of IQ and increased anemia as well as mortality rate (Woodhouse, 1999).

General objective of this study was to formulate biscuit based on Fish Protein Concentrate (FBC) and Probiotic which is good for improving immunity and nutritional status of children younger than five. Specific Objectives were three folds, to formulate biscuit based on Fish Protein Concentrate (FBC) and Probiotic; and analyze its physical quality and acceptability; to study the effect of biscuit based on Fish Protein Concentrate (FBC) and Probiotic to biological value and antibody (IgA), and to study the effect of biscuit based on Fish Protein Concentrate (FBC) and Probiotic to nutritional status and antibodi (IgA) of malnourished children.

Materials and methods

The biscuit was made by using main ingredient non-salt dried fish Ikan teri (Stolephorus sp.) from Tual, Maluku Tenggara used as a major component. other ingredients used are wheat flour, skim milk, milk powder, sugar, margarine, eggs, baking powder, essence mocca and probiotic cream containing Enterococcus faecium IS-27526.

A basic formula used to produced probiotic cream are krim probiotik 10 g butter + 10 g margarine + 75 g sugar powder + 5 ml milk + probiotic.
The study was conducted in two phases: The first phase, assessing the protein quality (NPR, BV, % Digestibility, NPU) and immune status by using Sprague Dauley Rats. The second phase was human trial with 3 groups of subjects, supplemented with biscuit non fish (group 1), biscuit fish concentrate (group 2) and Biscuit fish protein concentrate with probiotic cream (group 3). Each group consists of 35 subjects children younger than 5 years. Supplementation was carried out for 90 days, a placebo control trial pre-post study.

Results and discussion
Biscuit fish protein concentrate plus probiotic shows a good formula as compare to other formulas (NPR 6.90; BV 98.5%; % Digestibility 94.6; dan NPU 93.2 %). The effect of biscuit fish protein concentrate plus Probiotic tends to improve a nutritional status of children, A significance difference was found on the increment of body weight of children with Biscuit fish protein concentrate plus probiotic (Z skor BB/U) as compared to biscuit fish protein concentrate and biscuit non-fish protein concentrate (p< 0.05).

The effect of fish protein concentrate biscuit plus Probiotic tends to improve a nutritional status of children, A significance difference was exist increment body weight of children with biscuit KPI plus Probiotic (Z skor BB/U) as compared to fish protein concentrate biscuit and biscuit non-KPI (p< 0.05).

The result showed that the Fish Protein Concentrate (FPC) biscuit plus probiotic was significantly improved the nutritional status of the underfive children, the Z score body weight for age (W/A) 0.55 ± 0.47, Z score body height for age (H/A) 0.60 ± 2.3, and Z score body weight for body height (W/H) 0.55 ± 0.49, which were significantly higher than those two other treatment groups. Antibody IgA level increase from 87 to 107.6 mg/dl and viability of fecal lactic acid bacteria was 1.5 x 10^6 coloni/g). The morbidity rate of underfive children with biscuit’s FPC plus probiotic was much lower (14.3%) than those two other treatments (biscuit FPC or biscuit without FPC 23%, 29.5%, respectively).

Supplementation of probiotic Enterococcus faecium IS-27526 to undernourished children less than five for 90 days significantly improve the body weight of undernourished children and also enhance the humoral immune response (sIgA saliva) (Surono et al., 2005). This study confirmed and validated previous study with the same indigenous probiotic strains. Moreover, the addition of fish protein concentrate gave supplementation of nutrition, which has been proven in supporting the probiotic function in stimulating the humoral immune response to children less than five.

Keywords
Children younger than five, nutritional status, probiotic E. faecium IS-27526, serum IgA.

References
Effect of glucose in removal of microcystin-LR by viable commercial probiotic strains and strains isolated from Dadih fermented milk

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Introduction

In many eutrophic freshwaters, cyanobacteria frequently form toxic mass occurrences, produce a number of potent hepatoto- and neurotoxins called cyanotoxins. Cyanotoxins show a potent acute hepatotoxicity and tumourpromoting activity and are therefore considered a significant public health problem worldwide. Microcystins are cyclic heptapeptide hepatotoxins, tumor promoters (1) and possible carcinogens (2), which are produced by several cyanobacterial genera. Cyanotoxins are increasingly found in drinking water reservoirs, entering the water supply (3), contaminate drinking water resources and raw materials for the food industry, including animal tissues and agricultural products. Microcystin-LR (MC-LR) is the most common and the most toxic variant among approximately 80 microcystins, and a provisional guideline value of 1 µg L-1 for MC-LR in drinking water has been issued by the World Health Organization (4). Probiotic has been defined by the FAO-WHO as a “live microorganism which when administered in adequate amounts confers a health benefit on the host” (5). This study was designed to demonstrate the ability of specific commercial strains of lactobacilli and bifidobacteria and the natural Lactobacillus plantarum strains isolated from traditionally fermented dadih to remove the cyanobacterial peptide toxin MCLR from water solutions. Dadih, a yoghurtlike product, is an Indonesian traditional fermented product from West Sumatra, which is spontaneously fermented from fresh raw buffalo milk in bamboo tubes and capped with banana leaves (6). Studies on potential probiotic properties of indigenous lactic acid bacteria isolated from dadih have demonstrated antimutagenic, mutagen-binding, and cholesterol-binding properties, as well as acid and bile tolerance, good adhesion properties, and antipathogenic properties (7-8, 9–12).

Materials and methods

Microcystins. MC-LR was extracted from a culture of Anabaena sp. 90 (originating from the culture collection of Prof. Kaarina Sivonen, University of Helsinki, Finland) and purified by HPLC as described earlier (13). Ten micrograms of MC-LR was dissolved in 1 mL of PBS buffer, and appropriate dilutions were made.

Bacterial Strains. Six commercial probiotic and two dadih lactic acid bacterial strains were tested for their microcystin-removal capacity. The commercial strains were Lactobacillus rhamnosus GG (ATCC 53103, Valio Ltd., Helsinki, Finland), L. rhamnosus LC-705 (Valio Ltd.), L. plantarum Lp-115 (Danisco Inc., Madison), Bifidobacterium longum 46 (DSM...
14583), *Bifidobacterium lactis* 420 (Danisco Deutschland Gmbh, Niebüll, Germany), and *B. lactis* Bb12 (Chr. Hansen Ltd., Hørsholm, Denmark), and they were obtained in commercial lyophilized form. The indigenous dadih strains were *L. plantarum* strains with the identification numbers IS-10560 and IS-20560 (Gene Bank Accession numbers DQ860148 and DC860149, respectively) from the University of Turku culture collection. The bacteria were cultured in deMan-Rogosa-Sharpe (MRS) broth (Oxoid, Hampshire, United Kingdom) (MRS supplemented with 0.05% w/v cysteine-HCl for *Bifidobacteria*) for 18 h at 37 °C, and the cells were harvested by centrifugation (3200g, 4 °C, 20 min), washed twice with PBS buffer, then suspended in PBS with or without glucose (1, 2, or 3%) to reach a final cell density of approximately $10^{10}$ colony-forming units (CFU)/mL. Glucose was added in PBS as a bacterial nutrient. Total viable counts of bacterial suspensions were determined prior to incubation (control, time 0 h) by flow cytometry. The percentages of viability were calculated comparing the total viable counts before incubation ($t \rightarrow 0$, 100% viability) with the viable cells labeled with SYTO9 (green color) obtained after 24 and 48 h of incubation at 4 and 37 °C in different concentrations of glucose.

**Microscopy.** Visual inspection of the viability of bacteria (for *L. rhamnosus* GG) during incubation with MC-LR at 37 °C in absence or presence of glucose (0 or 1%) was determined by microscopy. An Olympus epifluorescence microscope BX50 (Olympus, Tokyo, Japan) with filter U-MWIB (excitation, 460–490 nm; emission, 515–700 nm) was used. Images were recorded with a digital camera (model DP-10; Olympus, Hamburg, Germany): green bacteria, viable; red bacteria, nonviable; and orange bacteria, injured.

**Microcystin Removal Assay.** One milliliter of the bacteria suspended in PBS at a concentration of approximately $10^{10}$ CFU/mL with or without the addition of glucose (1, 2, or 3%) together with 100 µg/L MC-LR were incubated in 1.5 mL borosilicate glass chromatographic vials under continuous reciprocal shaking, 120 rotations per minute (Certomat WR, B. Braun, Melsungen, Germany) at 4 or 37 °C for different times (0, 18, 24, and 48 h). Subsamples were taken and centrifuged (12000g, 10 min, room temperature) in 300 µL borosilicate glass chromatographic inserts. The supernatants were analyzed for residual MC-LR concentration by HPLC as compared with a 100 µg/L MC-LR control in PBS.

**Statistics.** Statistical analysis was performed using the t test. The probability level of 5% ($p \leq 0.05$) was used to indicate the significance.

**Results and discussion**

The results show that all tested strains were able to remove MC-LR from aqueous solutions, but differences in the elimination efficiency of the strains were demonstrated. The removal efficiency was dependent on the strain and on glucose addition. The results suggest that bacterial metabolic activity has an important role in toxin removal because at 37 °C, the removal percentages were highest ($p < 0.05$) for all tested strains. The best MC-LR removal percentages were obtained at 37 °C by *L. plantarum* strains isolated from dadih fermented milk. Furthermore, the glucose addition improved the removal efficiencies of all tested strains at 37 °C by enhancing both the removal rate and the amount of MC-LR removed. The addition of 2 or 3% glucose did not significantly improve or affect the removal further. In general, the viability of all bacterial strains tested decreased at 37 °C in the presence of glucose, but the behavior was strain-dependent. At 37 °C, the metabolic activity rate is higher in the presence of glucose and the viable cells may experience stress as shown by the decrease of viability. For some of the strains, such as *L. rhamnosus* GG and *B. longum* 46, the viability decreased dramatically as a result of the addition of glucose, whereas *L. plantarum* IS-10560 and IS-20560 and *B. lactis* Bb12 and 420, glucose did not significantly affect the viability within 24 h of incubation. The *B. lactis* strains Bb12 and 420 showed viabilities similar to dadih strains at 37 °C, but the removal percentages observed were lower. The microscopic images showed that in the absence of glucose most of the cells stayed viable until 24 h of incubation. The images also support the conclusion that the bacteria become stressed as a result of higher metabolic activity when glucose is added. All three techniques (plate
counting, flow cytometry, and microscopy) demonstrated that cell viability decreased during incubation and with an increasing concentration of glucose. The probiotic strains isolated from dadih showed high removal abilities also at lower bacterial concentrations (10^9-10^{10} CFU/mL) than the commercial probiotics, but with higher bacterial cell densities, the removal abilities were similar with all strains. In addition, dadih strains of \textit{L. plantarum} (IS-10506 and IS-20506) were shown to have higher removal abilities as compared to the commercial \textit{L. plantarum} strain Lp-115, which was shown to behave similarly to the other commercial strains.

For the dadih strains, a clear improvement on the removal ability was observed by the addition of glucose to the solution, but the increase was not so marked for the other strains. Of the commercial strains, \textit{B. lactis} Bb12 and 420 showed similar viabilities when compared to the dadih strains, but their MCLR removal efficiencies were significantly lower. During incubation, the bacterial strains consume glucose and as a consequence produce lactic acid, which in turn causes cell stress as a result of the decrease in pH. In this study, the bacterial cells removed MC-LR from solution faster in the presence of glucose but cell death also occurred faster.

In general, the dadih probiotic strains were more resistant and stayed viable longer. As a result also, the removal percentages observed for \textit{L. plantarum} IS-10506 and IS-20506 in the presence of glucose were higher than for the commercial probiotics. The commercial \textit{L. plantarum} strain Lp-115 was shown to behave more similar to the other commercial strains than with the \textit{L. plantarum} strains isolated from dadih. The results reveal that cell viability, bacterial cell density, cell culturability, and metabolic activity play important roles in the removal of MC-LR.

**Keywords**
Glucose, metabolism, microcystin-LR, probiotic, viability.

**References**
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Collado, M. C.; Surono, I.; Meriluoto, J.; Salminen, J. Potential probiotic characteristics against pathogen intestinal colonization of strains isolated from traditional dadih fermented milk. J. Food Prot. 2007, 70, 700–705.
Effect of IgY on in vitro biofilm formation of S. mutans isolated from children

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Introductions
Streptococcus mutans (S mutans) has been strongly implicated as a causative organism of dental caries. S mutans serotype c is a major etiologic agent of human dental caries. One of the concept in preventing dental caries is passive immunization with IgY. This yolk antibody can prevent the attachment between S mutans and tooth surface.

Purpose
This purpose of this study was to evaluate the effect of IgY–anti S. mutans serotype c on in vitro biofilm formation of S. mutans isolated from children dental plaque.

Methods
Subject between the ages 9 to 12 years of age were involved in this study. Dental Plaque samples were collected by rubbing a sterile wooden toothpick on the buccal surface of lower first molar. The biofilm assay was carried out by using 24-well tissue culture plates. Briefly, S mutans was cultured on TYSB agar and the selected colonies was isolated and grown in TSB medium. A 10,000 CFU/ml bacteria were inoculated in 24 well-plate supplemented without (control) or with 40 µg/ml IgY. The plate were then kept in incubator for 2 hours to allow biofilm formation on the bottom of the plate. The bacterial biofilm were quantified by measuring the absorbance at OD655.

Results
The result of this experiment demonstrated that plates with IgY, incubated for 2 hours showed significant decrease (p<0.05) of biofilm formation than plates without IgY.

Conclusion
IgY Anti S mutans serotype c has the potential to inhibit the formation of biofilm of S mutans isolated children dental plaque.

Keywords
Biofilm, IgY, Streptococcus mutans.

References

Genome 16
Effect of Portland cement on human dental-pulp cells viibility

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Introduction
Mineral trioxide aggregate is an endodontic material which has biocompatibility and provides an excellent sealing, non toxic and inducing the tissues regeneration. The basic substance of MTA is cement Portland enriched by bismuth oxide to give radiopacity property. Some studies report that MTA and Portland cement have similar mechanical and chemical constituents. However, there were only few reports using human pulps cells to assess the citotoxicity effect of Portland cement in vitro.

Objective
To compare the citotoxicity effect of the grey and the white Portland cement when co-cultured with human dental-pulp cells. Methods: Human dental-pulp cells were obtained from caries free teeth which were extracted for orthodontic treatment. The teeth were cracked to obtain the pulp tissue, then were cultured in DMEM supplemented with 10% FBS. The cells were used after fifth and sixth passages, and the specimens were soaked for 1 and 7 days with DMEM-free serum prior to be seeded into human dental-pulp cells in 24-well culture plate. Subsequently, the effect was assessed using MTT assay.

Results
Viability test showed that white Portland cement has no citotoxicity effect on human dental pulp cells, but the grey has. However, statistical analysis showed no significant different between the two effects.

Conclusion
This study demonstrates, both the white and the grey Portland cement showed similar property as biocompatible material when co-cultured with human dental-pulp cells in vitro.

References
**Escherichia coli** contamination in meals at canteen around campus in Depok, 2008

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**Introduction**

Meals are very important for energy source and growth for human body, and are expected to be good in features and delicious, but the most important thing is save to consumed or uncontaminated by dangerous and poisoned element, such as microorganism which could produce sicknesses. Ministry of Health Decree no.715/MENKES/SK/V/2003 mentioned that the number of **E. coli** should be 0/gram sample (or negative).

**Research method**

A cross-sectional design research conducted in all registered canteen around campus in Depok-West Java, in the year 2008. Amount of 13 canteens were observed of microbiology of **E. coli** contamination in meals served. There were 49 type of meals from 4 categories; dry meals, wet meals, and meals that poured or mix with sambals and sambal itself, using the most probable number methods.

**Result and discussion**

Almost all type of meals from each canteen were contaminated by **Escherichia coli**, Meals with sambal were the most risking from the contamination of **E. coli** (Table 1).

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Type of foods</th>
<th>Number of measured (n=47)</th>
<th>Frequency of measured</th>
<th>Number of ‘positive’</th>
<th>Percentage of ‘positive’</th>
<th>Rank of its category of foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry meals</td>
<td>Fried rice</td>
<td>7</td>
<td>21</td>
<td>5</td>
<td>23.88</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mix rice</td>
<td>3</td>
<td>9</td>
<td>4</td>
<td>44.44</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Rice + chicken grilled</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>100.00</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Padang rice (rendang)</td>
<td>4</td>
<td>12</td>
<td>8</td>
<td>66.67</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Kwetiauw</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0.00</td>
<td>6</td>
</tr>
<tr>
<td>Wet meals</td>
<td>Fried noodle</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>16.66</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>54</td>
<td>21</td>
<td>38.89</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lamb soup</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0.00</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Tongseng</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Meet soup</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Chicken soto</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>11.11</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Noodle soto</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Meat soto</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rib soto</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>‘lontong sayur’</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>66.67</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Noodle + chicken</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>42</td>
<td>12</td>
<td>28.57</td>
<td>4</td>
</tr>
</tbody>
</table>
It is proved that *E. coli* is the common contaminant in meals (Swane, et.al. 2003), besides *Salmonella* and *Staphylococcus* (Kurnia, 2004). The existene of *E. coli* is very dangerous, because it would risen the posibility of other pathogen, such as *Salmonella, Shigella,* and *Staphylococcus* (Djaja, 2003).

The result found that meals with the highest risk of bacteria contamination were mostly the traditional meals such as ‘siomay’, ‘rendang’, ‘karedok’ and ‘gado-gado’. Karedok and Gado-gado are food made by mixture of vegetables (sprouts, beans, gabage, tofu, and tempe) mixed or poured with sambal. This phenomenon proofed that type of meals that made from many ingredients were highly risk for bacterial contamination. There are 5 pathogen types of *E. coli* were ever observed (Refai, 1979) and these pathogen bacteria caused an outbreak that sometimes take life.

### Table 2. Contamination of *E. Coli* in Dairy and Non-dairy Meals for Each Cathegory from Canteen around Campus in Depok, 2008

<table>
<thead>
<tr>
<th>Canteen location</th>
<th>E. coli 'positive'</th>
<th>Dairy</th>
<th>Non-dairy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>J</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>K</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>M</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td><strong>15 (62.50)</strong></td>
<td><strong>9 (37.50)</strong></td>
<td></td>
</tr>
</tbody>
</table>

Categorization than made for two types of meal, dairy and non-dairy meals. Table 2 showed that the number of food with positive *E. coli* contamination in dairy meals were higher then non-dairy meals. According to Indrawani, every animal can be a reservoir of *E. coli*, including O157:H7 strain (Indrawani, 2004).

Meals are risking from the bacteria contamination, and it could lead to the very specific illness which can be avoided. Almost all of meals category were positively contaminated by *Escherichia coli*, like mentioned by Swane (Swane, et.al. 2003). There are about 35 types of bacteria in meals, such as *Escherichia coli* and *Salmonella* (Djaja, 2003). The existence of *E. coli* can lead the possibility of the existence of *Salmonella, Shigella,* and *Staphylococcus* (Refai, 1979).

### Conclusion

The survey of meals in canteens around the campus in Depok showed the positive contamination of *Escherichia coli*. Almost all type of meals sampled found positively contaminated by *E. coli* in each canteen. It is important to improve the quality of meals served.
in canteen by maintaining routine monitoring and evaluation of the meals material, process and personal hygiene and sanitation. The certificate mechanism from district or provincial health office is important to implement, as mentioned in the Ministry of Health Decree no.715/MENKES/SK/V/2003.

**Keywords**
Campus, *Escherichia coli*, meals.

**References**


Expression level of TAp73 isoform in oral squamous cell carcinoma cell lines

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Introduction
High telomerase activity that causes immortal characteristic of cancer cells is one of the result of mutation of p53 gene. The TAp73 isoform, one of p53 family, also has role in regulating telomerase activity. Study on the relation of the status of p53 and expression of isoform TAP73 on telomerase activity in oral cancer has not been provided. This study aims to analyze the role of isoform TAp73 on telomerase activity in two oral squamous cell carcinoma in relation to their status of p53 mutation, to see the chance of TAp73 isoform as anti-proliferation gene therapy.

Materials and methods
Two oral squamous cell carcinoma cell lines, HSC-3 and HSC-4 which have different location of the p53 gene mutation, were cultured and harvested for protein and mRNA extraction. The RT-PCR for TAp73 mRNA was run to see the expression at the pre-translational level. The SDS-PAGE gel electrophoresis of the total protein was initially run to describe the protein profile of the two cell lines and Western Blot specific for TAp73 and hTERT would be further performed. The expected bands were visualised under UV light and semi-quantitatively analysed using Quantity One (BioRad).

Results
At the mRNA level, HSC-3 cell line expressed higher level of TAp73 mRNA compared to that of HSC-4 cell line. The analysis of the expression of hTERT at the mRNA level is still being optimised. The results showed that the protein profile specifically TAp73 and hTERT of the two cell lines were quite similar but TAp73 were expressed in higher level in HSC-3 cell line while hTERT was expressed higher in HSC-4 as seen in SDS-PAGE. More specific protein analysis using Western Blot for TAp73 are still being optimized.

Discussion
The expression of TAp73 at the mRNA level which was visualised semiquantitatively was higher in HSC-3 cell line compared to that of HSC-4. This result should be further analysed specifically by using qRT-PCR. Visualisation of the protein band of TAp73 analysed using SDS PAGE also showed the same pattern, however the specific protein analysis using Western Blot should confirm this initial result. Studies have shown that the expression of p73 isoforms depend on the type of the tissue and its developmental stage, while their expression on cancer tissue also varied and could be detected easier. Mutant p53 protein was known to be bind with the TAp73 and inhibit its pro-apoptotic properties. The type of p53 polymorphism at codon 72 also known to influence the binding strength between the two molecules. The mutant p53 with arginine residu 72 (R72) would bind stronger to TAp73, therefore the HSC-4 cells which have this type of polymorphism, this event would cause the inactivation of the p73 protein which resulted in its lower expression of TAp73 but higher expression of hTERT.
Conclusion
This initial result showed that the expression of expected TAp73 protein was higher in HSC-3 cell line but the hTERT expression showed higher expression in HSC-4 cell line. This observation might be related to its characteristic in terms of telomerase activity. Further work on the optimisation of the detection of hTERT mRNA and analysis of TAp73 and hTERT using Western Blot would be performed.

Keywords
Oral cancer, p53, TAp73, telomerase.

References
Expression of tenascin C in rat neonatal cardiac tissue

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Introduction

Tenascin-C (TNC) is a large glycoprotein molecule at extracellular matrix, well known as regulator of multiple cellular functions during embryogenesis, wound healing or cancer progression. In the heart, TNC expression appears at the initial differentiation of cardiomyocyte and coronary vasculo/angiogenesis. TNC re-express after myocardial injury, regulating tissue remodeling. TNC is also essential for postnatal cardiac angiogenic function. Objective of this study is to describe location of TNC expression in rat neonatal cardiac tissue.

Materials and methods

The neonatal rat was sacrificed according to the guidance of the ethical commission on Health Research, Ministry of Health of the Republic of Indonesia. Neonatal rat cardiac tissues for TN-C immunohistochemistry were fixed in 10% neutral buffer formalin, dehydrated, and embedded in paraffin. Sections cut at 5 µm were placed on glass slides coated with Silan (Sigma). Sections were dewaxed in xylene and rehydrated in a series of graded concentrations of ethanol and distilled water. Heat mediated antigen retrieval was performed using 10mM citrate buffer pH 6.0 in microwave for 15 min. Immersed in 3% H2O2 (Blocking peroxidase solution, Dako Cytomation) for 20 min to block endogenous peroxidase activity. After equilibration in 10 mM PBS pH 7.4 and incubation in 10% normal horse serum for 30 min, they were incubated with goat polyclonal anti-human TNC polyclonal antibody (N-19/sc-9871, Santa Cruz Biotechnology; dilution 1:200 in PBS containing 1% v/v blocking serum) overnight at 4°C. Following washing in PBS for 10 min, they were treated with swine anti-goat biotynilated-primary antibody (LINK, LSAB kit k-0679, Dako Cytomation), followed by incubation with the secondary antibody linked to peroxidase labeled steptavidin complex (Streptavidin HRP, Dako Cytomation) (for 15 minutes each in room temperature). Color development was achieved with diaminobenzidine (Dako Cytomation). Counterstaining was performed with Mayer's haematoxylin. As a negative control, slide was not incubated in primary antibody. Microphotograph was taken with a Canon Microscopic photographic device.

Result and discussion

Immunoreactivity of tenascin-C was found at cardiac ventricle, especially at the cytoplasmic and membrane area of cardiomyocytes. The nucleus and perinuclear area are devoid of tenascin-C immunoreactivity. Atrioventricular valve also showed immunoreactivity for tenascin-C in connective tissue area as patches.
Tenascin C expression previously investigated by Imanaka-Yoshida et al. Their findings revealed tenasin C expression in association with cardiac diseases in patients (myocardial infarction, myocarditis) and animal model.

Our result showed pattern of intracytoplasmic immunoreactivity of tenasin C, membranous immunoreactivity and both. Tenasin C was previously found in extracellular space as extracellular matrix protein. This molecule was believed to be synthesized by myofibroblast which reside in interstitial space between stacks of cardiaomyocytes. Our study suggested cardiomocytes themselves secrete and synthesize tenasin C. This result confirmed the findings of Yamamoto et al through in vitro mechanical strain towards cardiomyocyte showed induction of tenasin C mRNA (3.9 ± 0.5-times fold, \( p < 0.01, n = 13 \)) and increased in tenasin-C concentration. Immunohistochemistry of tenasin C in cardiac provide structural images and location of tenasin C protein in cardiomocytes. Intracytoplasmic tenasin C expression signals the process of tenasin C synthesis in the cardiomycyte’s cytoplasm. Membranous tenasin C expression signals the secretion of tenasin C from inside the cardiomycytos to the extracellular space.

**Conclusion**

Tenasin C expression in rat neonatal cardiac are intacytoplasmic and membrane area of cardiomycytos suggested the process of synthesis and secretion of tenasin C by cardiomycytos.

**Keywords**

Immunohistochemistry, rat neonatal cardiac, tenasin-C.

**References**


Tenasin-C as an indicator of tissue reactions. On the pathogenesis of shoulderimpingement syndrome. 2003 Oulu University Library.
NCBI Entrez Gene. TNC tenasin C (hexabrachion) [Homo sapiens]. Gene ID : 3371.
Histodynamics of cardiomyocytes number and diameter in neonatal, adult and senilis rat cardiac tissue: Preliminary study

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Introduction
Heart was once considered as terminally differentiated organ, static from birth till end of life. Discovery of cardiac stem cells (CSCs) shed new perspective on heart as a dynamic organ, able to regenerate in homeostasis and injury. Quantitative morphological analysis is the most reliable evidence for cardiac regeneration. However, histological evidence on cardiac changes in developmental process from post natal to senile remains very much debatable, whether hypertrophy of cardiomyocytes or proliferation from CSCs occurred in the process of cardiac growth and development. This study aims to investigate changes in cardiac histological appearance (cardiomyocytes number and diameter) from post natal to senilis using animal model.

Materials and methods
Design of this study was comparative cross sectional with 9 rats divided in to three groups based on age (neonatal age 2 days old; young adult age 3-6 months old; adult age 12-18 months). The rats was sacrificed according to the guidance of the ethical commission on Health Research, Ministry of Health of the Republic of Indonesia. This preliminary study was performed at Histology Laboratory, Faculty of Medicine Universitas Indonesia from December 2007 to February 2008. The subjects underwent intravital fixation and cardiac organ was removed. Microscopic specimens were made and stained with Hematoxylin-Eosin. Data collected: 2 microphotographs from atrium and 2 from ventricle. Cardiomyocyte number was counted with Digimizer Image Analyzer. Measurement of cardiomyocyte diameter was calibrated with micrometer scale using Digimizer Image Analyzer.

Result and discussion
Optimization of Intravital Fixation

Figure 1. 3 neonatal rats age 2 days old
The intravital fixation preferred in this study to preserve the cardiac organ as in living condition and minimized the congested blood inside the cardiac organ. After thoracotomy was done, the right atrium was cut and infusion syringe from perista infusion pump was immediately inserted to the left ventricle. With the beating of the heart, the blood was quickly removed from the systemic circulation and replaced with fixative solution, 10% buffered formaldehyde.

Histology of 3 age groups rat cardiac

Histology of neonatal rat cardiac revealed 3 layers of cardiac wall. They are the innermost lining is endocardium (simple squamous endothelium), myocardium in the middle which directly attaches to endocardium and epicardium. Sub-endocardium (connective tissue between endocardium and myocardium) and sub-epicardium (connective tissue between epicardium and myocardium) still undeveloped. This is different from young adult and adult cardiac. The sub-endocardium and sub-epicardium is well developed. Cardiomyocytes in neonatal cardiac have large nuclei in the centre of the cells, no peri-nuclear space, and intercalated disc is not clear, distance between two adjacent cardiomyocytes was narrow.

Changes in Cardiomyocytes number and diameter with age

Changes in cardiomyocytes number showed this pattern: the number of cardiomyocytes were most abundant in neonatal, less abundant in young adult and least number in adult cardiac. This resembles degenerative process, decrease in number of cardiomyocytes with advancing age. This result need to be carefully interpreted. It was different from the result of Linzbach et al that showed increased cardiomyocytes number with aging. The difference was in the quantification methods used. Our study counted cardiomyocytes per high power field (magnification 10x40) of selected areas representing cardiac atrium and ventricle, while Linzbach made proportion of cardiac wall volume divided with cardiomyocyte’s volume.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>ATRIUM Number per hpf</th>
<th>Diameter in µm</th>
<th>VENTRICLE Number per hpf</th>
<th>Diameter in µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatus</td>
<td>72.8 ±5.3</td>
<td>6.3 ±0.6</td>
<td>153.3 ±10</td>
<td>6.9 ±0.5</td>
</tr>
<tr>
<td>Adult</td>
<td>42.6 ±8.9</td>
<td>9.2 ±0.4</td>
<td>78.2 ±6.6</td>
<td>10.7 ±0.3</td>
</tr>
<tr>
<td>Senile</td>
<td>22.8 ±5.2</td>
<td>18.1 ±1.2</td>
<td>40.3 ±3.6</td>
<td>23.4 ±2.3</td>
</tr>
</tbody>
</table>

The diameter size of cardiomyocytes increased with aging. Increase in diameter is probably due to either hypertrophy or maturation process. Neonatal cardiomyocytes were still immature therefore have smaller diameter compared with young adult and adult cardiomyocytes. Young adult cardiomyocytes were in growth and development phase therefore the diameter is larger.
than neonatal cardiomyocites but smaller than adult cardiomyocites. Adult cardiomyocites were fully mature and developed therefore have the largest diameter.

**Conclusion**
Cardiac muscle is a dynamic tissue. Number of cardiomyocytes/high power field in atrium and ventricle decreased with aging while the diameter size of cardiomyocites increased with aging.

**Keywords**
Aging, cardiac histology, cardiomyocyte hypertrophy, post natal growth & development.

**References**
In vitro displacement and inhibition of Bacteroides vulgatus intestinal colonisation by probiotic bacteria

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Disseminated at: Anggreini Puspitasari, Philips Onggowidjaja, Triswaty Winata, Seppo Salminen, Eeva Salminen and Ingrid S. Surono


Introduction

Probiotics are microbial food supplements, which beneficially affect the host's health. They are used to treat disturbed intestinal microflora and increased gut permeability which commonly occur in children with acute rotavirus diarrhoea, people with food allergies or colonic disorders and in patients undergoing pelvic radiotherapy (Salminen et al., 1996). One of the main criteria for selecting probiotic strains is their ability to adhere to intestinal surfaces. Attachment to mucosa prolongs the time probiotics can influence the gastrointestinal immune system and microbiota of the host. Thus the ability to adhere to intestinal surfaces is thought to correspond to the efficacy of the probiotic strain. The antibody titres detected from the serum of people treated with probiotic bacteria has been shown to be directly correlated with the adherence ability of the used strain (O'Halloran et al., 1997).

Probiotic bacteria are thought to improve resistance to gut infection by competing with pathogen through displacement, inhibition and exclusion of harmful bacteria and balancing the intestinal microbiota. The aim of this research was to find out the ability of probiotic bacteria, namely Bifidobacterium lactis Bb12, Lactobacillus rhamnosus GG, as commercial probiotic strains, and Lactobacillus plantarum IS-10506, Lactobacillus plantarum IS-20506 as Indonesian indigenous probiotic strains isolated from dadih in the displacement and inhibition of pathogenic bacteria Bacteroides vulgatus.

Materials and methods

Human intestinal mucus was isolated from the healthy part of resected colonic tissue as described earlier (Ouwehand 1999; 2002). Before use, the protein concentration was determined by a modification of the method of Lowry et al. (1951) as described by Miller and Hoskins (1981), with bovine serum albumin (Sigma, St. Louis, Mo.) as the standard. Human mucus was dissolved (0.5 mg of protein per ml) in HEPES (N-2-hydroxyethylpiperazine-N-2-ethanosulfonic acid)–Hanks buffer (HH; 10 mM HEPES, pH 7.4), and 100 µl of the solution was immobilized into polystyrene microtiter plate wells (Maxisorp, Nunc, Denmark) by overnight incubation at 4°C by the method of Collado et al., 2005.

Radiolabeled bacteria were harvested after overnight incubation and washed twice with HH buffer. The A600 value was adjusted to 0.25 - 0.05 to standardize the number of bacteria (approximately 10⁶ CFU/ml), and 100 µl of this suspension was added to the wells and incubated for 1 h at 37°C. Subsequently, the wells were washed twice with 200 µl of HH to remove unattached bacteria. Adhered bacteria were released and lysed with 1% (wt/vol) sodium dodecyl sulfate (SDS) in NaOH (0.1 mol/liter, 200 ml per well) by incubation at 65°C for 1 h. The contents of the wells were transferred to microfuge tubes containing scintillation liquid (OptiPhase “HiSafe
3, Wallac, Turku, Finland), and radioactivity was measured by liquid scintillation. Adhesion was expressed as the percentage of radioactivity recovered after adhesion relative to the radioactivity of the bacterial suspension added to the immobilized mucus. Adhesion was determined in three independent experiments, and each assay was performed in quadruplicate to calculate intra-assay variation, expressed as the remaining pathogen adhesion to immobilized mucus.

Results and discussion

Bacteroides vulgatus was displaced by LGG, Bb12, Lactobacillus plantarum IS-10506, Lactobacillus plantarum IS-20506, from the initial 100 % to 70,44%; 117,22%; 131%; 70,56%, respectively. The results showed that Lactobacillus rhamnosus GG and Lactobacillus plantarum IS-20506 were significantly (P<0,05) displaced the Bacteroides vulgatus adhesion by 70,44 % and 70,56 %, respectively. Both Bifidobacterium lactis Bb12 and Lactobacillus plantarum IS-10506 each was not significantly (p>0,05) displaced Bacteroides vulgatus adhesion. None of the four tested probiotic bacteria showed significant (P>0,05) in inhibiting Bacteroides vulgatus adhesion. There was reduction in the amount of Bacteroides vulgatus adhere to mucus in vitro in the present of LGG, Bb12, Lactobacillus plantarum IS-10506 and Lactobacillus plantarum IS-20506 to 87,89%; 99,11%; 87,44%; 83,56%, as compared to the control, 100 %.

The ability to exclude and displace pathogens from mucus by specific probiotic strains has been reported in other studies (Collado et al., 2005; Lee et al., 2003). The difficulties involved in the analysis of bacterial adhesion in vivo have led to the development of in vitro model systems for the selection of potentially adherent strains. Many different intestinal mucosa models have been used to assess the adhesive ability of probiotics; among them, adhesion to human intestinal mucus has been widely used (Collado et al., 2005; Kirjavainen, et al., 1998, Tuomola et al., 1999). This study has also used a reproducible and sensitive human intestinal mucus model (33). As a conclusion, Lactobacillus rhamnosus GG as well as Lactobacillus plantarum IS-20506 significantly displaced the adhesion of Bacteroides vulgatus.

Keywords

Adhesion, Bacteroides vulgaties, displacement, inhibition, probiotic bacteria.

References


Long-term outcome of a prospective cohort of apprentices exposed to high-molecular-weight agents

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Introduction

A long-term (8-year) follow-up study was conducted in 408 subjects from a cohort of apprentices enrolled when they started a vocational program involving exposure to high-molecular-weight allergens. The objectives were to examine: 1) incident specific sensitization, work-related respiratory symptoms and bronchial responsiveness in those who entered a workplace with similar exposure; 2) persistence of the same outcomes in those who developed these features during their apprenticeship whether or not they were still exposed.

Methods

A respiratory symptom questionnaire, skin prick tests with specific allergens (laboratory animals, flour and latex), spirometry and a methacholine challenge were administered to participants. The association between incidence or persistence of these outcomes and individual characteristics at baseline and end of apprenticeship was examined.

Findings

In subjects who at any time during follow-up held a job related to their training (78%), the cumulative incidence of sensitization, rhinoconjunctival and respiratory symptoms, bronchial hyperresponsiveness and probable OA at follow-up was respectively 9.8%, 12.6%, 5.3%, 14.3% and 3.0%. The persistence of these outcomes acquired during apprenticeship was 32.7%, 34.9%, 28.6%, 47.2% and 33.3%, respectively, compared to 0 to 25% in subjects who were no longer exposed. Several clinical, immunological and functional characteristics at baseline and acquired during apprenticeship were found to be significantly associated with the incidence and loss of the outcomes assessed at follow-up.

Discussion

The incidence of sensitization, symptoms, bronchial hyperresponsiveness and probable OA were lower while at work by comparison with the apprenticeship period. Among subjects no longer exposed, a very high proportion experienced loss of features they had acquired during their apprenticeship.
Nursing student's and nurse educator’s perceptions and attitudes towards bioscience in an Indonesian bachelor of nursing program

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Introduction
Bioscience has been defined by Prowse and Lyne (2000) as an integration of anatomy, physiology, microbiology and pharmacology. Bioscience including all these elements is regarded as providing a foundation for nursing professional science (Brown & Seddon, 1996; Clarke, 1995). According to Prowse and Heath (2005) and Prowse and Lyne (2000), nurses who have a sound knowledge of bioscience perform better in the clinical setting and achieve higher quality of care and increase patients' satisfaction. However, there is a gap between theory and nursing practice (Corlett, 2000) with many nursing students finding difficulty in learning bioscience in their nursing program (Gresty & Cotton, 2003; McKee, 2002) and a lack of confidence in applying bioscience in nursing practice (Clancy, McVicar, & Bird, 2000). The Faculty of Nursing in the Universitas Indonesia was established in 1985. There have been many changes in the teaching and learning of bioscience. However, no study aimed at evaluating the on-going curriculum, especially in bioscience, has been conducted. Conducting this study would be expected to result in many beneficial outcomes. The study would provide a clear description of nursing students’ and nurse educators’ perceptions and attitudes towards bioscience which have not been explored in any previous Indonesian study. The study findings would enable the curriculum to be developed in ways that would improve the quality of teaching and learning in nursing education; thus resulting in better qualified graduates.

Methodology
This study was a descriptive survey using a self-administrated questionnaire. A validated questionnaire developed previously for a similar project by Friedel and Treagust (2005) was utilized. Participants were sourced from a Faculty of Nursing in a public university in Jakarta, Indonesia. The participants were second and third year undergraduate students and nurse educators who were not involved in the teaching of bioscience subjects. Data collected was analyzed using both descriptive and inferential statistics. Frequencies were used to describe the participants’ characteristics and frequency and descriptive statistics, paired sample t-tests and independent sample t-tests were used. The 0.05 level of significance was used to indicate that a difference between means was statistically significant. Ethic approval for this research was given before the study was undertaken.

Finding
A total of 221 eligible potential participants, 183 nursing students and 38 nurse educators, were invited to attend meetings between the co-researcher and potential...
participants. The response rate for the nursing students was 81.3% and for the nurse educators it was 94.7%.

In terms of the mean attitude scores for nursing students, they had better attitudes to bioscience in nursing practice scores (mean score=4.26) than to science at school scores (mean score=3.91) and to bioscience in nursing education scores (mean score=3.95). In terms of the scores for attitudes of nurse educators, it was surprising that their attitudes towards bioscience in nursing education (mean score=3.66) and attitudes towards bioscience in nursing practice (mean score=3.78) were less positive than their attitudes towards science at school (mean score=3.86). The independent sample t-test comparing the two mean scores indicated that the nursing students’ and the nurse educators’ attitudes were statistically different only for their attitudes towards bioscience in nursing practice (p <0.05).

Both nursing students and nurse educators were asked to respond to similar statements about bioscience and its application in nursing practice. More of the nursing students (94.8%) than the nurse educators (75.0%) agreed with this statement. When compared with the nursing students, a higher percentage of the nurse educators (36.1%) strongly agreed or agreed that their science background was not good enough for the bioscience study they had to do, 23.7% of the nursing students either strongly agreed or agreed with this statement. Likewise, the percentage of the nursing students who strongly disagreed or disagreed with this statement was higher (46.7%) than the percentage of the nurse educators (36.2%).

Discussion

In general, both nursing students and nurse educators were found to hold positive attitudes towards science at school, in nursing education and in nursing practice. Although the nursing students had very positive attitudes towards bioscience in nursing practice, their attitudes towards bioscience in nursing education and at schools were less positive. This implies that although these students were relatively new to nursing concepts and nursing practice, they were aware that applying bioscience in their future nursing practice would be valuable. Although no students in this study were reported as being over 25 year old while in the previous study by Friedel and Treagust (2005) 48% of the students were over 30 year old, this study finding is consistent with the results of a study by Friedel and Treagust (2005) and supports the view that students accept that the study of bioscience is useful and will have a positive impact on their study in the later years of their course as well as on their ability to apply bioscience in their nursing practice.

As in a previous study conducted by Clancy et al. (2000), this study reported that both students and nurse educators believed that bioscience is very important for nursing practice. However the proportion of the nursing students who agreed that bioscience knowledge forms the basis of nursing was greater than the proportion of the nurse educators who agreed with this statement. Previous studies have reported that nursing students and nurse teachers have different perceptions on the value of bioscience and other subjects (Jordan, et al., 1999; Courtenay, 1999). In the Courtenay (1999) study, nursing students had a more positive value of bioscience subjects than did the nurse educators. In the present study, the percentage of the nursing students who disagreed that there was too much classroom time allocated to bioscience subjects in the nursing course was higher than that of the nurse educators. This finding appears to be consistent with the finding of a study by Jordan, et al. (1999) that lecturers were satisfied with time allocated to teaching bioscience. These lecturers perceived that
bioscience subjects were less important than other subjects such as social policy, psychology, ethics and law, research and critical thinking

Conclusion
It was evident that nursing students had more positive attitudes to bioscience in nursing practice than to bioscience in nursing education and to science at school. The nursing students’ were found to have better attitudes to bioscience in nursing practice when compared with those of the nurse educators. The nursing students were not confident in explaining a number of topics within the bioscience. Another important finding was that the majority of both nursing students and nurse educators perceived that bioscience knowledge was essential to form the foundation of nursing practice. In order to improve the quality of teaching and learning bioscience in the faculty, recommendations have been made such as to increase the relevancy of bioscience subject contents to nursing practice, to increase the time allocated for bioscience and to provide bioscience integrated with nursing subjects. A further study using a combined of quantitative and qualitative methods should be undertaken to explore in-depth perceptions of students, nurse educators, graduates and employers. A more extensive study involving more than one nursing program in Indonesia would be needed to generate more generalizable findings.

Acknowledgment
We are indebted to June M. Friedel and David F. Triageust for the permission of using their questionnaire.

Keywords
Attitude, biomedical sciences, bioscience, Indonesia, nursing, perception, student.

References
Protein profiles of *S. mutans* as an antigen to induce IgY anti *S. mutans*

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**Introduction**

Primary causatif agent of caries are *Streptococcus mutans (S. mutans)* serotype c, e, f and *Streptococcus sobrinus (S. sobrinus)* serotype d. The early phase of dental caries development is adhesion of organism to saliva protein (pellicle) on tooth surface, followed by colonization of bacteria forming a membrane that mention dental biofilm (dental plaque). Adhesion and colonization process of bacteria are doing by antigen I/II, glucocyltransferase (Gtf) and glucan binding protein (Gbp) that act as virulen factors. Many researchs are doing to prevent caries for example using chicken yolk immunoglobuline (Ig Y). Veterinay Faculty of Institute Pertanian of Bogor (IPB) Institute have success doing IgY purification from fresh chicken yolk that made and produce as IgY water soluble fraction (WSF) freeze dry yolk anti *S. mutans*. The aim of this research is identify protein profil of *S. mutans* from Veterinary Faculty of IPB that use to produce yolk immunoglobuline (Ig Y).

**Method**

Spectrofotometer with Bradford method is using for distance *S. mutans* and *S. sobrinus* antigen protein value. SDS-PAGE using for identify protein profil.

**Results**

*S. mutans, S. sobrinus* and *S. mutans* from Veterinay Faculty of IPB have the same profile protein, bands with weight 190 kDa (antigen I/II), 140 kDa (Gtf) and 60 kDa (Gbp). There are 62-98 kDa, 28-38 kDa and 17-28 kDa bands that found from *S. mutans* from Veterinay Faculty of IPB.

**Conclusion**

IgY anti *S.mutans* from Veterinay Faculty of IPB has able to inhibit *S. mutans* virulence factors.

**References**


Qualitative work overload and other risk factors related to hypertension risk among Indonesian Police Mobile Brigade (Brimob)

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Introduction
The police force, specifically the members of the Indonesian Police Force (Kepolisian Republik Indonesia or POLRI), are officers concerned mainly with law and order, keeping the peace in the community, enforcing the law, detect and prevent crime. (Suparlan, 2002) One of the units in the POLRI is the Mobile Brigade (Brimob). The Brimob is present in every high intensity crisis, mass riots, or disasters that need emergency aid, which can occur in remote inaccessible places. It means working in a stressful environment.

Members of the Brimob may suffer hypertension which is related to work stressors and other risk factors. In the United States reported that when compared to men of the same age and income bracket in the general population, the police officers had a higher prevalence of hypertension (Franke, 2002).

Qualitative overload is one of the work-related stressors that occurs when there is a discrepancy between technical capability and knowledge compared to the demands of the work at hand. (Perry, 2002). This study aimed to identify the relationship between work stressors and other hypertensive risk factors.

Methods
The subjects for this cross-sectional study were Brimob members undergoing their periodic medical check-up during the period of July until October 2007. They were chosen by consecutive sampling and must have had a tour of duty in a conflict area. The study was carried out at one of the Brimob headquarters.

Data on age, marital status, level of education, blood pressure, body height and weight, work unit, length of employment, rank, post tour of duty, exercise, smoking, coffee, diabetes mellitus, family history of hypertension were recorded on a form especially constructed for this study.

A subject was hypertensive if systolic blood pressure (SBP) was 140 mmHg or higher, or diastolic (DBP) 90 mmHg or higher, or taking antihypertensive drugs. Normal subjects were those who had SBP less than 120 mmHg and DBP less than 80 mmHg, and have never been diagnosed with hypertension.

Work stressor was diagnosed using a diagnostic questionnaire, Kuesioner Diagnostik Stress Kerja (Isfandari, 1992). The subject had to fill his answers on the questionnaire made up of 30 questions on 6 types of work-related stressors. The 6 types of work-related stressors evaluated were: role ambiguity, role conflict, quantitative overload, qualitative overload, career development, and personal responsibility. The accumulated score was classified as low if less than 10, and moderate to high if more than 10.
Relative risk (RR) was used since the prevalence of hypertension among Brimob members was more than 10%, with 95% confidence interval based on the result of Cox regression analysis with time constant [Barros, 2003]. STATA version 9 was used for statistical analysis. Ethical approval was obtained from the Research Ethical Commission of Faculty of Medicine Universitas Indonesia. The study was undertaken after approval was granted by the Chief of the Brimob.

Results
There were 340 members of the Brimob aged 21 to 51 years eligible for this study, but 4 subjects did not fill in the questionnaire, leaving 336 as subjects. The number of subjects included in the analysis was 190, which consisted of 111 subjects with normal blood pressure and 79 subjects with hypertension (stages 1 & 2). None of the subjects were on antihypertensive.

The subjects with hypertension and normal blood pressure were equally distributed in terms of age, marital status, level of education, rank, length of employment, terms of exercise, smoking, coffee, history of diabetes mellitus, and family history of hypertension, work-related stress such as role ambiguity, role conflict, quantitative work overload, career development, and personal responsibility.

When compared to the subject that was more than 4 weeks post tour of duty, the subject that have only been home 1 day – 1 week more likely had a higher hypertension, and the subject that have been home 1 week – 1 month less likely had hypertension. In term of work units, the 2/Pelopor unit and the 3/Pelopor unit have a lower risk of being hypertensive.

Hypertension was found to be related to obesity and qualitative work overload. Medium to high level qualitative work overload had a two-fold risk for hypertension [adjusted relative risk (R Ra) = 2.00; 95% confidence interval (CI) = 0.97-4.14; p = 0.060]. Overweight subjects had 48% increased risk to hypertension (R Ra = 1.48; 95% CI = 0.98-2.22; P = 0.059). Obese subjects had a two-fold risk of being hypertensive (R Ra = 2.21; 95% CI = 1.51 - 3.14).

Discussion
This study has several limitations. Firstly, the sample obtained did not represent the entire Brimob in Indonesia. The study was directed only at a segment of the Brimob, those undertaking their periodic medical check-up. Secondly, hypertension this study was made based on cross-sectional data which might not confirm to standards in the clinic, and the possibility of secondary hypertension was not explored.

This study reveals 79 (23.5%) Brimob officers had hypertension. This figure is higher than in Indonesian Air Force helicopter air crew which noted 11.5% of them had hypertension (Hanum, 2006). Most likely, Indonesian Air Force helicopter air crew were less likely younger ages.

Our study revealed qualitative overload work stress increased the risk of hypertension among members of Brimob. This coincides with finding of other studies (Krisnawati, 2006), and in another study (Tsutsumi, 2001).

Compared to the study result in office workers in Jakarta, where moderate to high qualitative work overload had a 7-fold increase on the risk of hypertension (Krisnawati, 2006), the members of Brimob seems to have a better coping mechanism. The risk of hypertension was only 2-fold in moderate to high qualitative overload in the Brimob. In addition, other studies on various professions in Japan and on law enforcement officers, including policemen, in the United States verify the relationship between work-related stress and the increased prevalence of hypertension (Frankem., 2002), and another study (Tsutsumi, 2001).

This study found that the risk of hypertension was higher among the overweight or obese compare to normal body weight subjects. This coincides with finding of other study, where the risk of hypertension increases with excess weight and obesity, especially in the young adult population.(Lucini, 2007).

Other work-related stressors, such as role ambiguity, role conflict, career development, and personal responsibility seemed to have no association with the risk of hypertension in Brimob.
subjects. These might be due to career development is well-regulated with periodic advancement in rank, and the sample size of subjects was not sufficient to identify these increase risks.

**Conclusion**

Qualitative work stress and overweight and obesity increased the risk of hypertension among members of Brimob. Therefore, qualitative work overload management and control of body weight should be included in programs for maintaining health of Brimob members.

**Acknowledgment**

The authors wish to thank all subjects who cooperatively participated in this study. We also would like to express our gratitude to Dr. Glenn Kaunang who facilitated this study.

**Keywords**

Hypertension, qualitative work overload, police.

**References**


Risks for the development of outcomes related to occupational allergies: An application of the asthma-specific job exposure matrix compared to self reports and investigator-scores on job-training related exposure

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Introduction

Risks for development of occupational sensitization, bronchial hyperresponsiveness, rhinoconjunctival and chest symptoms at work associated with continued exposure to high-molecular weight (HMW) allergens were estimated with three exposure assessment methods.

Methods

A Cox regression analysis with adjustment for atopy and smoking habit was done in 408 apprentices in animal health technology, pastry-making, and dental hygiene technology with an 8-year follow-up after training. The risk of continued exposure after training, estimated by the asthma-specific job exposure matrix (JEM), was compared to self reports and investigator-scores on job-training related exposure. Associations between outcomes and work duration in job(s) related to training were also evaluated.

Results

Exposure to animal-derived HMW allergens, subsequent to the apprenticeship period, as estimated by the JEM, was associated with a significantly increased risk for occupational sensitization (hazard ratio (HR) 6.4; 95% CI 2.3 to 18.2) and rhinoconjunctival symptoms at work (HR 2.6; 95% CI 1.1 to 6.2). Exposure to LMW agents significantly increased the risk of developing bronchial hyperresponsiveness (HR 2.3; 95% CI 1.1 to 5.4). Exposure verification appeared to be important to optimize the sensitivity and the specificity, as well as hazard ratios produced by the JEM. Self reports and investigator-scores also indicated that further exposure to HMW allergens increased the risk of developing occupational allergies. The agreement between self reports, investigator-scores, and the JEM were moderate to good. There was no significant association between respiratory outcomes and work duration in jobs related to training.
Discussion
The asthma-specific JEM could estimate the risk of various outcomes of occupational allergies associated with exposure to HMW and LMW allergens, but it is relatively labour-intensive. Exposure verification is an important integrated step in the JEM that optimized the performance of the matrix.

Keywords
Bronchial hyperreactivity, high molecular weight allergens, job exposure matrix, occupational diseases, occupational exposure.

References


Salivary immunoglobulin a response to *Streptococcus mutans* serotype C is not associated with primary dentition caries among Indonesian preschoolers

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**Introduction**

*Streptococcus mutans* is the major pathogenic bacteria involved in dental caries process. Previous studies had identified salivary Immunoglobulin A antibodies against five different serotypes of *Streptococcus mutans*, and serotype C was dominantly isolated from dental plaque. There have been conflicting results on the association between salivary IgA response to *Streptococcus mutans* and caries status.

**Objective**

This cross-sectional study was aimed to investigate the association between salivary IgA response to *Streptococcus mutans* serotype C and primary dentition caries among Indonesian preschoolers.

**Materials and methods**

This cross-sectional study was conducted in Ciputat Sub-district West Java. We randomly selected 313 out of 1786 healthy preschoolers belonged to middle-low income families, enrolled in 24 kindergartens. General characteristics and caries risk behaviour were assessed. Salivary IgA response to *Streptococcus mutans* serotype C using Eliisa method, primary dentition caries/Deft-t score, plaque index and saliva flow rate were determined. Deft score of 0 (zero) means caries free. Plaque index determines oral hygiene status; high plaque index means bad oral hygiene. Saliva flow rate of ≤ 0.2 ml/minute means low flow rate. Caries risk behaviour was determined by interviewing the preschooler’s caretaker using caries risk assessment tool adopted from American Academy of Pediatric Dentistry.

**Results and discussion**

Age of the preschoolers ranged 27.3-82.3 months, with similar proportion of boys and girls. Prevalence of high caries risk behaviour, high plaque index, high Deft-T score and low saliva flow rate was 48%, 18%, 64%, and 4.5% respectively.
Figure 1 shows that the preschoolers were mostly 60 months of age or older. Median value of *Streptococcus mutans* serotype C was 0.227 od, with a tendency of higher median values among younger preschoolers (Figure 2). Figure 3 shows a tendency of higher proportion of primary dentition caries among older preschoolers. Median value of Def-t score was significantly higher in children aged ≥ 60 months compared to <60 months (*P*=0.013).

Table 1 shows highly association between Def-t score and plaque index, a confirmation of the theory that plaque is a prerequisite for dental caries, and therefore, primary dentition caries may be reduced by having good oral hygiene. The positive correlation between behaviour risk factor and plaque index and Def-t score indicates the importance of caries risk assessment for individual as well as behaviour shifting, may be useful to prevent dental caries development at earlier stage of life.

Table 1. Associations amongst Def-t score, plaque index, caries risk behaviour and saliva flow rate of the preschoolers

<table>
<thead>
<tr>
<th></th>
<th>Caries risk behavior</th>
<th>Plaque index</th>
<th>Saliva flow rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Def-t score</td>
<td>( r = 0.48^* )</td>
<td>( r = 0.71^* ) \ (( P&lt;0.001 ))</td>
<td>( r = 0.20^* ) \ (( P&lt;0.001 ))</td>
</tr>
<tr>
<td>Plaque index</td>
<td>( r = 0.46^* )</td>
<td>-</td>
<td>( r = 0.71^* ) \ (( P&lt;0.001 ))</td>
</tr>
<tr>
<td>Saliva flow rate rate</td>
<td>( r = 0.20^* )</td>
<td>( r = 0.46^* ) \ (( P&lt;0.001 ))</td>
<td>-</td>
</tr>
</tbody>
</table>

*Spearman correlation coefficient*

A correlation between saliva flow rate and Def-t score was also observed: preschoolers with low saliva flow rate had a reduced oral clearance of plaque acids and food retention due to lower self-cleansing effect that physically clears cariogenic materials from the mouth, less able to buffer acid formation in the plaque, less contains fluoride to form protective coating on the teeth.

No association between salivary IgA response to *Streptococcus mutans* serotype C and primary dentition caries was observed, which could probably due to a dynamic process of dental caries development involving demineralization of enamel by the product of bacterial metabolism, with alternate periods of remineralization. This process requires an interaction of susceptible tooth, cariogenic bacteria and fermentable carbohydrate within a period of time. Another possibility is that serotype C was not the dominant bacteria responsible for primary dentition caries in this study, as other studies on the serotype C were done in non-Indonesian of different population.

**Conclusion and recommendation**

No association between degree of dental caries and salivary IgA antibodies was observed probably due to nature of cross-sectional method used in this study or else, dominant bacteria responsible for primary dentition caries among Indonesian preschoolers was not serotype C. A longitudinal study to observe salivary changes in caries, and further study on *Streptococcus mutans* serotype e and f are proposed.

**Keywords**

Indonesia, primary dentition caries, salivary IgA.
References
The Dutch diagnostic model for laboratory animal allergens sensitization was generalizable in Canadian apprentices

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Introduction

The use of these diagnostic models can increase the efficiency of health surveillance, by allowing an occupational physician to predict for an individual worker the probability of being sensitized to LA allergens. On the basis of this prediction, a decision can be made to conduct additional specific tests to diagnose occupational allergies among workers with a high probability. The utility of predictive models depends on how well they perform when applied to a new related population. In general, prediction models show a lower performance in populations other than where the model was derived. Therefore, we aimed at assessing the transportability of an earlier obtained diagnostic questionnaire model for sensitization to laboratory animal allergens derived from LA workers population to the Canadian animal health apprentices’ setting.

Methods

The model was externally validated in 414 Canadian animal health apprentices. Several approaches were used: (1) no adjustment; (2) recalibration of the intercept of the model; (3) re-estimation of the intercept and the regression coefficients of predictors; and (4) model revision, by excluding the existing predictor(s) and/or including new predictor(s). The bootstrapping procedure was done following the third and fourth methods. The calibration was assessed graphically and with the Hosmer-Lemeshow (H-L) test. Discriminative properties were determined by the area under the receiver operating characteristic curve (ROC area).

Results

When applied without adjustment, the model’s discriminative ability was adequate (ROC area was 0.74 vs. the original ROC area of 0.76); the calibration was poor (H-L test p-value <0.001). The other methods yielded models with good calibration (p-value > 0.10) and reasonable discrimination (ROC area ranged between 0.73 and 0.75). The refitted and revised model showed a good internal validity (correction factors from the bootstrapping procedure were > 0.90).
Discussion
Our analyses suggest that with local adjustment, the diagnostic model is externally valid and has a reasonable performance in predicting the presence or absence of sensitization to LA allergens in the Canadian animal health apprentices.

Keywords
Diagnostic model, occupational sensitization, questionnaire, screening, validity.

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The effect of IgY-Anti S. mutans in rat’s dental biofilm formation

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Introduction

Streptococcus mutans (S mutans) has been strongly implicated as a causative organism of dental caries. S mutans serotype c is a major etiologic agent of human dental caries. One of the concept in preventing dental caries is passive immunization with IgY. This antibody can prevent the attachment between S mutans and tooth surface. That mechanism can inhibit the adhesion and colonization of S mutans at initial phase so S mutans biofilm formation decrease. Previously research showed that anti S mutans serotype d IgY can inhibit the formation of biofilm by S mutans serotype c,e, and f.

Purpose

The purpose of this study was to determine the difference of Streptococcus mutans biofilm formation with or without anti Streptococcus mutans serotype c immunoglobulin Y from children dental plaque.

Methods

Subject between the ages 9 to 12 years of age were used in this study. Dental Plaque samples were collected by rubbing a sterile wooden toothpick on the buccal surface of lower first molar. The biofilm assay was carried out by using 24-well tissue culture plates. Briefly, S mutans isolate in trypticase soy broth (TSB) were centrifuged two times, and pelet were given 40 \( \mu \)g/ml IgY. The plates were kept in incubator for 2 hours. Control groups are without IgY. Biofilm formed in plates were quantified by measuring the absorbance at optical density 655 nm (OD\textsubscript{655}).

Results

Biofilm assay demonstrated that plates with IgY, incubated for 2 hours showed significant decrease (p<0,05) of biofilm formation than plates without IgY.

Conclusion

Anti S mutans serotype c IgY has the potential to inhibit the S mutans biofilm formation from children dental plaque.

Keywords

Biofilm, IgY, Streptococcus mutans.

References

Smith DJ, King WF and Godiska R. Passive Transfer of Immunoglobulin Y Antibody to Streptococcus mutans Glucan Binding Protein B Can Confer Protection against Experimental Dental Caries. J Infect Immun

The effects of phytosterol in low fat milk on serum lipid levels among mild-moderately hypercholesterolemic subjects

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Introduction

There are several risk factors identified for the development of CHD. One of the most important risk factors for CHD is dyslipidemia - changes of serum lipid profile – especially hypercholesterolemia (Krummel, 2000; Tribble & Krauss, 2001). Many clinical trials have been carried out to find the dietary components which have cholesterol-lowering effect. Plant-stereols is also named phyto-sterols, is dietary factor known to lower blood cholesterol. Consuming between 2 to 3 g per day phytosterol lowers serum total- and LDL-cholesterol by 9% to 20% without affecting HDL-cholesterol (Hallikainen, et al, 2000). Korpela, et al (2006) found that 2 g/day plant sterols in low-fat milk products for 4 weeks reduced 6.5% in serum total cholesterol, and 10.4% in serum LDL-cholesterol, while no significant changes in serum HDL-cholesterol and triglyceride levels. The cholesterol-lowering effects of phytosterol differ according to food matrix, which low-fat milk was found to be the most effective vehicle among the four foods, i.e., milk, yoghurt, bread, and cereal (Clifton, et al, 2004).

This study aimed to evaluate the effect of phytosterol properly solubilised in a partly vegetable oil-filled low fat milk, on serum total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, in mild-moderately hypercholesterolemic volunteers, who consumed their habitual diets with some behavior change through a scheduled counseling

Materials and methods

A randomized, two-arm parallel pre-post test design was conducted to evaluate the effect of phytosterol on serum lipid profile in hypercholesterolemic subjects, at Department of Nutrition-Universitas Indonesia in Jakarta from June to November 2006. Each subject was randomly assigned to one of the following intervention for six weeks period: counseling plus milk containing 1.2 g phytosterol (PS) and those received counseling alone(C). The counseling aimed in order the subjects to follow the dietary recommendation of therapeutic lifestyle changes (TLC Diet), whereas the energy requirement of the subject was individually calculated using the Harris-Benedict equation.

Results and discussion

The total number of subjects for each group was 20 subjects. At the end of the six weeks intervention period, only 17 subjects in the PS group, and 14 subjects in the C group completed the study. This sample size is still within adequate range. The age of the subjects were 40.4 ± 7.5 years old, and 43.1 ± 8.4 years old respectively for PS, and C groups. The composition of the subjects were 11 males (9 in PS group, and 2 in C group) and 20 females (8 in PS group, and 12 in C group). After six weeks intervention, there were significant reduction in Body Mass Index (BMI) and Waist-Circumference in PS groups (p<0.05), while in C group the reduction were not significant (p>0.05). No significant changes of nutrient

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intake were found in both groups between before and after intervention. In PS group, the underlying mechanism of significant reduction of anthropometric measures without the decreased of nutrient intakes was still unclear, however it might be suggested due to over reported on their dietary assessment.

The changes of serum lipid profile of both groups were presented in table 1.

| Table 1: Serum Lipid levels of the subjects before and after intervention based on the intervention group |
|-------------------------------------------------|------------------|------------------|------------------|
| Variables                                        | PS- group        | C- group         | p-value**        |
| n                                                | 17               | 14               |                  |
| Total cholesterol $^1$, mg/dL                    | 233.5 ± 24.6     | 218.3 ± 18.6     |                  |
| Total cholesterol $^2$, mg/dL                    | 211.2 ± 30.3     | 219.6 ± 24.3     |                  |
| $p$-value*                                       | 0.01             | NS               |                  |
| Difference in serum total cholesterol, mg/dL (%) | -22.3 ± 28.7     | 1.3 ± 18.8       | 0.009            |
|                                                  | (-9.2 ± 12.3)    | (0.7 ± 9.0)      |                  |
| LDL-cholesterol $^1$, mg/dL                      | 176.9 ± 24.7     | 164.7 ± 21.8     |                  |
| LDL-cholesterol $^2$, mg/dL                      | 154.5 ± 24.3     | 160.0 ± 26.4     |                  |
| $p$-value*                                       | 0.004            | NS               |                  |
| Difference in serum LDL-cholesterol, mg/dL (%)   | -22.4 ± 27.9     | -4.7 ± 17.2      | 0.024            |
|                                                  | (-11.5 ± 16.7)   | (-2.8 ± 10.5)    |                  |
| HDL-cholesterol $^1$, mg/dL                      | 43.6 ± 8.0       | 46.8 ± 9.0       |                  |
| HDL-cholesterol $^2$, mg/dL                      | 40.3 ± 8.0       | 45.9 ± 37.9      |                  |
| $p$-value*                                       | NS               | NS               |                  |
| Difference in serum HDL-cholesterol, mg/dL (%)   | -3.2 ± 6.5       | -0.9 ± 6.8       | NS               |
|                                                  | (-6.7 ± 13.2)    | (0.5 ± 14.7)     |                  |
| Ratio LDL/HDL-cholesterol $^1$                   | 4.2 ± 0.9        | 3.7 ± 1.0        |                  |
| Ratio LDL/HDL-cholesterol $^2$                   | 4.0 ± 1.1        | 3.5 ± 0.6        |                  |
| $p$-value*                                       | NS               | NS               |                  |
| Difference in LDL-HDL ratio (%)                  | 0.18 ± 0.96      | 0.18 ± 0.61      | NS               |
|                                                  | (3.2 ± 26.6)     | (1.7 ± 16.4)     |                  |
| Triglyceride $^1$, mg/dL                         | 167.6 ± 65.4     | 109.6 ± 32.9     |                  |
| Triglyceride $^2$, mg/dL                         | 146.8 ± 56.9     | 118.8 ± 40.0     |                  |
| $p$-value*                                       | NS               | NS               |                  |
| Difference in serum triglyceride, mg/dL (%)      | -20.8 ± 57.7     | 9.1 ± 41.1       | NS               |
|                                                  | (-6.7 ± 31.0)    | (14.1 ± 41.7)    |                  |

$^1$, before intervention; $^2$, 6 weeks after the intervention
*) using paired t-test, or Wilcoxon
**) using unpaired t-test, or Mann-Whitney
NS, no significant difference (p value > 0.05)

After six weeks intervention showed the significant decreased for serum total- cholesterol and LDL-cholesterol in PS group (respectively -9.2 ± 12.3 % and -11.5 ± 16.7% (p<0.05), while no significant reductions of serum HDL-cholesterol and triglyceride. In the C group, there were no significant changes for all serum lipid measures. The decreased serum total- and LDL- cholesterol levels in PS group was consistent with other reports that the supplementation of phytosterol-fortified food products (1-4 g/day) may reduce circulating cholesterol levels by 8-15% within 3 to 6 weeks in mildly hypercholesterolemic subjects (Mensink, etal, 2002; Gyling and Miettinen, 1994). One of the mechanisms by which phytosterol reduces serum cholesterol was suggested to be the inhibition of its absorption and the increament of its efflux from enterocytes into the intestine lumen (Turley and Dietchy, 2003). The dietary counselling alone in the present study seemed to have no effect on serum cholesterol profile, eventhough lipid lowering diet with highly motivated subjects were reported to reduce total cholesterol concentration by 3-4% (Neil, et al, 1995)

Further analysis using repeated measures, it was found that the significant reduction of serum total cholesterol, and LDL cholesterol levels in PS group were due to the intervention of phytosterol. However, the Body Mass Index and Waist-Circumference in this group was also reduced which might contribute to the reduction of total- and LDL-cholesterol.
Conclusion

The intervention of phytosterol reduced significantly total cholesterol, and LDL cholesterol levels, while no significant reductions on serum HDL-cholesterol and triglyceride.

Keywords

β-carotene, cholesterol, phytosterol, soluble fiber, TLC-diet.

References


The effect Portland cement in ALP activity of dental-pulp cells

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Introduction
Mineral trioxide aggregate is an endodontic material which is used to seal the communication between the pulp and oral environment or periodontal tissue. It has biocompatibility and provides an excellent sealing, non toxic and inducing the tissues regeneration. The basic substance of MTA is cement Portland which added bismuth oxide 4:1 ratio to give radiopacity property. However, there were only few reports that use human pulps cells to asses alkaline phosphatase activity induced by Portland cement in vitro.

Objective
To investigate the ability of Portland cement in producing alkaline phosphatase. Methods: Human dental pulp cells were obtained from caries free teeth which were extracted for orthodontic treatment. The teeth were split to obtain the pulp tissue. Cultured in DMEM supplemented with 10% FBS. The cells were used between the fifth and sixth passages. Alkaline phosphatase was asses by its supernatant for 24 hours and 72 hours.

Results
The mean value for alkaline phophatase production in MTA was higher than Portland cements. Meanwhile, the statistical analysis shows no significant different between those specimens.

Conclusion
Portland cement has its ability to induce alkaline phosphates production by human pulp cells.

References
The effects of xylitol on dental pulp cells

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Introduction
Xylitol is a polyol sugar alcohol and is used as an artificial sweetener that has been successfully used in chewing gums to prevent dental caries as xylitol could inhibit the growth of Streptococcus mutans, one of primary causative agents of dental caries for the past two decades (Makinen KK, 2008). Furthermore, besides xylitol could be able to block bacteria from producing the acids that cause tooth decay and decrease plaque formation, xylitol also could enhance remineralization (hardening) of weakened teeth, and it relieves dry-mouth by increasing saliva. Xylitol could inhibit the growth of periodontopathic bacteria P. gingivalis (Su-Ji H et al, 2005). Therefore, xylitol might be a promising candidate as both an anticaries and an antiperiodontitis agent. Dental pulp is a loose connective tissue that provides dentinogenic, nutritive, sensory, and defensive functions to the tooth. Dental diseases and injuries require replacement of the affected dental tissue. Culture of pulp cells appears as a promising tool to ensure the dental tissue regeneration. On the open dental pulp cavity, xylitol might diffuse across dentine from a cavity and are of concentrations high enough to produce a biological effect upon the dental pulp. Subsequently, xylitol may interfere with the function of the dental pulp cells, either by cytotoxicity or by enhance the pulp cells proliferation.

Objectives
To observe the effects elicited by xylitol upon the dental pulp cells proliferations based on cells viability.

Methods
The dental pulp cells were obtained from freshly extracted teeth of patients with indication of teeth extraction (e.g.orthodontic therapy). The cells were cultured in DMEM for 48 hr (37°C, 5% CO₂, and then exposed to 2%, 4%, 8%, and 16% xylitol, except the controls. The cells viability were determined by MTT Assay and Bradford Protein Assay.

Results
The results of MTT Assay showed that after treated with 2% and 4% xylitol, the cells viability were increased (113%; 157%, respectively) than the controls (100%). Then, they tended to decrease after exposed to 8% and 16% (138%; 122%, respectively), eventhough they were still higher than the controls. Furthermore, the results of Bradford Protein Assay showed that the protein total of dental pulp cells after treated with 2%, 4%, 8% and 16% xylitol were increased (23031.31 µg/ml; 26380.87 µg/ml, respectively) than the controls (19013.05 µg/ml). Furthermore, they tended to decrease after treated with 8% and 16% xylitol (23192.57 µg/ml; 21498.48 µg/ml, respectively). However, they were still higher than the controls. Thus, the increasing of dental pulp cells viability and the protein total of cells indicated that xylitol could stimulate the cells viability.
Conclusion
Xylitol could enhance the proliferations of the dental pulp cells, so that by chewing xylitol, it might help the regeneration of injured dental pulp.

Keywords
Cells viability, protein total of dental pulp cells, xylitol.

Acknowledgment
The authors acknowledge to PT.LOTTE INDONESIA for the grant to support this research.

References
The knowledge and practices of health worker toward food safety in Malang, East Java Province

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Introduction

Foodborne disease remains a public health problem in Indonesia (WHO, 2000). One of health workers' task is to educate the community on food safety (MOH, 2003). In order to ascertain that health workers play their roles in prevention of foodborne disease, the assessment on health worker knowledge and practice on food safety is indeed needed.

Method

This cross sectional study was done in Malang, East Java. The subject was 128 health workers who had serviced more than 1 year. They were randomly selected. Information was obtained through self administered questionnaire and interview. The cronbach alpha was 0.6 for questions on food safety knowledge.

Result

Seventy percent (70\%) of health workers had scores on food safety knowledge \( \geq 80\% \). The most difficult questions to answer were issues related with food storage (correct temperature to keep cooked food) and surveillance (stakeholder need to be involved in FBD surveillance).

<table>
<thead>
<tr>
<th>Table 1. Characteristics of subjects (n=128)</th>
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</thead>
<tbody>
<tr>
<td>Age, years (range)</td>
</tr>
<tr>
<td>Work duration at current place, years</td>
</tr>
<tr>
<td>Work duration as health educator, years</td>
</tr>
<tr>
<td>Female, n (%)</td>
</tr>
<tr>
<td>Profession, n (%)</td>
</tr>
<tr>
<td>Nutritionists</td>
</tr>
<tr>
<td>Community health workers</td>
</tr>
<tr>
<td>Others (midwife &amp; nurse)</td>
</tr>
<tr>
<td>Having task as health educator, n (%)</td>
</tr>
<tr>
<td>Employment status, n (%)</td>
</tr>
<tr>
<td>Permanent staff</td>
</tr>
<tr>
<td>Part time staff</td>
</tr>
<tr>
<td>Monthly salary ( \geq 110 ) US$</td>
</tr>
<tr>
<td>Satisfy to received salary</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Proportion of health workers applying Food Safety knowledge on control measures (n=128)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of control measures</td>
</tr>
<tr>
<td>Policy development</td>
</tr>
<tr>
<td>Procedures on cleaning and sanitation</td>
</tr>
<tr>
<td>Procedures on personal hygiene</td>
</tr>
<tr>
<td>Procedures on food storage</td>
</tr>
</tbody>
</table>
Discussion
Sixty six percent (66%) of the respondents have disseminated food safety messages to various target in the community (Fig. 1). A lower proportion of health workers applying food control measures (Table 2). Health workers tended to practice supervision and give corrective actions toward hygiene and sanitation operations, rather than to establish procedures (p < 0.05 chi square test).

Conclusions and recommendations
The health workers have satisfactory food safety knowledge, however they still lack on some critical issues of food safety. Encouragement toward their function as food safety educator is necessary by provision of infrastructure and reward.

Keywords
Food safety, health workers, knowledge, practices.

Acknowledgment
Supported by SEAMEO TROPMED RCCN UI, Min. of National Education of Indonesia and Industry Council for Development

References
The role of probiotics LIS 10506 and LIS 20506 on intestinal’s brush border protein expression on LPS induced rat

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Introduction

The intestine is an extremely complex living system that participates in the protection of the host through a strong defense against aggressions from the external environment (Davidson and Butler 2000). The integrity of the gastrointestinal brush border is a key element in preventing systemic absorption of enteric toxins and bacteria (Mooseker, Keller et al. 1983; Mooseker, Bonder et al. 1984; Lievin-Le Moal, Amsellem et al. 2002).

The primary functions of gastrointestinal tract have been perceived traditionally to be limited to digestion and absorption of nutrients and electrolyte, and to water homeostasis. The integrity of the gastrointestinal brush border is a key element in preventing systemic absorption of enteric toxins and bacteria. In the critically ill situation, breakdown of gastrointestinal brush border as barrier function may fuel sepsis. Probiotic are living organisms, mostly found in food supplement, which provide health benefit beyond mere nutritive value. The concept of using bacteria to treat disease and to promote health has existed for not less than 100 years. The hypothesis of this study is that probiotic could improve the breakdown of intestinal brush border induced by LPS as a model of intestinal infection.

Through extensive studies probiotic microorganism, appear to be highly beneficial for the treatment of clinical conditions with abnormal mucosal barrier functions. The understanding of probiotic function on intestinal brush border recovery is needed to support this hypothesis.

Materials and methods

Male adult Wistar rats Rattus norvegicus, 8-12 weeks of age, with 100-120 grams body weight were used in the study. There were four groups with 5 rats each. The first group : induced by LPS (2.5mg/kg/body weight) without probiotic, The second group : without induced by probiotic or LPS ; The third group: induced by LPS followed by intragastric probiotic Lactobacillus plantarum IS-10506 and the fourth group : induced by LPS followed by probiotic Lactobacillus plantarum IS-20506 for 7 days. The dose of probiotic was 2.67x10^9 CFU/day in 0.25 cc.

Rats (Rattus norvegicus) were sacrificed by cervical dislocation; the small intestine was immediately excised and its contents were removed with phosphate-buffered saline (PBS). After one end of the intestine was clamped, the lumen was filled with 3.7% formaldehyde in PBS, the other end was clamped, and the whole intestine immersed for 10 min at room temperature in the same fixative. The intestine was drained and cut open longitudinally. Epithelial cells were removed from the luminal surface by scraping, suspended in PBS, and
single cells were prepared by passing the suspension several times through a 22-gauge syringe needle. The cells were filtered through a 100-/μm mesh nylon cloth, collected at 300 g for 5 min, and finally resuspended in a small volume of PBS. After protein isolation, analysis protein was done by using SDS-Page with 12% gradient. The protein weight was measured by comparing protein fraction in Fermentes standard.

**Results**

This study is preliminary, to prove the role of probiotic on molecular aspect in brush border of intestine rehabilitation. The black arrows (figure 1 and 2) showed the expression of intestinal protein brush border before induced by LPS *E.coli* or probiotic, while the red arrows showed the protein expression of intestinal brush border after inducing LPS *E.coli*. The blue arrows showed improvement of intestinal brush border in the LPS group after inducing probiotic.

Figure 1 showed SDS-Page. The significant improvement of intestinal brush border in the illeum after inducing probiotic LIS 10506. Significant improvement of protein expression intestinal brush border with the molecular weight in range 40-55 kDa, 55-70 kDa, 95-130 kDa dan 100-130 kDa has been shown. This improvement of protein expression in jejunum with the molecular weight range in 40-50 kDa, 66-70-72 kDa, 60-70 kDa dan > 250kDa is also recognised. The effect of probiotic in duodenum found in 50-55 kDa molecular weight is shown.

Figure 2 showed significant improvement of intestinal brush border in the duodenum with the molecular weight range 50-55kDa and in jejunum with the molecular weight range in 38-40kDa; 40-50 kDa; 66-70 kDa. The improvement is also found in the illeum of intestinal with the molecular weight range in 36-55 kDa dan 55-72kDa.

*Figure 1. SDS Page improvement of intestinal brush border the illeum after inducing probiotic LIS-10506*

*Figure 2. SDS Page improvement of intestinal brush border in the duodenum after inducing probiotic LIS-20506*

From this study, understanding the molecular mechanisms of intestinal brush border rehabilitation induced by probiotic LIS 10506 and LIS 20506 has been proved. The effect of probiotic LIS 20506 on jejunum is better than LIS 10506.

**Keywords**

Border, intestinal brush, probiotic, repair.
References


The toxic effects of Triethylene Glycol Dimethacrylate (TEGDMA) on dental pulp cells culture

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Introduction

Background

Triethylene glycol dimethacrylate (TEGDMA) is a common component of the bonding agents and resin composites used in dentistry for various purposes, including restorative dentistry. Most of dental resinous materials contain high quantities of the diluent monomer TEGDMA as it reduces viscosity of resin materials and enhances bond strengths to dentin. However, TEGDMA monomers could be released from composite resins following incomplete polymerization and degradation processes by salivary enzymes in the mouth. Subsequently, TEGDMA is available in saliva and diffuses toward and affects the dental pulp which contains various cells, and thus may cause severe cytotoxic effects (Hume and Gerzina, 1996; Spahl et al, 1998). Some researchers reported that TEGDMA induced toxicity to several cells, apoptosis and mutagenesis (Schweikl and Schmalz, 1999; Janke et al, 2003). However, there has not been any reports yet about the cytotoxic effects of TEGDMA on human dental pulp cells.

Objectives

To determine the toxic effects of TEGDMA on human dental pulp cells based on cells viability, protein total, and protein profiles.

Methods

Dental pulp cells were isolated from the pulp of the freshly extracted teeth (free caries) and cultured in DMEM for 48 h (37°C, 5% CO2). TEGDMA with several concentrations of 2mM, 4mM and 8 mM were added to the dental pulp cells and incubated for 24 h. Cells viability was measured by MTT Assay, then was read by microplate reader. Whilst, the protein total was measured by Bradford Protein Assay, and the protein profiles were determined by SDS-PAGE.

Results and discussion

The MTT Assay of this research showed that the cells viability of dental pulp cells after treated with 4mM, and 8mM, and 12mM TEGDMA were statistically significant lower (94.5%, 87.8%, 83%, respectively) than the controls (100%) by one way analysis of variance (p<0.05). Therefore, by decreasing the cells viability in this research, TEGDMA might be reported to have cytotoxic effect on dental pulp cells. Furthermore, the results of Bradford protein assay of this research showed that the protein total of dental pulp cells after exposed to 4mM, 8mM, and 12mM TEGDMA were statistically lower (22762.27µg/ml ±3385.87; 20268.44µg/ml±1701.14; 23706.51µg/ml±3214.52; respectively) than the control group (24253.77µg/ml±3072.88). Thus, the decreasing of protein total of dental pulp cells after
exposed to TEGDMA expressing the cytotoxicity of TEGDMA on these cells. Whilst, the protein total of dental pulp cells cultured medium after exposed to 4mM, 8mM, and 2mM TEGDMA, were statistically higher (28635.85µg/ml±2373.4; 35288.41µg/ml±3469.48; 38199.79µg/ml±2752.47; respectively) when compared with the controls (27073.83µg/ml±2772.47). The results showed that the protein total in cultured medium was increased following the decreased cells viability which meant that protein in cultured medium was not used by the dental pulp cells since the cells were necrotic or apoptotic. Furthermore, the results of this research showed that the protein profiles of dental pulp cells and cultured medium identified by SDS-PAGE were altered as there were several different molecular weights of protein in dental pulp cells after treatment with TEGDMA compared with the control group.

**Conclusion**

TEGDMA with several concentrations of 2mM, 4mM, and 8mM caused cytotoxicity to human dental pulp cells showed by decreasing the cells viability and protein total of the cells, also increasing the protein total in cultured medium. Furthermore, there was alteration of protein profile of dental pulp cells following exposed to TEGDMA. Consequently, it should be the aim of future studies to replace TEGDMA with more biocompatible diluent monomers.

**Keywords**
Cells viability, cytotoxicity, TEGDMA, total protein.

**Acknowledgments**
The authors acknowledge Indonesia University for supporting this research by the grant from DRPM (RUUI 2008).

**References**
Total dissolved solid (TDS) assessment of surface water contaminants near pulp and paper mills in Pelalawan district, Province of Riau, Indonesia

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Introduction

Paper and pulp industries in Indonesia has contributed to Indonesian economy in foreign exchange and finance, job provision, and development of other economic sectors associated with industry, particularly in pulp and paper productions. Based on processes of pulp and paper production as described in the 2003 AMDAL document, pulp and paper mills have potential impacts directly on air and water quality. Hazardous chemicals in wastewater effluent potentially impact human health and the aquatic ecosystem. These chemicals are originated largely from wood chip digestion and bleaching processes. Even though the Minister of Environment has standardized the effluent by pH, BOD, COD, TSS, and Maximum Waste Debit by Kep-51/MENLH/10/1995 on Wastewater Standard for Industrial Activities (MenLH 1995), yet some bleaching-by products are not regulated.

The residential community may worry about wastewater effluent. Although the wastewater possibly has been appropriately treated before discharged, its physical appearance may indicate visibly that the wastewater is not completely safe to human health and the environment. Using contaminated water for domestic purposes is usually considered to be responsible for skin problems and other waterborne diseases. Indirect exposure, for example through food chain such as fish consumption, is of additional significant also if its existence in corresponding environmental media can be well identified and accurately quantified.

Purpose and objective

The purpose of study is intended to presents actual measurement of TDS to support management implementation through engagement of community involvement. The ultimate goal of this study is to protect human health and the environment from the adverse impacts of exposures to pulp and paper mills’ contamination. By this protection, it is expected that a critical mass of productive people with optimal health status and healthy behaviour and living in healthy environment will be created. This can be achieved by managing appropriately physical and social environmental risk factors.

Method

Water quality parameters refer to Attachment B.V of the Minister of Environment decision of Kep-51/MENLH/10/1995 on Wastewater Standard for Industrial Activities and Class B water of the PP 82/2001. These parameters were TDS only. Water samples are collected from 7 sites for surface water samples presented in Table 1. It should be noted that water samples of upper stream were required to know whether or not the wastewater effluent has significant impact on the river water. The analysis methods were measured by accredited laboratories. The water analysis quality analysis methods adopted mostly from Standard Methods for the Examination of Water and Wastewaters (Clesceri et al. 1998).
Result and discussion

For AMDAL documentation, water quality refer to Class water of PP No. 82.2001 (RI 2001). Environmental quality is conventionally evaluated using environmental standards or guidelines. In most instances, this technique is not sufficient to recognize environmental changes if the standards or guidelines are not exceeded. Alternatively, environmental quality can be evaluated using Control Chart, one of 7 control measures commonly used in quality improvement techniques. It was firstly introduced in 1924 by Walter Andrew Stewart of US Bell Telephone Laboratories to eliminate abnormal variation by separating special and common causes (Miller and Miller 1995).

The result of measurement of TDS showed in Table 1. The table represents the value of TDS (mg/L) and its sampling sites. Based on statistical requirements, there was one parameter (TDS) included for Control Chart construction. Procedure to construct Control Chart has been described elsewhere (Rahman et al. 2004) and the constructed Control Chart is presented in Graph 1 with sampling site codes refer to Table 1.

Table 1. Sampling sites for TDS measurement in Pelalawan District, Province of Riau, Indonesia, 2006

<table>
<thead>
<tr>
<th>Code</th>
<th>Location</th>
<th>TDS (mg/L)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWS1</td>
<td>water intake</td>
<td>19</td>
</tr>
<tr>
<td>SWS2</td>
<td>upper stream of wastewater effluent</td>
<td>13</td>
</tr>
<tr>
<td>SWS3</td>
<td>around wastewater effluent</td>
<td>1,520</td>
</tr>
<tr>
<td>SWS4</td>
<td>down stream of wastewater effluent</td>
<td>1,450</td>
</tr>
<tr>
<td>SWS5</td>
<td>Pelalawan village</td>
<td>24</td>
</tr>
<tr>
<td>SWS6</td>
<td>upper stream of Port</td>
<td>20</td>
</tr>
<tr>
<td>SWS7</td>
<td>down stream of Port</td>
<td>60</td>
</tr>
</tbody>
</table>


*) Governor of Riau regulation of No. 23 of 2003 for Class II water; numerically same as PP of No. 82/2001; SWS1 = water intake for pulp and paper mills; SWS2 = upper stream of wastewater effluent; SWS3 = around wastewater effluent; SWS4 = down stream of wastewater effluent; SWS5 = Pelalawan village; SWS6 = upper stream of Port; SWS7 = down stream of Port.

Total Dissolved Solid (TDS) has not exceeded corresponding Control Limit so no action required controlling them. In other words, the impact of wastewater effluent can be naturally tolerated by the existing aquatic ecosystem. In the constructed Control Charts, impact of wastewater effluent can be observed from increasing level of the surface water parameters at SWS3 (around wastewater effluent) where the wastewater is discharged to water body.

Total Dissolved Solid (TDS) has exceeded the standard at SW3 and SW4. It is clear, however, that water quality evaluation by ecological and legal viewpoints give different outcomes in terms of specific parameters and sampling sites.
Control Chart technique has been applied previously to evaluate water quality of Asahan River, North Sumatra (Rahman et al. 1998). It has been able to detect dramatic water quality changes due to pulp and rayon wastewater effluent, even though the legal standards had not been exceeded. It has been useful as well to evaluate unregulated critical parameters. For example, wastewater effluent has dramatically elevated color unit to intolerable level (exceeding Upper Control Limit) whereas this parameter was not regulated by PP 20/1990 (RI 1990).

Conclusion and recommendation

All the data sets have been thoroughly analyzed and discussed their meaning, importance, and comparison with other relevant study results. It can be concluded that: Current levels of TDS parameters exceeding legal standard (PP 82/2001) can be tolerated by existing aquatic system. Wastewater effluent of pulp and paper mills can be tolerated by the existing aquatic system of the Kampar River. It has been demonstrated also that the Control Chart technique is more sensitive to evaluate environmental hazard than conservative legal appraisal.

Keywords

Control chart, pulp and paper, total dissolved solid.

References

Water quality of Angke River: Microbiology point of view

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Introduction

The Angke River is located at the northwest part of Jakarta. This river was polluted with garbage that can cause diseases. People lived in the riverside in a low ceilings and muddy floors. Every year flood cause serious problems during the rainy season, since this river is located in the lowlands. Based on this fact, since 2002, Tzu Chi foundation has helped relocate people from Angke River to Tangerang in order to clean up the river and to make proper livelihood for the people. In 2005 the village has a drinkable tap water. They also provided wastewater sewage treatment and recycled water for watering plants and cleaning up public areas (Shu, 2008) Tzu Chi foundation also supports a research that will be organized by several faculties in Universitas Indonesia as an integrated research. One of the researches is the study of water quality of Angke River. The Department of Microbiology, Faculty of Medicine, Universitas Indonesia was appointed to conduct a research for examining the quality of water, based on microbiological aspect. In term of microbiological test, Escherichia coli (E. coli) are used as the indicator for testing the quality of drinking water. The presence of E. coli in the water, indicate that water is contaminated by human/mammals feces (Cappucino and Sherman, 2005; Ministry of Health RI, 2003). The parameters of microbiology examination of water quality are: Total Coliform and Fecal Coliform.

Materials and methods

Eight samples from Angke River from different locations were taken on April 15th, 2007: Duri Kosambi, Pesing Poglar, Teluk Gong and Pantai Indah Kapuk 1 point respectively, Muara (Estuary) 4 points. In this study we used double tube method since this method is easier and effective for restless water, toxic water, metal and phenol. To detect Total Coliform and Fecal Coliform in 100 ml water, we used Most Probably Number (MPN) method, which was done in 2 steps: Presumptive Test and Confirmed Test. To ensure the presence of E. coli in water, we have to conduct Completed test using selective medium and biochemical test (Cappucino and Sherman, 2005; Ministry of Health RI, 2003). The study was completed within 2 weeks. The interpretation is based on the Ministry of Health Recommendation (Keputusan Mentri Kesehatan RI, 2002). The requirements of good quality of drinking water are: Total Coliform = 0, Fecal Coliform = 0 and E. coli not found. Another interpretation based on Government Regulation: Peraturan Pemerintah Republik Indonesia No. 82, 2001 about water quality handling and water pollution control (PP, 2001).

Result and discussion

Escherichia coli were found at all points studied in the Angke River. The MPN of Total and Fecal Coliform and other microorganisms isolated at the eight sampling locations is shown in Table 1. At Duri Kosambi, the microorganisms found were the most variable i.e. E. coli, Klebsiella oxytoca (K. oxytoca), Proteus mirabilis (P. mirabilis), Pseudomonas aeruginosa (P. aeruginosa). The lowest MPN was found at Pantai Indah Kapuk (MPN of Total and Fecal Coliform were 81 and 0 respectively), followed by the estuary (Muara, at the outer side of the river mouth) where the MPN of Total coliform = 430 (Table 1). Clean water is different from
drinking water. Not all clean water is permitted to be used as drinking water; instead drinking water is definitely clean water. Nowadays, in big cities, even clean water is very difficult to be found. Only forty percents of middle to high economic level people in big cities in Indonesia has access to use clean water. As a result of bad water condition and sanitation is diarrhea that is the major cause of high mortality rate mostly in children. With the issue of global warming, healthy water crisis may get worst. Not only because of contaminated with bacteria and waste, but also due to dry season is predicted in many Indonesian regions (Diambang Krisis Air Sehat, 2007). Based on biology parameter, fecal coliform in most river in crowded cities in Java are more contaminated with coliform bacteria, for example Progo River (Central Java and Jogyakarta), Ciliwung River (Jakarta), and Citarum River (West Java) (Dinar, 2007). As compare to Singapore, it needs 18 years to recover the river water quality (Kualitas Air Sungai di Indonesia Terus Menurun, 2007). Another study in Sukabumi (West Java) concluded that rivers in Sukabumi were contaminated by Escherichia coli that cause diarrhea. Fifteen rivers were contaminated with coliform and fecal coliform above standard quality for 3rd class water quality. In those rivers, the MPN of total and fecal coliform were around 10,000/100 ml and 20,000/100 ml respectively. Nowadays people do not use river water in Sukabumi for drinking water anymore (Mayoritas Sungai di Kota Sukabumi Tercemar Coli, 2007). Badan Pengendalian Lingkungan Hidup (BPLH) study in 33 locations of 13 rivers showed that in 2004 the river and soil water quality in Jakarta was contaminated with organic and inorganic compounds. One strategy to solve these problems is to relocate people, move them far away from the water sources (Nunuy, 2004). The result of our study at Duri Kosambi showed that this location was contaminated with E. coli originated from the environment, but not from human/animal feces. Other microorganisms observed such as K. oxytoca, P. mirabilis and P. aeruginosa are human pathogens/opportunistic pathogens. At Pesis Poglal and Teluk Gong we found microorganisms that generally cause gastrointestinal and urinary tract infection in human (K. oxytoca,K. pneumoniae, and P. mirabilis) (Cappucino and Suherman, 2005; Mims et al, 2004). Almost all MPN Total Coliform of the locations studied were 2400/100 ml which is higher than the standard quality for drinking water. This number is still lower compare to the total coliform in some rivers in Sukabumi which are not used as drinking water anymore (Mayoritas Sungai di Kota Sukabumi Tercemar Coli, 2007). Even though the MPN Total Coliform of water from Pantai Indah Kapuk and outer side of river mouth were the lowest, based on Ministry of Health Recommendation, the Republic of Indonesia (SK Menkes RI No. 907/MENKES/SK/VII/2002 July 29th, 2002), the water could not fulfill the requirements for drinking water (Keputusan Mentri Kesehatan RI, 2002). In general, the water at Angke River is not recommended to be used as drinking water. However, the result using microbiology parameters showed that the water can only be used as clean water according to the government regulation which categorized the river as 2nd class water quality. People live in Pantai Indah Kapuk, have a higher economic level than other areas. So, it can be assumed that they are more educated and have more knowledge and insight in hygiene and sanitation. At the estuary, the water has a higher salt concentration; so that coliform bacterial growth is inhibited. This data is supported with the data from Sukabumi which showed that estuary areas have a lower number of total and fecal coliform (Nunuy, 2004).

Conclusion
The water quality of eight sampling location is categorized as the 2nd class quality not recommended to be used as drinking water except the water from Pantai Indah Kapuk and estuary area that can be used as drinking water after boiling.

Acknowledgment
This research is a part of a multidisciplinary research in Angke River supported by Tzu Chi Foundation.
Keywords
Angke River, *E.coli*, fecal coliform, most probability water quality, total coliform number.

References
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Wheat allergen exposure and the prevalence of work-related sensitization and allergy in bakery workers

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**Introduction**

Occupational airway diseases are common among bakers. The present study describes the association between exposure to wheat allergen levels and sensitization to wheat allergens, work-related upper and lower respiratory symptoms and asthma in bakery workers.

**Methods**

As part of a Health Surveillance System for early detection of (allergic) occupational airway diseases a so-called validation study was performed among Dutch bakers for validation of a diagnostic model that predict the likelihood of sensitization to specific workplace allergens. The present study used serology and questionnaire results of a subgroup of 860 bakers participating in the validation study. An earlier developed job-exposure matrix was used to predict average and cumulative personal exposure to wheat allergens.

**Results**

The prevalence of wheat sensitization, work-related respiratory symptoms and asthma increased till average wheat exposure levels of approximately 25–30 lg/m³, leveled off and decreased at higher exposure concentrations. Exposure–response curves showed a stronger pronounced bell-shape with cumulative exposure. Associations were strongest for asthma and work-related lower respiratory symptoms (PR_2 and PR_3.5–4.5 for average and cumulative exposure, respectively). Associations were only found in atopics. Wheat sensitization was an important factor in the prevalence of respiratory symptoms.

**Discussion**

In accordance with earlier studies, the present study showed a bell-shaped exposure–response relationship especially for cumulative wheat allergen exposure with sensitization, allergic respiratory symptoms and asthma. The healthy worker effect may be the possible explanation for the bell-shaped relationship.

**Keywords**

Asthma, occupational sensitization, wheat allergen exposure, work-related respiratory symptoms.

**References**


Genome 70


Which tools best predict the incidence of work related sensitisation and symptoms

Introduction
This study used information from the questionnaire alone or in conjunction with clinical tests, such as skin-prick testing (SPT) and bronchial responsiveness (BR) testing at entry, to develop models for estimating the probability of the occurrence of specific IgE-sensitisation to and respiratory symptoms in contact with laboratory animal (LA) allergens after 32 months’ training in an animal health technology programme.

Methods
Four multivariable logistic regression models were developed for each endpoint, consisting of: (1) questionnaire; (2) questionnaire and SPT; (3) questionnaire and BR testing; and (4) questionnaire, SPT and BR testing. The prognostic models were derived from a cohort of Canadian animal health technology apprentices. The models’ internal validity and diagnostic accuracy were evaluated and compared.

Results
Symptoms indicative of asthma and allergic symptoms at baseline composed the final questionnaire model for the occurrence of occupational sensitisation and symptoms. Both questionnaire models showed a good discrimination (area under the receiver operating characteristics curve were 0.73 and 0.78, respectively) and calibration (Hosmer-Lemeshow test p value .0.10). Addition of SPT and/or BR testing increased the specificity of the questionnaire model for LA sensitisation, but not for symptoms at work. To facilitate their application in practice, the final questionnaire models were converted to easy-to-use scoring system.

Discussion
Questionnaire is an easy tool that can give accurate prediction of the incidence of occupational sensitisation and symptoms.
Keywords
Allergy, bronchial hyperreactivity, occupational diseases, prognosis, questionnaire.

References
Formulate and evaluate: Population-specific complementary feeding recommendation using linear programming

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Introduction

Poor dietary quality is characteristic of complementary feeding diets consumed in disadvantaged environments; contributing to multiple micronutrient deficiencies and their associated adverse effects on infant health, growth and long-term development (Dewey and Brown, 2003). In response, international agencies have emphasized the need for country-specific approaches to improve complementary feeding diets, including evidence-based guidelines on appropriated complementary feeding (WHO/UNICEF, 2003). To facilitate these efforts, we have developed an approach based on linear programming analysis (LPA) that objectively formulates and evaluates sets of food-based recommendations; and, when optimal combinations of local foods are unlikely to ensure a nutritionally adequate diet, it confirms the need for alternative intervention strategies to complement a food-based strategy (Ferguson et al, 2006). The objective of the paper is to describe the contribution of the LPA in the decision-making process involved in nutrition intervention program planning and advocacy for improved complementary feeding diets and to describe, in simple terms, the steps using a series of hypothetical examples.

Materials and methods

Data requirements for performing LPA is presented in Table 1.

<table>
<thead>
<tr>
<th>Data requirements</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of foods typically consumed by target population</td>
<td>All modules</td>
</tr>
<tr>
<td>For each food, nutrient content per 100 grams, a realistic portion size per eating occasion, a maximum frequency of consumption per week, and its cost per edible 100 grams (optional)</td>
<td>All modules</td>
</tr>
<tr>
<td>The food consumption patterns of the target population (low-average-high levels)</td>
<td>Modules I, II, IV</td>
</tr>
<tr>
<td>The highest price the target population would be willing to spend on their infant’s diet (optional)</td>
<td>All modules</td>
</tr>
<tr>
<td>The target population’s breastfeeding status (breastfed – yes/no)</td>
<td>Modules I, II, IV</td>
</tr>
<tr>
<td>The estimated average energy requirements of the target population</td>
<td>All modules</td>
</tr>
<tr>
<td>The desired nutrient content of the target population’s diet (e.g. FAO/WHO nutrient requirements)</td>
<td>Modules I, II, IV</td>
</tr>
</tbody>
</table>

Results and discussion

\textit{Module I: Formulation of a set of food-based recommendations}

Using this module, user can: (1) formulate a set of draft food-based recommendations, (2) examine the nutrient or food content of the diet that best achieves the desired nutrient levels, i.e. optimal nutrient contents (FAO/WHO, 2002; FAO/WHO, 2004), and (3) identify nutrients
that are below their recommendation levels (FAO/WHO, 2002; FAO/WHO, 2004), even in a diet that best achieves the desired nutrient levels.

**Module II: Evaluation of recommendations for a food-based approach**

Using this module, user can: (1) test a set of food-based recommendations to determine whether local diets conforming to them are likely to be nutritionally adequate, (2) explore the cost implications of a given set of food-based recommendations; and (3) determine whether a food-based approach alone is likely to ensure a target population’s nutrient requirements are met.

**Module III: Identification of nutrient-dense local foods that provide key problem nutrients**

User can use this module to identify a combination of foods that, together, would provide specific amounts of selected nutrients. These nutrient-dense foods can then be incorporated into a set of food-based recommendations to improve them.

**Module IV: Selection of a food-based approach from among alternatives**

Using this module, user can compare alternative sets of food-based recommendations in terms of their worst-case scenario nutrient levels or lower cost. The results from this analysis provide objective evidence with which to inform the selection of a final set of food-based recommendations from among alternative sets.

Several key nutrition program planning and advocacy decisions are addressed in each module I-IV above, which shows the unique contribution LPA can make on decision-making process (Table 2).

<table>
<thead>
<tr>
<th>Modules</th>
<th>Planning/advocacy decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1. What is the optimal set of food-based recommendations for a specific target population? 2. What combination of nutrient-dense foods will come as close as possible to achieving the desired nutrient levels? 3. What nutrients, if any, are likely to be low in local complementary feeding diets?</td>
</tr>
<tr>
<td>II</td>
<td>1. Will a set of food-based recommendations ensure nutritionally-adequate diets? 2. What is the lowest cost expected in diets conforming to a specific set of food-based recommendations? 3. What nutrients will likely remain low in diets adhering to the set of food-based recommendations being tested?</td>
</tr>
<tr>
<td>III</td>
<td>1. What is best combination of local foods to fill a nutrient gap? 2. To create a recipe to improve dietary adequacy, which foods should be selected?</td>
</tr>
<tr>
<td>IV</td>
<td>1. What are the comparative cost and nutritional benefits of alternative sets of food-based recommendations? 2. What is the impact on worst-case scenario nutrient levels and minimal cost of one specific recommendation in a set of food-based recommendations i.e. is it worthwhile including it?</td>
</tr>
</tbody>
</table>

**Conclusion**

This review has demonstrated the way in which an approach based on LPA can rapidly and objectively inform food-based intervention program planning decisions and identify the need for alternative intervention strategies to complement them.

**Keywords**

Complementary feeding, food-based approach, linear-programming.

**References**


The development of model intelligence tutorial system for nursing Problem Based Learning (Sistiwat)

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Introduction
The Problem Based Learning (PBL) is the most appropriate learning method for the higher education in nursing. The reason why this method is the most suitable method because it requires facilitator’s attention in order to help each students to be more focus and directed when they have to find out the solution over the problem that is given to them. However, nowadays the facilitators in Faculty of Nursing Universitas Indonesia (FON-UI) don’t have enough time to guide the students properly. This study aimed to find a prototype of tutorial intelligentsia system for the nursing problem based learning which is integrated with the internet connection or called the Computer Mediated Learning (CML) in Universitas Indonesia so that the problem of the facilitator in FON UI can be solved by that.

Materials and methods
The samples of this study were the students who enrolled Biology subject at the first semester in 2008/2009 at FON-UI. The all samples identified into two groups; the experiment and control group. The samples that were given the application of biotechnology as their trigger to discuss using the combination of PBL system and internet connection/ CML (PBL Sistiwat) classified as the experiment group whereas the samples that were given the reproduction system as their trigger to discuss using PBL in face-to-face interaction method classified as the control group. After applying the second method of learning, the researchers observed and measured the students’ ability to understand the concept of knowledge and how to solve the problem with the nursing knowledge. In addition, researchers also measured the satisfaction level of students using the PBL method of on-line internet (Sistiwat) the quantitative and qualitative.

Results and discussions
The PBL learning system with tutorial web-based learning experience designed to match the face tutorial sessions PBL as closely as possible with the same time allow students to participate from different locations. This system consists of four main components: the multi-tool capital to support the students communication between students and between students and the system in the group (network UI CML), a reference theoretical concept (of teaching materials and modules), a model case, and the tutorial module.
This study’s results showed that the PBL Sistiwat compete the PBL in face-to-face interaction. It illustrated that the post tests scores’ mean and the paper and presentation scores in PBL Sistiwat was higher than PBL in face-to-face interaction (p = 0.017 and 0.000, α = 0.05). Besides, the students’ satisfactory level showed that the number of students who
identified their satisfaction in satisfied level was 62 out of 91 (68.1%), whereas the number of students who identified their satisfaction in very satisfied level was 21 out of 91 (23.1%). The results of deep interview using Focus Group Discussion (FGD) also supported the qualitative result.

**Conclusion**

To sum up, the PBL Sistiwat method was recommended to be applied in nursing education system in order to create the professional nurses who can in touch with science and technology.

**Keywords**

CML, nursing, PBL, tutorial intelligentsia system.

**References**


The implementation of informatics technology media utilization to improve knowledge in practicing public health services in Jabodetabek

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Introduction

In line with the development of science and knowledge and the demand of society to public health practitioners to always providing the best services, the public health practitioner needs to identify an alternative method, an easy way of learning which is not limited to space, place, and time. Based on the above reasons, a research in measuring the effectiveness of Informatics Technology based learning was conducted to the Public Health Practitioners in Jabodetabek.

Methodology

This research has been conducted in 2 years with Operations Research Studies/OR. The Operations research has steps: needs assessment, trial and error, implementing and evaluation. The research activity began with identification the problem, and continued with an improvement of distance learning program using CD-delivery and e-learning. Before elaborating the activities, the research team arranged a meeting with The Headmaster of Health Office in DKI Jakarta, Depok, Bekasi, Bogor, Cilegon, and Serang. The purpose was to find out their readiness on infrastructure and to develop an implementation strategic on informatics technology based learning.

The implementation of the activities in the first year (2007) was a training program to stimulate team building, active learning method, and to establish a community in a learning program. The instrument used in the research was a questionnaire that was distributed to 152 public health practitioners in Jabodetabek. The purpose was to identify their basic knowledge on technology based learning, support of infrastructure, and their motivation to conduct informatics technology based learning. In the second year (2008), an action research was implemented on distance learning program for the public health practitioners in Jabodetabek.
Result and discussion
A website has been developed to achieve this purpose, that was www.fik.ui.ac.id/pkko.

The findings of the research in 2008 demonstrated that in the area of infrastructure: there are 99% of Puskesmas and Health Office have computers, 76% connects to the internet, and 20% has a good internet access. The use of this technology is 98% related to administrative tasks, whereas its use for improving their knowledge through a distance learning method is not considered yet. Forty three percent of the respondents stated they have a good motivation to improve their knowledge using a distance learning method. In addition, from basic learning skills through internet perspective, there are 56% of the respondents have moderate internet use skill.

After the action research was conducted through a training program to learn how to use informatics technology, the research result shown as on the table below:

<table>
<thead>
<tr>
<th>No</th>
<th>Variable</th>
<th>Jabodebek</th>
<th>Cilegon &amp;Serang</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>As an alternative learning method</td>
<td></td>
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</tr>
<tr>
<td></td>
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<td>0</td>
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<tr>
<td></td>
<td>• Agree</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td></td>
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<td>82</td>
</tr>
<tr>
<td>2</td>
<td>As a media of improving knowledge</td>
<td></td>
<td></td>
</tr>
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<td>0</td>
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<tr>
<td></td>
<td>• Agree</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>• Strongly agree</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>3</td>
<td>Improving the perspective</td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>• Agree</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
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<td>• Strongly agree</td>
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<td>80</td>
</tr>
<tr>
<td>4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Disagree</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>• Agree</td>
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<td>20</td>
</tr>
<tr>
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</tr>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>• Agree</td>
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<td>28</td>
</tr>
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<td>Create difficulties</td>
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<td></td>
</tr>
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<td>48</td>
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<tr>
<td></td>
<td>• Disagree</td>
<td>48</td>
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</tr>
<tr>
<td></td>
<td>• Agree</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>• Strongly agree</td>
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<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Very flexible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Strongly disagree</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Disagree</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>• Agree</td>
<td>44</td>
<td>44</td>
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<tr>
<td></td>
<td>• Strongly agree</td>
<td>53</td>
<td>53</td>
</tr>
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<td>Enjoyable</td>
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<td></td>
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<tr>
<td></td>
<td>• Disagree</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
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<td>• Agree</td>
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<td>38</td>
</tr>
<tr>
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<td>• Strongly agree</td>
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<td>61</td>
</tr>
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</tr>
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<td>1</td>
</tr>
<tr>
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<td>• Agree</td>
<td>33</td>
<td>33</td>
</tr>
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<td></td>
<td>• Strongly agree</td>
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<td>67</td>
</tr>
<tr>
<td>10</td>
<td>Needs expenses</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

80 Information and Communication Technology
Table 1 above showed that half of the respondents stated agree that informatics technology based learning can improve the willingness to learn; be an alternative learning method, and be a learning media. Furthermore, informatics technology based learning facilitates in gaining the information easier, less difficult, and flexible. Informatics based learning method also encourage respondents to learn using internet access and be independent learner. However, the cost of learning using internet is assumed still expensive. Finally, the perception on informatics technology based learning is balanced between good perception (43% and 46,2%) and poor (unfavourable) perception (57% and 53,8%).

**Conclusion and suggestion**
This research used an action research to identify the needs and perception on the IT based learning from the public health practitioners in Puskesmas and Health Office in Jabodetabek area. The number of respondents at the beginning of the research was 152 persons. After the action research, there was only 126 persons participated. The result of the research concludes that informatics technology based learning is potential to be implemented by the public health practitioners in Puskesmas, encourage the active and independent learning. The infrastructure obstacle and the expensive cost of internet access causes the good and the poor perception of the respondents still balanced. Therefore, the policy and support from the institution’s leader is needed to success the learning program base on informatics technology. The supporting infrastructure and motivation to use this method is the successful key of the program.

**Keywords**
Active learning, informatics technology, internet, public health practitioner.

**References**
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www.apindonesia.com., education problems in Indonesia, acces.7 March 2007.
Thermal radiation modeling for oil and gas tank

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Introduction

Many different types of consequences modeling exist 1, 2, 3, 4, 5, 6. They range from simple equations that can be solved by hand to complex models that require massive amounts of input data and powerful computers1, 2, 3, 4, 5, 6. Several fire accident scenarios could be modeled including pool fire, jet fire, and BLEVE 1, 2, 3, 4, 5, 6. A pool fire occurs when a flammable liquid forms a puddle on the ground and catches on fire1, 2, 3, 4, 5, 6. Thermal radiation is the primary hazard associated with a pool fire. Other potential pool fire hazards include smoke, toxic by products from the fire, and secondary fires and explosions in the surrounding area1, 2, 3, 4, 5, 6. The impact of thermal radiation on human depends on heat flux generated from the thermal radiation1, 6. Table 1 shows a different level of heat flux (kw/m²) with its related impact.

Table 1. Impact of thermal radiation on human3

<table>
<thead>
<tr>
<th>Incident Flux (kW/m²)</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>100% lethality in 1 minute (Barry, 2002)</td>
</tr>
<tr>
<td>25</td>
<td>1% lethality in 10 seconds (Barry, 2002)</td>
</tr>
<tr>
<td>15.8</td>
<td>100% lethality in 1 minute, significant injury in 10 seconds (Barry, 2002)</td>
</tr>
<tr>
<td>12.5</td>
<td>1% lethality in 1 minute, first degree burns in 10 seconds (Barry, 2002)</td>
</tr>
<tr>
<td>6.3</td>
<td>Emergency actions lasting a minute can be performed by personnel without shielding but with appropriate clothing (API RP 521)</td>
</tr>
<tr>
<td>4.7</td>
<td>Emergency actions lasting several minutes can be performed by personnel without shielding, but with appropriate clothing (API RP 521)</td>
</tr>
</tbody>
</table>

ALOHA (Areal Locations of Hazardous Atmospheres) is a computer program designed especially for use by people responding to chemical releases, as well as for emergency planning and training. ALOHA models three hazard categories: toxic gas dispersion, fires, and explosions. ALOHA uses three threshold values (measured in kilowatts per square meter and denoted as kW/m²) to create the default threat zones 7, 8: Red: 10 kW/m² (potentially lethal within 60 sec); Orange: 5 kW/m² (second-degree burns within 60 sec); and Yellow: 2 kW/m² (pain within 60 sec).

Methodology

The computer software use for modeling is ALOHA® version 5.4 which is a trademark from The CAMEO® Software System, developed jointly by the National Oceanic and Atmospheric Administration (NOAA) and the US Environmental Protection Agency (EPA)7, 8. Unit of Analysis was selected based on the worst case scenario and the materials stored. The Tank No. 18 was chosen with the material stored is gasoline (Premium) (Figure 1)9. Threat zone is generated using the software, and there are three levels of concerns are chosen: red, orange and yellow. The red threat zone represents the worst hazard and the orange and yellow threat zones represent areas of decreasing hazard. Geographic Information System using Google Earth is then used to plot the threat zone.
Results and discussions

The flammable liquid storage tank was located in North Jakarta in which several other flammable liquids including different types of gasoline (Pertamax Plus, Pertamax, Premium), Kerosene and Diesel oil (Solar) are stored. The storage plant was located near to the residential zone (Figure 1). There are 23 (twenty four) storage tank which consist of: 10 (ten) tanks stored Premium, 2 (two) tanks for Pertamax, 2 (two) tanks for Pertamax Plus, 4 (four) for kerosene, and 5 (five) for diesel oil.

Figure 1. Flammable storage plant at North Jakarta

Figure legend:

- **Pertamax Plus**
- **Pertamax**
- **Premium**
- **Diesel Oil**
- **Kerosene**

GIS mapping for threat zone generated using Google Earth at the altitude of 1994 feet is presented in Figure 2. The **Red** threat zone (heat exposure at 10 kW/m²) will affect 45,257 m² of the area, affecting Tank No. 15, 16, 17, 19, and 20 (Figure 2). The red zone will also affect the main car transportation way inside the storage plant, and 7 (seven) Rukun Tetangga (RT) which occupied by 773 family members or 2869 people at the residential area near the storage plant. The **Orange** threat zone (heat exposure at 5 kW/m²) will affect 90,829 m² of the area, affecting Tank No. 15, 16, 17, 19, 20, and 22 (Figure 2). The orange zone will also affect the main car transportation way inside the storage plant, and 16 (sixteen) Rukun Tetangga (RT) which occupied by 2370 family members or 8814 people at the residential area near the storage plant. The **Yellow** threat zone (heat exposure at 2 kW/m²) will affect 222,376 m² of the area, affecting Tank No. 11, 12, 13, 14, 15, 16, 17, 19, 20, 22, 23 and 24 (Figure 2). The yellow zone will also affect the main car transportation way inside the storage plant, oil storage tank, control room, and 21 (twenty one) Rukun Tetangga (RT) which occupied by 3195 family members or 11,890 people at the residential area near the storage plant.
Conclusion
In conclusion, the model could be used for zone classification of thermal radiation, the number of people effected, and to develop emergency response plan.

Keywords
ALOHA (Area Locations of Hazardous Atmosphere), consequences analysis, Fire Modeling, pool fire, thermal radiation.

References
Functionality of indigenous probiotic from Dadih and regulatory aspects of probiotic in Indonesia

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Introduction
Dadih is an Indonesian traditional yoghurt like-product product from Minangkabau, West Sumatera, spontaneously fermented from raw buffalo milk in bamboo tubes and capped with banana leaf. Interestingly, the milk was fermented under unhygienic condition, no heat process applied to the milk, and fermented spontaneously by lactic acid bacteria indigenously present in the raw buffalo milk (Akuzawa and Surono, 2002), elder people in West Sumatera even believe that dadih has beneficial effects for their health.

Dadih lactic IS-27526 was able to enhance humoral immune response \textit{in vivo}, increase the IgA levels in mice (Riewpassa, 2006). LAB in foods have a long history of safe use (Salminen, \textit{et al}. 1998), likewise, dadih which is safe for human consumption. In the case of orally administrated probiotic, adhesion and viability, or the retention of heat labile component, appear to be important for the stimulation of the immune system (Ouwehand, \textit{et al}., 1999).

The objective of this research were to study the effect dadih probiotic supplementation on humoral immune response (total IgA serum and slgA saliva in children younger than 5 years, increase of their body weight, and to do the tracking of dadih probiotic on Indonesian people.

Materials and methods
Dadih probiotic were assessed for probiotic function, by tracking on the stool samples using molecular detection on Indonesian adults living with HIV/AIDS. The safety of \textit{Lactobacillus plantarum} isolated from Dadih, was validated in immuno compromise subjects. \textit{Enterococcus faecium} strain was validated in undernourished children younger than 5 years, on humoral immune response slgA from saliva, and in improving nutritional status.

Results and discussion
The dadih \textit{Lactobacillus plantarum} strain has probiotic function on the subjects shown by availability of the probiotic strain in the fecal samples of the subjects identified by PCR, and have been proven as safe probiotic towards immuno-compromised HIV/AIDS subjects. \textit{Enterococcus faecium} enhance the humoral immune response by increasing slgA saliva of the children.

Regulation for functional Food took effect in 2005. For probiotic food products, the government allows to rate “probiotic fermented milk” according to the number of viable cells under this regulation. It is important for the government to make sure that such products is safe for the consumers and their health claims are not misleading. National Agency for Drug and Food Control, Republic of Indonesia is currently developing a Draft Guidelines for Evaluation of Probiotic in Food for Nutrition and Health Claim based on The NADFC Decree 2005 on Functional Food. "Probiotic (Lactobacillus and Bifidobactrium, except \textit{L. bulgaricus})"
can help maintenance digestive function” is allowed, however, there should be based on scientific evidence. The result is based on the clinical study in Indonesian people. The regulation will cover steps to evaluate the microorganism: identification of genus/species/strain, functional characterization, clinical study in human: safety, efficacy, effectiveness, as well as the labeling. Genus, species and strain (physiological effect depend on specific strain). While the claim should include minimum viable numbers of the probiotic at the end of the shelf life, suggested serving size to be consumed in relation with the health claim, storage conditions, address for consumer to get information

**Keywords**
Children less than five, dadih, HIV/AIDS people, immune function, indigenous probiotic, regulation.

**References**
Probiotic properties of lactic acid bacteria isolated from dadih, a traditional Indonesian fermented milk

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Introduction

Dadih, an Indonesian traditional fermented buffalo milk in Indonesia, has been believed to have a beneficial impact on human health due to the probiotic properties of the lactic acid bacteria (LAB) involved in its fermentation process. Various indigenous lactic bacteria are involved in the dadih fermentation, an Indonesian traditional fermented buffalo milk of West Sumatra, which may vary from time to time as well as from place to place of dadih making (Akuzawa and Surono, 2002). Some dadih lactic acid bacteria have immunomodulatory properties (Surono et al., 2005).

In previous studies the adhesion capacity of specific LAB isolates from dadih to intestinal mucus and the ability to inhibit human pathogens and displace them from human mucus showed that L. plantarum IS-10506 is a potential probiotic culture. Many criteria have been suggested for the selection of probiotics, including safety, tolerance to gastrointestinal conditions, ability to adhere to the gastrointestinal mucosa, and competitive exclusion of pathogens (Collado et al., 2005; Collins et al., 1998; Ouwehand et al., 2002). Adhesion to the intestinal mucosa would allow colonization, although transient, of the human intestinal tract and has been related to the ability to modulate the immune system, especially during its development (Schiffrin et al., 1997). Thus, adhesion is one of the main selection criteria for new probiotic strains (Salminen et al., 1999). The aim of the study was to validate the effect of the most potential strains on humoral immune response as well as viability of fecal lactic acid bacteria in vivo.

Materials and methods

Strains and culture conditions. The indigenous dadih LAB strains were Lactobacillus plantarum IS-10506 and IS-20506 and Enterococcus faecium IS-27526, IS-23427, and IS-16183. All strains were isolated from dadih fermented milk (Surono, 2003) and were identified by 16S rRNA gene sequencing as L. plantarum (GenBank accession no. DQ860148 and DC860149) and E. faecium (GenBank accession no. EF068251, EF068250, and EF068249). All strains were kept in the University of Turku culture collection. For assays with freshly grown bacteria, the bacteria were cultured in MRS broth for 18 h at 37°C under aerobic conditions, harvested by centrifugation (3,200 xg, 4°C, 20 min), and washed twice with phosphate-buffered saline (PBS) pH 7.0 buffer. The viability of the cells was tested on MRS agar plates. The bacterial pathogens used in this study were Bacteroides vulgatus DSM 1447, Clostridium histolyticum DSM 627, Escherichia coli K-2, Salmonella enterica serovar Typhimurium ATCC 12028, and Staphylococcus aureus DSM 20231, were grown in Gifu anaerobic medium (Nissui Pharmaceutical, Tokyo, Japan) under anaerobic conditions (10% H2, 10% CO2, and 80% N2; Concept 400 anaerobic chamber, Ruskinn Technology, Leeds, UK). Bacteria were metabolically labeled by the addition of tiritated thymidine at 10 l/ml ([5-3H]thymidine, 120 Ci/mmol; Amersham Biosciences, Buckinghamshire, UK). All bacterial cultures were incubated at 37°C.
Competition between pathogens and LAB strains. Competitive exclusion of the pathogens by tested probiotics was determined as described previously (Rinkinen et al., 2003). Also, we analyzed the influence of the previous incubation in the competition test; for this, probiotic and pathogen strains were mixed in the same proportions and were incubated for 120 min at 37°C. After incubation, the mix was added to the intestinal mucus, and competitive adhesion was assessed following the methodology described elsewhere (Collado et al., 2005). After a total reaction time of 120 min for each condition, the cells of the pathogen bound to the mucus were removed, and the adhesion ratio (percent) was calculated as described above. For each condition, wells with PBS only, instead of nonradiolabeled adhesive cells, were included as controls, and the percentage of the pathogenic cells bound was considered the reference value (0%).

Statistical analysis. Statistical analysis was done by SPSS 11.0 software (SPSS Inc., Chicago, Ill.). Data were subjected to a one-way analysis of variance.

Animal experiment
Sprague Dauley rats were used, grouped into 4, Control group, supplemented with normal diet only without probiotic, L. casei Shirota group, L. plantarum IS-10506 group, and L. plantarum IS-20506 group, each kind of probiotic was supplemented at 10^10 cfu/day. Each rat was placed in metabolic cage, fed with normal diet for 5 days during adaptation period, and then supplemented with probiotic for 7 days and followed by normal diet for 3 days. Fecal secretory IgA was observed by sandwich ELISA, at 4 periods, before treatment, after 3 days treatment, after 7 days treatment, and after normal diet for 3 days or end of experiment. Likewise, the total fecal lactic acid bacteria and coliform were plate counting.

Results and discussion
The adhesion of LAB strains varied from 1.4 to 9.8%, depending on the strain. The most adhesive L. plantarum strain was IS-10506, with 9.8% adhesion, whereas the most adhesive E. faecium strain was IS-16183, with 4.9% adhesion.
Results of competitive exclusion studies between pathogens and LAB strains show that previous incubation at 37°C for 2 h decreased the pathogen adhesion to intestinal mucus, but this behavior depended on each LAB strain and the pathogen assayed. Every LAB strain was able to compete and reduce (P < 0.05) the adhesion of E. coli K-2, S. enterica serovar Typhimurium ATCC 12028, and S. aureus DSM 20231. The values ranged from 39.5 to 43.2%, 12.3 to 32.9%, and 23.9 to 36.3%, respectively. In certain cases, the presence of LAB increased the adhesion of B. vulgatus DSM 1447 and C. histolyticum DSM 627. All strains, with one exception, i.e., L. plantarum IS-20506, improved pathogen adhesion from 9.0 to 13.5%. L. plantarum IS-10506 improved the adhesion of B. vulgatus (33.5%). Every LAB strain after incubation with pathogen strains at 37°C was able to compete and reduce (P < 0.05) the adhesion of E. coli K-2, S. enterica serovar Typhimurium ATCC 12028, and S. aureus DSM 20231 by 57.7 to 64.7%, 32.8 to 56.0%, and 54.7 to 59.4%, respectively. Further, all LAB strains reduced the adhesion of B. vulgatus DSM 1447 and C. histolyticum DSM 627 from 44.4 to 66.8% and 14.5 to 34.00%, respectively.
In general, preincubation with LAB strains reduced pathogen adhesion. This is consistent with the coaggregation between pathogen and LAB strains shown in previous studies (Collado et al., 2007). These results suggest that coaggregation mechanisms between pathogen and LAB strains are involved in the reduction of pathogen adhesion to mucus. Natural wild strains isolated from dadih typical Indonesian fermented milk show inhibitory, competitive, and displacing properties against pathogens, and they are promising candidates for future probiotics. However, considering the high specificity of these processes, it is very important to characterize the properties of the strains and strain combinations in order to select the best strain or strain combination for the prevention or treatment of specific infections. In this study, L. plantarum IS-10506 and E. faecium IS-27526 appear to have the best properties of the assessed isolates.
**Total secretory IgA**

The increased values of fecal secretory IgA in rat supplemented with *L. plantarum* IS-10506 were significantly higher (p=0.05) than control and other probiotic groups, at the end of 3 days, at the end of 7 days and 3 days after normal diet (0.491 mg/ml, 0.311 mg/ml and 0.647 mg/ml respectively).

**Fecal microbiota**

Supplementation of probiotics significantly increased the fecal lactic acid bacteria in all of probiotic groups, and the highest was found in IS-10506 group, while fecal coliform was significantly lower in *L. plantarum* IS-10506 group, followed by *L. plantarum* IS-20506 group and *L. casei* Shirota group.

It is concluded that *Lactobacillus plantarum* IS-10506 and IS-20506 isolated from dadih are potential candidates for using them as probiotic bacteria as they are capable of remaining viable in the gut, reducing total fecal coliforms, and inducing the total IgA secretion. The increase of secretory IgA is important to protect the mucosal surface from infectious diseases.

**Keywords**

Adhesion, competitiveness against pathogen, dadih, immune system, *Lactic acid bacteria*, probiotic, viability.

**References**


Nano-coral as osteoconductive agent in bone regeneration process

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Introductions
Coral as a new biomaterial for bone graft substitute has been studied for induction of jaw bone regeneration. The structure of the commonly used coral, porites, is similar to that of cancellous bone and its initial mechanical properties resemble those of bone. The exoskeleton of these high content calcium carbonate scaffolds has since been shown to be biocompatible. However those potency need to be improved.

Objectives
This study was aimed to evaluate potency of nano scale Coral as osteoinductive agent by in vitro and in vivo experiments. Methods: We prepared a nano-scale coral to achieve the material properties such as more biocompatible and biodegradable. MG 63 osteoblast cell lines were coculture with nano-coral for further evaluation of bone regeneration marker, Alkaline Phosphatase (ALP) and osteocalcin. In addition, rat connective tissue and bone trabeculae content of tooth socket of post tooth extraction were also evaluated.

Results
ALP has significantly increased in the group with the addition of the size of 1000 nm coral in comparison to those group without coral treatment (p<0.05). A significant higher of osteocalcin concentration was also noted in the experimental group with the addition of 200mesh and 1000nm coral (p<0.001). Furthermore, connective tissue and bone trabeculae fractions were formed in a higher proportion in comparison to those negative control.

Conclusions
Nano-coral induced bone regeneration protein markers ALP and osteocalcin in osteoblast culutre as well as enhanced connective tissue and bone trabeculae formations.

Keywords
ALP, coral, osteoblast, osteocalcin, scaffold.

References
Analysis of radioactive transport safety regulation implementation in Indonesia

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Introduction
The transport safety regulation for radioactive materials plays important role to ensure the implementation of safety procedures. Several international standards for safety regulations for the transport of radioactive materials have been established (Table 1).

Table 2. Safety Regulations for the Transport of Radioactive Material

<table>
<thead>
<tr>
<th>Mode of transport</th>
<th>International / regional organization</th>
<th>Name of regulation / agreement / code</th>
<th>Current version</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>IAEA</td>
<td>Regulation for the Safe Transport of Radioactive Material, TS-R-1</td>
<td>TS-R-1; 2005 Edition</td>
<td>Worldwide</td>
</tr>
<tr>
<td>Road</td>
<td>UN/ECE</td>
<td>European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)</td>
<td>2005 Edition</td>
<td>Regional</td>
</tr>
<tr>
<td>Rail</td>
<td>OTIF</td>
<td>Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID)</td>
<td>2005 Edition</td>
<td>Regional</td>
</tr>
<tr>
<td>Road and rail</td>
<td>MERCOSUR/ MERCOSUL</td>
<td>Agreement of Partial Reach to Facilitate the Transport of Dangerous Goods</td>
<td>1994</td>
<td>Regional</td>
</tr>
<tr>
<td>Inland waterways</td>
<td>UN/ECE</td>
<td>European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)</td>
<td>2005 Edition</td>
<td>Regional</td>
</tr>
<tr>
<td>Post</td>
<td>UPU</td>
<td>Universal Postal Convention and its detailed regulations</td>
<td>2005 Edition</td>
<td>Worldwide</td>
</tr>
</tbody>
</table>

Source: Safety Regulations Governing the Transport of Radioactive Material.

Methodology
A comparison between the international safety standards of IAEA2-15 and existing Indonesian regulation16-25 on the issue of safe transportation of radioactive material was conducted by analyzing each items in the regulations.
Results and discussions

A comparison between international safety standards for safe transport of radioactive materials with existing Indonesian regulation is summarized in Table 1.

Table 1. A comparison between international safety standards for safe transport of radioactive materials with existing Indonesian regulation

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>IAEA</th>
<th>Indonesia</th>
</tr>
</thead>
</table>


Conclusion

The analysis of international safety standards for safe transport of radioactive materials with existing Indonesian regulation suggested that the Indonesian regulation need to be improved. Some particular guidance including the establishment of guidance for the quality assurance program and emergency response for the safe transport of radioactive material need to be developed to ensure the safe transport of radioactive materials, particularly in Indonesia.

Keywords

Radioactive transportation, risk identification, safety regulation for radioactive transport.

References


Chairman Decree No: 01/Ka-BAPETEN/V-99. Safety Provision on Working Against Radiation.


Chairman Decree No: 03/Ka-BAPETEN/I-03. Safety Requirements of Type A and Type B Radioactive Material Packages Test.


Rational addiction demand models for cigarettes in Indonesia

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Introduction
A rational addiction (henceforth RA) framework based on Becker and Murphy’s (1988) has become a standard approach in the analysis of addictive good. Key feature of the RA is the existence of lags and leads dependent variable as the main regressors. This feature leads to dynamic specifications. In spite of the large number of studies on demand for cigarettes, few studies have tested the RA model in a developing country context. This paper addresses this gap by testing the RA model of cigarette demand in Indonesia. This study is the first attempt at providing empirical evidence on smoking behaviour that confronts the RA hypothesis with Indonesian datasets. Previous studies in the country have been done in the context of a demand system without trying to model dynamic specifications of cigarette demand. Given a cross-sectional, some unobserved heterogeneity that may confound the results can not be controlled for. The use of individual panel data in the current study gives obvious advantages for adjusting individual behaviour regarding demand for cigarettes. The authors explored several econometrics methods. Empirical results obtained from different methods were compared, and the performances were assessed with several statistical criterion.

Methods
We estimated the dynamic specifications of cigarette demand model in the form of:

\[ C_{it} = \beta_0 + \beta_1 C_{it-1} + \beta_2 C_{it+1} + \beta_3 P_{it} + \beta_4 P_{it+1} + \beta_5 X_{it} + \nu_i + d_i + \varepsilon_{it} \]  

(1)

Error term \( \varepsilon_{it} \) in (1) may be serially correlated, and thus ordinary least square (OLS) yields inconsistence parameter estimates. The presence of \( C_{it-1} \) and \( C_{it+1} \) also leads endogeneity problem. Hence, this study explored not only OLS methods, but also instrumental variable (IV) approaches i.e., 2SLS, GMM, and system-GMM. The most appropriate method was selected based on statistical tests i.e., exogeneity, heteroskedasticity, and IV-tests. To employ system-GMM, we applied the methods developed by David Roodman (2006) and implemented “xtabond2” module in STATA for reducing the bias caused by too many overidentifying in the GMM. A finite sample correction was also used to the robust two-step covariance matrix calculated for system-GMM (Windmeijer 2000).

We used individual pooled data derived from three-wave a panel of the Indonesian Family Life Survey (IFLS), spanning the period 1993-2000. The dependent variable is the number of cigarettes smoked per day at the time of the interview. The main covariate is the number of cigarettes smoked in the previous wave \( (C_{it-1}) \) and in the next wave \( (C_{it+1}) \) from the current interview. These variables measure the effects of past and future consumption on current marginal utility of consumption. Other covariates include price cigarettes, price alcohol and income (proxied by expenditures). Prices and income variables were expressed in real terms.
by deflating current values using a consumer price index obtained from the Central Bureau of Statistics.

We investigated other variables as the instruments for both $C_{t-1}$ and $C_{t+1}$, including lagged and lead cigarettes prices, lagged and lead employment status, home ownership, Moslem, type of wall, and type of floor. To evaluate whether there may be a bias from weak instruments and whether they are orthogonal to the $\epsilon_{it}$ in (1), we employed several IV-tests. First, the relevance of the instruments was investigated by evaluating $R^2$ and $F$-test of a reduced form regression of both $C_{t-1}$ and $C_{t+1}$. Second, test of the over-identification, using Hansen's $J$-statistic in the case of GMM, and both Sargan's and Basmaan’s tests for 2SLS, was used to validate the instruments. Finally, $C$-test was used to assess orthogonality requirement of the instruments.

Results and discussion

Table 1 presents the results the cigarette demand (eq.1) estimation. Coefficient estimate of the cigarette prices indicates the short run elasticity. The long run elasticity is computed. The ratio of the coefficient on the lead to that on the lag, $\beta_2/\beta_1$, gives an estimate of the discount factor. It also can be used to derive the implied discount rate, which is $(\beta_1/\beta_2 - 1)$.

Pooled OLS that ignores the endogeneity with robust cluster standard errors are reported in Table 1. The Table also reports results of the 2SLS and GMM estimations that allows for the endogeneity. Both 2SLS and GMM estimation yields statistically significant results for $C_{t-1}$, cigarettes and alcohol price. The magnitudes of prices are almost similar from both 2SLS and GMM. The coefficient of $C_{t+1}$ has a positive sign and smaller than the coefficients of $C_{t-1}$. This is consistent with the theory, which rises to a positive rate and reasonable time preference.

Table 3: Model estimation results

<table>
<thead>
<tr>
<th>Metode Estimasi</th>
<th>OLS</th>
<th>2SLS</th>
<th>GMM</th>
<th>System GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{t-1}$</td>
<td>0.244$^{†}$ [0.021]</td>
<td>0.520$^{†}$ [0.113]</td>
<td>0.521$^{†}$ [0.112]</td>
<td>0.846$^{†}$ [0.130]</td>
</tr>
<tr>
<td>$C_{t+1}$</td>
<td>0.318$^{†}$ [0.027]</td>
<td>0.133 [0.152]</td>
<td>0.119 [0.145]</td>
<td>-0.749$^{†}$ [0.078]</td>
</tr>
<tr>
<td>$PC_{t-0}$</td>
<td>-0.154$^{†}$ [0.045]</td>
<td>-0.118$^{†}$ [0.070]</td>
<td>-0.129$^{‡}$ [0.066]</td>
<td>-0.358$^{†}$ [0.084]</td>
</tr>
<tr>
<td>$PA_{t+0}$</td>
<td>0.182$^{†}$ [0.019]</td>
<td>0.152$^{†}$ [0.035]</td>
<td>0.157$^{†}$ [0.035]</td>
<td>0.253$^{†}$ [0.060]</td>
</tr>
<tr>
<td>Ln-exp</td>
<td>-0.021 [0.018]</td>
<td>-0.016 [0.018]</td>
<td>-0.015 [0.018]</td>
<td>0.023 [0.056]</td>
</tr>
<tr>
<td>Constant</td>
<td>0.469$^{†}$ [0.226]</td>
<td>0.333 [0.351]</td>
<td>0.36 [0.354]</td>
<td>1.455$^{†}$ [0.768]</td>
</tr>
</tbody>
</table>

N                  | 1790 | 1783 | 1783 | 1783 |
R-squared          | 0.41 | 0.33 | 0.33 | 0.33 |
Uji-F              | 181.45$^{†}$ | 104.72$^{†}$ | 81.72$^{‡}$ | 27.63$^{†}$ |
# instrument       | 12   | 12   | 12   | 12   |
# excl. instruments| 8    | 8    | 8    | 8    |

Short elasticity   | -0.154 | -0.118 | -0.129 | -0.358 |
Long elasticity    | -0.352 | -0.340 | -0.358 | -0.396 |
Discount factor    | 1.303  | 0.256  | 0.228  | -0.885 |
Discount rate      | -0.233 | 2.910  | 3.378  | -2.130 |

$^{†}$significant at 10%; $^{‡}$significant at 5%; $^{‡‡}$significant at 1%; Robust standard errors in [brackets]

Based on the Durbin-Wu-Hausman and Wu-Hausman tests, we found evidence endogeneity of $C_{t-1}$ and $C_{t+1}$, with a $p$-value of 0.031. While 2SLS has been applied widely to correct the endogeneity problem in the RA model, we left this out for two reasons (Hidayat & Thabrany 208). First, unknown heteroskedasticity was detected, and this leads to give an invalid inference since the standard error would be inconsistent. Second, results of the IV-tests gave a little doubt of the excellence the instruments. The latter raises concern on the use of GMM, and hence the system-GMM was selected as the best methods.

All parameters estimates produced by system-GMM, except income, were significant at the 1%. The short and long run elasticity was estimated to be $-0.358$ and $-0.39$, respectively. A positive value of the $C_{t+1}$, with a $p$-value <1%, suggests the effect of dependence, reinforcement and tolerance is significant. Since the coefficient term of $C_{t+1}$ turned out to be a
negative, the RA-hypothesis is rejected. The RA-hypothesis is accepted when the coefficient of the lead is a positive and significant, and when the discount rate has a reasonable value. A rational smoker engages in a rational learning process, balances the utility value of smoking with expected utility loss and selects the efficient risk level. This behaviour doesn’t hold true for Indonesian smokers. They neglect future consequences of smoking risks. They are myopic addict so ignore the impact of current and past choices on future consumption decisions when making current choices. Although investigating determinant of the myopic addict is beyond the scope of this study, intuitively two factors contribute on this. First, smokers are seriously misinformed about a key risk of smoking. Whilst health warnings on cigarette packs have been mandated, our findings reveal that smokers don’t process information on the dangers of smoking efficiently. Second, smokers are exposed to many favorable messages about smoking (perhaps by advertising from Tobacco industries), and such messages cloud their thoughts about the risks. Anecdotal, tobacco industries provide more attractive and thorough advertisement on their products than public health campaign do. In light of this view, the promotion of more informed and responsible smoking should become policy objective. Policy makers have to redesign current public health campaign against cigarette smoking.

Conclusions
This study estimates the demand for cigarette following the rational addiction framework. The demand equation was tested on individuals aggregated data taken from three-wave a panel of the Indonesian Family Life Survey covering the periods 1993-2000. The authors explored several estimators, and chose the best fit one to overcome several econometric problems. Whilst the effect of dependency, reinforcement and tolerance is significant (suggesting cigarette is an addictive good), the RA-hypothesis was rejected in favour of the myopic one. This study confirms that the demand for cigarettes to be more prices sensitive for the long-run than the short-run. A ten percent increase in cigarette prices lowered the demand by 3.4 percent and 3.9 percent for the short and long-run, respectively.

Acknowledgments
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Keywords
Demand for cigarettes, IFLS, rational addiction, tobacco.

References
The differences between unconditional and conditional demand estimates

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Introduction
Estimates the probabilities of using healthcare services can be done based on samples of either unconditional or conditional on being ill responses. The latter are the preferred approaches because an individual’s decision to seek treatment implies that they are ill, which is especially true in developing countries. However, conditional on ill estimates poses several problems (Hidayat 2008). First, there may be an association between self-assessed health status and healthcare use, raising the possibility of endogeneity, and therefore the estimated responses of healthcare demand to exogenous variables based on an ill sample only would be biased. Second, conditional estimates may be susceptible to an underreporting of the incidence of illness in surveys and, thus would yield only a lower-bound estimate. Finally, the total effects of prices on the demand can be inferred only from unconditional estimation and such estimations would produce long-run effects. This study investigates the effects of health insurance on the demand for outpatient care, based both on samples of unconditional responses and on samples of responses conditional on being ill. The purpose is (i) to compare the results of the two approaches estimations and (ii) to investigate the effects of health insurance on the use of public and private outpatient care.

Methods
Healthcare demand is a function of health insurance and a set of exogenous variables including health status, income, gender, household size, marital, education, electricity, age, travel cost, travel time, urban, and survey site. Two types of health insurance schemes, Askes and Jamsostek, were included in the analyses. Although these schemes are assumed to be exogenous, apparently due to a mandatory program, the possible endogeneity problem of insurance participation was tested using both the approaches described in Waters (1999) and instrumental variable estimation (Baum et al. 2003). The dependent variable is outpatient care during the previous four weeks of interview in three provider options: self-treatment, public and private. The three provider option was estimated using a multinomial logit (MNL) model, with self-treatment as the references. The model was applied to the data from the second round of the Indonesian Family Life Survey (IFLS2), a panel survey carried out by the RAND Corporation in conjunction with Indonesian researchers and various international agencies (Frankenberg et al. 2000). The MNL assumes the stochastic portions of the conditional utility functions are uncorrelated across alternatives, and thus requires the assumption of independence of irrelevant alternatives (IIA) be satisfied.

Results and discussion
To construct conditional on being ill samples, this study used a definition of sickness that more accurately identifies people more likely to have used healthcare services. Individuals included in the definition were those who reported having at least one activity of daily living impairment and/or a serious illness. This approach identified 5055 individuals in the conditional sample, around 31% of the total sample (n=16485). This finding implies that a
problem with conditional estimates relates to the underreporting of incidents of illness (Sauerborn *et al.* 1996) could be minimized by adopting complete list of health measurements to capture the event of illness.

Since the study applied to conditional on being ill samples, health status was also potentially endogenous due to a sample selection. A probit model with the sample selection was carried out to investigate whether conditional estimates are affected by selection bias. The results yielded an insignificant correlation between the error terms – i.e., $X^2(1) = 0.02$, with a *p*-value 0.88 – ruling out any possibility of sample selection bias. This suggests that conditional estimates do not suffer from the sample selectivity problem.

Table 4: MNL estimation results using self-treatment as the comparison group

<table>
<thead>
<tr>
<th></th>
<th>Unconditional estimates</th>
<th>Conditional estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public Providers</td>
<td>Private providers</td>
</tr>
<tr>
<td><strong>Askes</strong></td>
<td>0.654 ‡ [0.101]</td>
<td>0.125 [0.141]</td>
</tr>
<tr>
<td><strong>Jamsostek</strong></td>
<td>0.512 * [0.270]</td>
<td>1.362 ‡ [0.187]</td>
</tr>
<tr>
<td><strong>Askes*Inc</strong></td>
<td>0.065 ‡ [0.040]</td>
<td>-0.014 [0.049]</td>
</tr>
<tr>
<td><strong>Jamsostek*Inc</strong></td>
<td>0.760 ‡ [0.239]</td>
<td>-0.388 ‡ [0.112]</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>7.121 ‡ [0.504]</td>
<td>13.031 ‡ [0.686]</td>
</tr>
</tbody>
</table>

*The estimated parameters β; superscript ‡, ††, and *significance at 1%, 5%, and 10% level, respectively. ‡Robust standard errors given in [brackets]. †References (omitted groups).

Table 1 displays the selected results of the MNL estimation. Detailed estimation results is in Hidayat B (2008). The pseudo $R^2$ values suggest the covariates explain 14% and 12% variation in the unconditional and conditional models, respectively. Both Hausman and Small-Hsiao tests confirmed that the MNL model passed the IIA assumption, suggesting that retaining the present model does not lead to inconsistent estimates. The coefficient estimate for Askes was positive for public and private providers, but only significant for the former at the 1% level. The findings hold true for both unconditional and conditional estimates. The coefficient estimate of Jamsostek in the unconditional estimates was positive for both provider types, although there was a difference in the level of significance (i.e., 10% at public and 1% at private). While in the conditional estimates, the coefficient of Jamsostek was significant for the private provider only.

Although both unconditional and conditional estimates yielded similar results with respect to the direction of most covariates, the recycling prediction results (see Table 4 in Hidayat B 2008) suggests that the latter yield a lower insurance effect than the former. The effects of Askes on the use of public provider were 7.5% lower in the conditional estimates (55%) than in the unconditional ones (62%). The demand effects of Jamsostek for outpatient with private providers were 20% lower in the conditional estimates than in the unconditional ones (156% and 176%, respectively).

When should we use unconditional estimates, and when should we rely on conditional estimates? It depends on the purpose of the research. When the research aims to measure long-run price effects, unconditional estimates are the desired option. However, if the research is designed to measure equity in healthcare use (Waters 2000), conditional estimates are preferable. Because conditional estimations do not suffer from statistical selection bias, they are acceptable for short-term analysis, and may even be preferable since they are less costly to implement (i.e., questionnaires need only be administered to those who are sick). Conditional surveys are also worthwhile, especially in developing countries, since research resources are usually inadequate.

The coefficient estimate of the interaction (Jamsostek*Inc) was negative for both provider types and significant at the 1% levels, except for public provider in the conditional estimates.
The negative coefficients of the interaction terms taken together suggest that the effects of Jamsostek on the probability of using formal healthcare were higher among the poor (Fig.1). These finding indicate that low-income people have a higher price elasticity of demand. From a public health perspective, these findings are of substantial interest. It suggests that expanding health insurance, as is the current policy thrust, will have a stronger impact on increasing formal care usage rates among the poor. The introduction of a demand-side subsidy to insure the 76.4 million poor in Indonesia is supported by the findings of this study.

Figure 2: The effects of health insurance on the use of public and private providers

**Conclusion**

This study estimates the effects of health insurance on healthcare demand in Indonesia using samples that are both unconditional and conditional on being ill. The latter approach does not suffer from the sample selectivity problem. Both estimations yield very similar outputs with respect to the direction of most of the covariates. The magnitude effects of insurance on demand for healthcare, however, are higher in the former estimates than the latter. The choice between using unconditional or conditional estimates for future studies should be determined by the main purpose of the research.

This study supports growing literature that health care demand is regressive irrespective of insurance status. Health insurance significantly improves access to health care services, with the largest demand effect of insurance found among individuals in the lowest income. This study supports the expansion of insurance programs or the establishment of a national health insurance program in order to address under-utilization of formal healthcare in Indonesia. A demand-side subsidy to pay premiums for the poor is also recommended.

**Keywords**

Conditional estimates, healthcare demand, health insurance, unconditional estimates.

**References**


The effect of community based health insurance on access and equity in access to healthcare services: a case study from Purbalingga, Indonesia

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Introduction

The Indonesian health sector fights with inequitable use of formal care services. The income-related inequity in access to formal care existed in Indonesia. The distribution of outpatient care showed inequity favouring the rich for private providers and inequity favouring the poor for public ones (Hidayat et al 2004). The Indonesian health sector also struggles with low demand for formal healthcare services. Utilization of formal healthcare services, even in the case of illness, is very low. Only 23% of those reported having an illness sought formal care. This figure is even lower than the studies derived from other developing countries i.e., Burkina Faso 42% (Sauerborn et al 1994) and Zambia 40% (Hjortsberg 2003).

The development of formal health insurance is an increasingly popular policy option to address the issues of a low health care demand in many developing countries. Health insurance has the potential to lower financial barriers as the financial risk of health is shared among members, and no further costs will arise at the point of health care use (with the exception of no cost sharing policies). Health insurance would be a potential tool to increase the demand for health care.

Since 1999, the government of Purbalingga, Central Java (population about 849.831) had introduced community health maintenance insurance (known as Jaminan Pemerliharaan Kesehatan Masyarakat, JPKM) with very low premium rate (about US$ 11 per family per year) and a limited benefit basket. The scheme covers about 42% of the population. This study aims to evaluate the effect of JPKM on access and equity in the distribution of health care use.

Methods

This study used data from a National Social Economic Survey (Susenas) 2004. To investigate the effects of JPKM on access, we used health care demand framework. Our econometric methods considered the feature of the dependent variables used in the analyses. For discrete data, which measures demand for health care in terms of probabilities of use of medical care, we adopted the discrete choice econometric. Whilst for discrete count, we used count data models, and opted to negative binomial (Cameron and Trivedi 1986).

To investigate equity, we used a concentration index ($CM$) which is an extension of the Gini coefficient. The $CM$ can take values between -1 and +1. If there were no variation in access among income groups, the index would be zero. A positive (negative) score of the $CM$ indicates inequity in the access, favouring the richest (poorest) groups.
Results and discussion

The most important results of the NB estimates confirm that the coefficient estimate for JPKM was positive, and significant for public hospitals, health centers and policlinic. Since the coefficient estimates alone does not readily tell us much about the magnitude of the effect of JPKM, the predicted probabilities of using various types of providers were calculated based on the NB estimations. Two scenarios were used; (i) holding all variables at current mean and (ii) changing JPKM status only and holding all other variables at their mean. This strategy assures that the distribution of the covariates and the sample size for each scenario is the same, and the differences in the probabilities predicted under different scenarios indeed due to difference in JPKM status.

Table 5: Predicted utilization of healthcare services under two scenarios

<table>
<thead>
<tr>
<th>Public hospitals</th>
<th>Health centres</th>
<th>Private practice</th>
<th>Policlinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sc:1</td>
<td>Sc:2</td>
<td>%</td>
<td>Sc:1</td>
</tr>
<tr>
<td>All</td>
<td>31.5</td>
<td>100.9</td>
<td>220</td>
</tr>
</tbody>
</table>

By income:

<table>
<thead>
<tr>
<th></th>
<th>Public hospitals</th>
<th>Health centres</th>
<th>Private practice</th>
<th>Policlinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>7.5</td>
<td>27.8</td>
<td>273</td>
<td>181.3</td>
</tr>
<tr>
<td>2nd</td>
<td>32.2</td>
<td>71.5</td>
<td>122</td>
<td>143.6</td>
</tr>
<tr>
<td>3rd</td>
<td>31.5</td>
<td>116.1</td>
<td>269</td>
<td>87.7</td>
</tr>
<tr>
<td>4th</td>
<td>40.0</td>
<td>122.6</td>
<td>206</td>
<td>128.5</td>
</tr>
<tr>
<td>5th</td>
<td>54.2</td>
<td>159.8</td>
<td>195</td>
<td>102.2</td>
</tr>
</tbody>
</table>

The predicted utilization when all individuals set out at the current mean level (scenario 1) were 33, 132, 186 and 14, respectively for public hospitals, health centers, private doctor practices and policlinic (Table 1). Except for private practice, the prediction utilization among JPKM beneficiaries (scenario 2) was increased. The magnitude effects of JPKM is percentage changes from scenarios 1 to scenario 2. The table reveals that the effects of JPKM on access to public hospitals, health centers and policlinics were 220%, 119% and 123%, respectively. The effect is higher among individuals in the lower income, suggesting low income have higher price elasticity of demand.

Table 2 present the estimated $C_M$ and their t-statistics. The negative value of the $C_M$ in healthcenter indicates the poor used health centers more often than the rich. Whilst the $C_M$ for public hospitals, doctor practice, and policlinic was positive indicating utilization of these providers concentrated in the rich (pro-rich inequity). Similar pattern (in terms of the $C_M$ sign) was observed for scenario 2 (right panel), but the degree of the $C_M$ was difference.

Table 6. Concentration indices of outpatient use at various providers, Purbalingga, Indonesia

<table>
<thead>
<tr>
<th>Scenario 1: Public hospitals</th>
<th>Scenario 2: JPKM effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_M$</td>
<td>SE</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>Public hospitals</td>
<td>0.0499</td>
</tr>
<tr>
<td>Health center</td>
<td>-0.0875</td>
</tr>
<tr>
<td>Doctors practice</td>
<td>0.2867</td>
</tr>
<tr>
<td>Policlinic</td>
<td>0.0194</td>
</tr>
</tbody>
</table>

*significant at 1% level

The effects of JPKM on equity can be seen graphically from the concentration curves, which show the cumulative proportion of outpatient care use against the cumulative proportion of the sample population ranked by income. If everyone, irrespective of the income level, has exactly the same value of outpatient care use, the concentration curve will then coincide with the diagonal (equality line). If the concentration curve lies above (below) the equality line, it indicates inequity of access in favour of the poorest (richest). The further the concentration curve lies from the equality line, the greater the degree of inequity in outpatient care use across income groups. Figures 1 presents the concentration curves in public hospitals, health centers, doctor practice and policlinic, respectively. Generally the concentration curves for the JPKM beneficiaries are closer to the equity line. This finding suggests that although still inequitable, JPKM has a positive effect on closing the equity gap of the insured.
Figure 3: Concentration curves of outpatient use at various providers, Purbalingga, Indonesia.

Conclusions
There are strong effects of JPKM on improving access to formal health care, and the effects are higher among individuals in the lower income group. Whilst JPKM reduces inequitable access to health care services among the insured, the effects is a modest.

Keywords
Health insurance, JPKM, access, equity, healthcare demand.

References
SCIENCE AND TECHNOLOGY EXTENDED ABSTRACTS
Analysis of adduct which is formed from reaction between cyclophosphamid with guanine and DNA *Calf Thymus* in vitro by high performance liquid chromatography-strong cation exchange

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Introduction

Adduct is produced from the reaction between alkylating agents with nucleophile such as amino acid, nucleic acid and protein (Baird and Mahadevan, 2004; Sharma and Farmer, 2004). N7-guanine is the most vulnerable to be attacked because it has the highest nucleophilicity while O6-guanine is most difficult to be attacked because it has the lowest nucleophilicity. Although O6-guanine has a relatively lowest nucleophilicity, almost every alkylating agent can produce O6-alkylguanine in a significant amount (Korolkovas and Burkalter, 1976).

Cyclophosphamide, is one of the alkylating agents that most used as anti cancer in a chemotherapy regiment dosage (8). The advantage of cyclophosphamide compared to other alkylating agents is that it can be administered orally and parenterally (9). Several methods have been developed in order to detect the adduct. Those methods such as Thin Layer Chromatography (TLC), Gas Chromatography (GC), High-Performance Liquid Chromatography (HPLC), Magnetic Core Spectroscopic Resonance (MCSR), Mass Spectroscopic (MS) and radioactive labelling. The previous research that used HPLC-fluorescence needed a few steps of complex derivatives so that it needed bigger cost and longer time.

In this research, the liquid chromatography method is used with a strong cation exchange column because nucleotide base adduct has a weak base characteristic that can be protonized into acid environment (pH 3.95) produces substance with positive charge, so it can compete with the mobile phase. The objective of this study is to analyze and to characterize adduct as a result of cyclophosphamide reaction with guanine and *calf thymus* DNA in vitro by High performance liquid chromatography with strong cation exchange column.

Material and method

A. Instrumentation

A set of HPLC; strong cation exchange column (Supelcosil LC-SCX, 25 x 4.6 mm), pump (Shimadzu LC-6A), oven column (Shimadzu CTO-6AS), detector (Shimadzu SPD-6AV UV-Vis), and recorder (Shimadzu CR-4A Chromatopac); Spectrophotometer UV-Vis (Shimadzu UV-Vis 1601).

B. Material

1. Guanine, N7-Methylguanine, O6-Methylguanine, Adenine, N3-Methyladenine, cyclophosphamide, *calf thymus* DNA. (Sigma) Ammonia 25% p.a, formic acid p.a, chloride acid p.a, absolute ethanol, dimethylsulphoxide, Tris, and methanol (Merck)
2. S9 mix enzyme (Pharmacology Lab ITB Bandung)
3. Aquabidestilata (PT.Wida Wi), Aquadest (Bumi Indah)
Procedure

1. Reaction of guanine with cyclophosphamide in vitro

4.0 mg of Guanine dissolve in 1.0 ml of potassium hydrogen phosphate 5 mM solution and mix with 4.0 mg of cyclophosphamide in mixture of 1.0 ml buffer Tris 0.01 M pH 8.0 and dimethylsulphoxide, then add 0.5 ml of S9 mix enzyme. As a control, S9 mix enzyme is not added. Then it is incubated in 37 ± 1°C for 6 and 12 hours. The alkylated DNA is precipitated by using 2.0 ml of ethanol absolute solution, centrifuged with 3.000 rpm for 10 minutes, the alkylated DNA is washed again by using 2.0 ml of 70% ethanol, and centrifuged again. The DNA pellet and supernatant from incubation 6 and 12 hours is hydrolyzed by using 1.0 ml chloride acid solution 0.1 N on 70°C for 30 minutes. The hydrolyzed DNA and supernatant are injected as much as 20.0 µl into HPLC.

2. Reaction of calf thymus DNA with cyclophosphamide in vitro

2 mg of calf thymus DNA with 4.0 mg of cyclophosphamide in mixture of 1.0 ml of buffer Tris 0.01 M pH 8.0 and dimethylsulphoxide, then add 0.5 ml S9 mix enzyme. As a control, S9 mix enzyme is not added. Then it is incubated in 37 ºC for 6 and 12 hours. And then repeat procedure 4.

Result and discussion

The chromatogram from each standard Guanine, N7-Methylguanine, O6-Methylguanine, Adenine and N3-Methyladenine in 0.1 N chloride acid, with sequential retention time + 4.60; ± 7.72; ± 8.11; ± 10.57; and ± 16.14 minutes. On the Guanine reaction with cyclophosphamide in vitro, the resulted adduct is N7-methylguanine with retention time of ±7.60 minutes with or without adding S9 mix enzyme. This shows that N7-guanine position is vulnerable to be attacked because of the high nucleophilicity. The amount of N7-methylguanine increased on the 12 hours incubation compared to 6 hours incubation. On the 6 hours incubation, N7-methylguanin was produced with concentration of 6.7050±0.3985 µg/ml and increased on the 12 hours incubation to be 8.6082±1.3753 µg/ml. The reaction between 2 mg of Calf thymus DNA with 4.0 mg of cyclophosphamide within the mixture of 0.01 M pH 8.0 buffer tris and dimethylsulphoxide, only produce O6-Methylguanine with retention time ± 10.50 minutes, with concentration of 3.1528 ± 0.6095 µg/ml (6 hours) and 4.6149 ± 0.5589 µg/ml (12 hours), without S9 enzyme, while with the adding of enzyme, there was no detection of adduct O6-Methylguanine. The instability of the adducts were determined and compared with standard. N7-Methylguanine resulted from reaction of Guanine with cyclophosphamide and O6-Methylguanine resulted from reaction of calf thymus DNA with cyclophosphamide are both not stable which is showed by the area (concentration) that was decreasing over the injection period (interval 1,3,4,7,9 and 11 hours) whether from the 6-hour-incubation, 12-hour-incubation. The instability of adduct resulting from the reaction can be linked to the apurination (lost of purine residu) on the DNA strand that was alkylated, which ended with the strand scission.

Summary

Reaction between 4.0 mg Guanine with 4.0 mg cyclophosphamide in vitro, without addition of S9 mix enzyme produce N7-methylguanine with retention time ± 7.60 minutes, with concentration of 6.7050 ± 0.3985 µg/ml (6 hours) and 8.6082 ± 1.3753 µg/ml (12 hours).Furthermore on the reaction between 2 mg calf thymus DNA with 4.0 mg cyclophosphamide without addition of S9 mix enzyme, produce O6-Methylguanine, with retention time of ± 10.50 minutes, with concentration of 3.1528 ± 0.6095 µg/ml (6 hours) and 4.6149 ± 0.5589 µg/ml (12 hours).

Keywords

Adduct, alkylating agent, Cyclophosphamide, DNA calf thymus, HPLC.
References


Analysis of O\textsuperscript{6}-Alkylguanine in rat blood during recurrent oral administration of cyclophosphamide

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Introduction
Cyclophosphamide as one of the alkylating agents has been widely used in the cancer chemotherapy because it is highly effective in eradicating the cancer cells by directly reacting with DNA so that DNA is mutated by the alkylating process and lost its function of cell replication. Besides its application in breast cancer, cyclophosphamide is also used in other cancers such as Hodgkin disease, non Hodgkin lymphoma, Burkitt’s lymphoma, ovarium, lung, etc. The mechanism of alkylating agent’s reaction with DNA is simple and not selective and therefore normal cells can be attacked, and stimulate secondary cancer in various tissues (Connors, 1986). Cyclophosphamide produces O\textsuperscript{6}-alkylguanine adduct \textit{in vitro} which has been proven to give mutagenic and carcinogenic effects (Van Zeeland, 1985; Harahap, Y., 2003).

Although cyclophosphamide has cytostatic effect, from various tests on animals it is found that it has carcinogenic effect following oral administration or intravenous that triggers benign and malignant tumors on many tissues including bladder. In a therapy using cyclophosphamide, whether in single or combination with other cytostatic, second malignancy is often reported following the stopping of cyclophosphamide administration especially bladder cancer and leukaemia (Penn, 1986; Haas et al.,1987; Haase et al., 2002).

In this research, O\textsuperscript{6}-alkylguanine was detected in whole blood of male sprague-dawley rats after 8 hours oral administration of cyclophosphamide at doses 15 mg/200 g rats’ weight, where cyclophosphamide was given in three series with a range between the administration was two weeks. Method used to detect O\textsuperscript{6}-alkylguanine was High Performance Liquid Chromatography (HPLC)-fluorescence with strong cation exchange column (Harahap, Y. 2008).

The objective of this research is to know whether there is O\textsuperscript{6}-Alkylguanine on the rat’s blood which was administered with Cyclophosphamide and use the adduct as biomarker for early detection of cancer risk.

Material and method

Material:
O\textsubscript{6}-methylguanine, N\textsubscript{7}-methylguanine, N\textsubscript{3}-methyladenine, guanine, and adenine (Sigma Aldrich); cyclophosphamide (Sigma Aldrich); ammonia 25 % (Merck); formic acid (Merck); methanol (Merck); hydrochloride acid (Malincrodt); Tris (Bromma); aquabidestilata (Wida Wi); male rat Sprague-Dawley; ammonium chloride (Merck); potassium carbonate (Merck); Na\textsubscript{2}EDTA (Merck); sodium chloride (Merck); sodium dodesil sulfat (SDS) (Merck); sodium hydroxide (Merck); phenol (Merck); chloroform (Merck); ethanol absolute (Merck); ethanol 70%; dimethylsulphoxide (DMSO) (Merck).
Tools:
A set of HPLC consisted of column (Supelcosil LC-SCX 5µm, 250 x 4.6 mm), pump (Shimadzu LC-10AD VP), oven column (TC 1900), fluorescence detector (Shimadzu RF-10 A XL), and recorder; syringe 100 µl (Hamilton); Centrifugal tool (Profuge and Lab. Digital Centrifuge DSC-300 SD); ultrasonic mixer (Elmasonic S 40 H); Thermomixer (Eppendorf); hematocrite tube (superior).

Procedure

Chromatographic condition
Method used to detect O6-alkylguanine was High Performance Liquid Chromatography (HPLC), with strongly cation exchange column (Supelcosil LC-SCX, 5µm, 250 x 4.6 mm), mobile phase consisted of ammonium formate-solution methanol (94:6) with final concentration of ammonium formate was 30 mM, pH 3.95, flow rate was 1.2 ml/minute, column temperature was 30°C and detected at excitation wavelength 300 nm and emission wavelength 370 nm.

Administering cyclophosphamide orally on rats
The test animals was divided into two groups, there were test group and control group. Each groups consisted of ten rats. Cyclophosphamide was administered orally with dosage of 15 mg/200 g on test group, while aquabidest was administered with the appropriate volume to the control group. Drug administering was done for 3 cycles with 2 weeks of drug administering range.

Analysis of O6-alkylguanine in rats’ blood
3 ml of rats’blood that were given cyclophosphamide was added into a tube that contains Na2EDTA. Then DNA isolation was performed and the DNA was hydrolyzed with 0.1N hydrochloride acid at 70°C for 30 minutes. The hydrolyzed DNA was injected as much as 20 µl to the HPLC. From the resulted peak, the concentration of O6-alkylguanine can be calculated using standard calibration curve.

Result and discussion
The method gave an acceptable validation result according to accuracy and precision test results that fulfill the criteria, linear calibration curve, limit of detection is 4.5752 ng/ml and limit of quantitation is 15.2506 ng/ml. The selectivity test to the sample components was done to know whether there were other components to be detected at retention time of O6-alkylguanine. The standard use was O6-methylguanine, N7-methylguanine, N3-methyladenine, guanine, and adenine. Among all standards, only N3-methyladenine that was not detected using the method. However the retention time of guanine, adenine, N7-methylguanine, and O6-methylguanine were 3.725, 5.442, 5.517, and 8.908 minutes respectively. Before sample was analyzed, DNA isolation had been done from whole blood then the DNA was hydrolyzed by adding 0.1 N hydrochloride acid for 30 minutes at 70°C to release DNA bases and its alkylated forms. After three series of cyclophosphamide administrations, O6-alkylguanine had not been found in rats’ blood. Most of the test animals were died because of the toxicity of cyclophosphamide, while most of the control group were survived. As a verification, cyclophosphamide was reacted with calf thymus DNA. It yield O6-alkylguanine after incubated for 6 hours.

Conclusion
O6-alkylguanine was not detected after three series of cyclophosphamide administration to the rats with dosage of 15 mg/200 g with limit of detection is 4.5752 ng/ml and limit of quantitation is 15.2506 ng/ml.

Keywords
Cyclophosphamide, DNA calf thymus, HPLC, O6-alkylguanine, Strong Cation Exchange.
Reference
Comparative bioavailability of two cetirizine tablet formulations in Indonesian healthy volunteers

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Introduction

Cetirizine \{2-\{4-(4-chlorophenylmethyl)-1-piperazinyl\}ethoxy\} acetic acid dihydrochloride is described as a nonse dating anti histamine which is long acting and has some mast cell stabilizing activity. Cetirizine is rapidly absorbed from the gastrointestinal tract after oral administration, peak plasma concentration being attained within about one hour. Food delays the time to peak plasma concentration but dose not decreased the amount of drug absorbed. Cetirizine is approximately 93\% bound to plasma protein and has an elimination half life of about 7 – 11 hours. Cetirizine is excreted primarily in the urine mainly as unchanged drug [Moffat et al. 2004].

This study was in bio equivalence of 10 mg cetirizine tablet tended to evaluate the manufactured by Novell Pharmaceutical Laboratories, Indonesia, with the international reference tablet manufactured by UCB Pharma, Spain.

Material and methods

The study was conducted according an open, randomized, two period crossover design with a 1-week wash out period. Eighteen volunteers participated and all completed the study successfully. Blood samples were obtained prior to dosing and at 0.25, 0.5, 1, 2, 3, 8, 12, 24 and 30 hours after drug administration. Plasma concentrations of cetirizine were monitored using high performance liquid chromatography over a period of 30 hours after administration. The pharmacokinetics parameter $AUC_{0-30h}$, $AUC_{0-\infty}$ and $C_{\text{max}}$ were tested for bioequivalence after log-transformation of data and ratios of $t_{\text{max}}$ were evaluated non parametrically.

Result and discussion

All 18 volunteers successfully completed the trial according to the protocol. Both cetirizine formulations were well-tolerated at the administered dose and no serious adverse clinical events were observed and the mean cetirizine concentration versus time profiles for both formulations are shown in Figure 1.
Figure 1. Plasma concentration time curves of cetirizine after oral administration of two different formulations containing 10 mg of cetirizine. Data are shown as mean ± SD from 18 subjects. Vertical bar represents the standard deviation of the mean.

The ratio of $\text{AUC}_{0-30h}/\text{AUC}_{0-\infty}$ for all individuals and for both products was 0.90 or above, indicate an adequate sampling time, since the extrapolated portion of the total AUC is less than 20%. The pharmacokinetic parameters used to assess the bioequivalence of the test formulation versus the reference were $\text{AUC}_{0-30h}$, $\text{AUC}_{0-\infty}$ for the extent of the absorption and $\text{C}_{\text{max}}$ and $\text{t}_{\text{max}}$ for the rate of absorption. Descriptive statistics of the pharmacokinetic parameter for cetirizine test and reference preparations are summarized in Table 2 with shows the geometric mean values and the range for the $\text{AUC}_{0-30h}$, $\text{AUC}_{0-\infty}$, $\text{C}_{\text{max}}$ and $\text{t}_{\frac{1}{2}}$ values obtained for each formulation. The pharmacokinetic characteristic $\text{t}_{\text{max}}$ is presented as mean (± SD). The results of the bioequivalence analysis are given in Table 3. The parametric 90% confidence intervals for ratio T/R ranged from 101.9 – 114.95 (point estimate 108.23) for $\text{AUC}_{0-30h}$, 101.91 – 114.68 (point estimate108.11) for $\text{AUC}_{0-\infty}$, 90.18 – 110.25 (point estimate 99.71) for $\text{C}_{\text{max}}$ and 92.92 – 102.48 (point estimate 97.59) for $\text{t}_{\frac{1}{2}}$, respectively, and were entirely included within the bioequivalence acceptance limits of 80 – 125% [CPMP 2001].The intra individual variations in the $\text{AUC}_{0-30h}$, $\text{AUC}_{0-\infty}$, $\text{C}_{\text{max}}$ and $\text{t}_{\frac{1}{2}}$ estimated from the coefficients of variation as determined by ANOVA were 10.34%, 10.10%, 17.23% and 8.37%, respectively.

Summary
In conclusion, the two cetirizine formulations are equivalent with respect to the rate and extent of absorption and it can be assumed to be therapeutically equivalent and exchangeable in clinical practice.

Acknowledgment
This study was sup ported by PT Novell Pharmaceutical Laboratories, Jakarta, Indonesia.

Keywords
Bioavailability, Bioequivalence, Cetirizine, Plasma concentration, HPLC.

References


Comparative bioavailability of two estazolam tablet formulations in Indonesian healthy volunteers

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Introduction
Estazolam (8-chloro-6-phenyl-4H-1,2,4-triazolo [4.3-α]-1,4-benzodiazepine, CAS 29975-16-4) is a triabenzolobenzodiazepine derivative. The spectrum of pharmacological actions of benzodiazepines, including sedative/hypnotic, anxiolytic, anticonvulsant and muscle relaxant effects, is elicited by binding to the supramolecular benzodiazepine GABA receptor complex. Benzodiazepines increase sleep time and improve sleep quality by reducing sleep-onset latency and wakefulness after sleep onset and by increasing sleep efficiency [1, 2]. Because tolerance and dependence occur with prolonged use, benzodiazepines are most useful for short-term treatment of insomnia. Benzodiazepines withdrawal may cause anxiety, depression, nausea, perceptual changes, rebound insomnia, intense dreams, nightmares and poor memory consolidation. Estazolam is classified as a short-acting benzodiazepine with general properties similar to diazepam. It is given by mouth as a hypnotic in the short-term management of insomnia usually in a dose of 1 to 2 mg at night. Estazolam has shown that this drug is rapidly absorbed following oral administration and is rapidly diffused into brain and other tissues. Peak plasma concentrations of estazolam are reached on average within 2 h (0.5–6 h) of oral administration. Estazolam is extensively metabolized, mainly to 1-oxo-estazolam and 4-hydroxy-estazolam. These metabolites are excreted either free or conjugated in the urine with small quantities detected in the feces. Only a small proportion of a dose is excreted as unchanged drug. The mean elimination half-life has generally been reported to be in the range of 10 to 24 h [2–5]. This study was designed to investigate the pharmacokinetics and bioavailability of two estazolam tablet formulations in order to prove bioequivalence between both formulations.

Material and methods
1. Subjects and study design
Twenty-four healthy adult volunteers (17 males and 7 females) were selected among Indonesian residents and participated in this study. The ages of the subjects were between 18 and 37 years (25.8 ± 5.2 years), the body weights were between 46.5 and 73 kg (56.2 ± 7.5 kg) and the heights were between 148 and 173 cm (162.9 ± 6.5 cm). The sample size n = 24 subjects was based on a previous report [6]. The subjects were selected after passing a clinical screening procedure including a physical examination, ECG and clinical laboratory tests. The volunteers were excluded if they had a history of any illness of the hepatic, renal and cardiovascular system, had taken alcohol or other medications for a prolonged period of time or had a history of benzodiazepine derivative intake. The test preparation was Estalin® (2 mg estazolam tablets, manufacturer: PT Novell Pharmaceutical Laboratories, Jakarta, Indonesia). The protocol of this study was reviewed by the Committee of The Medical Research Ethics of the Faculty of Medicine Universitas
Indonesia and was approved by the National Agency of Drug and Food Control, Indonesia. All participants signed a written informed consent after they had been informed of the nature and details of the study.

Each volunteer received an oral dose of 2 mg of estazolam according to a standard two-way crossover randomized design. The dose was taken with 240 ml of tap water. There was a two-week washout period between the doses. The subjects were asked to fast from 10 h before until 4 h after drug administration. Serial venous blood samples (10 mL) were collected predose and at 1, 1.5, 2, 2.5, 3, 5, 8, 12, 24, 36, 48 and 72 h after the administration in heparinized tubes. After blood separation, plasma was frozen at −20 °C until drug analysis.

2. Analytical method

The concentrations of estazolam in plasma were analyzed by a validated HPLC method with ultraviolet detector. The mobile phase was acetonitrile:disodium hydrogen phosphate 5 mmol/L, pH 6.0 (35:65) pumped isocratically at 1 mL/min through a Purospher® STAR RP-18, 5 µm, 250 mm x 4.6 mm (Merck, Darmstadt, Germany) maintained to 40 °C. The wavelength was set at 254 nm. Briefly, a 20 µL aliquot of internal standard (alprazolam in methanol) was added to a 1.5 mL aliquot of plasma sample. After mixing, to the mixture was added 2 mL of water, 2 mL of 0.1 N NaOH and 8 mL of diethyleter. The mixture was vortexed for 5 min and centrifuged for 15 min at 3500 rpm. After centrifugation, the organic phase was removed and evaporated to dryness under vacuum at 60°C. The residue was reconstituted with 150 µL of the mobile phase and removed to the HPLC vial. The assay was linear over the concentration range of 1–250 ng/mL.

3. Pharmacokinetic and statistical analysis

The bioequivalence was studied using the primary parameters, AUC 0-t, AUC 0-∞ and C max.

\[ \text{AUC}_{0-\infty} = \text{AUC}_{0-t} + *C_t/K_e \]

where \( *C_t \) is the estimated last plasma concentration. The apparent elimination half-life (t½) of cetirizine in plasma was determined by using the following equation \( t_{1/2} = (\ln2)/K_e \). The accepted bioequivalence range for these parameters was 80 % to 125 %. All statistical analyses were performed using EquivTest 2.0 statistical program (Statistical Solutions, Cork, Ireland).

Result and discussion

All 24 volunteers successfully completed the trial according to the protocol. Both estazolam formulations were well tolerated at the administered dose and no serious adverse clinical events were observed. The mean estazolam concentrations versus time profiles for both formulations are shown in Fig. 1. The pharmacokinetic parameters used to assess the bioequivalence of the test formulation versus the reference were AUC 0-t, AUC 0-∞ for the extent of the absorption and C max and t max for the rate of absorption. Descriptive statistics of the pharmacokinetic parameter for estazolam test and reference preparations are summarized in Table 1 which shows the geometric mean values and the range for the AUC 0-t, AUC 0-∞, Cmax, and t½ values obtained for each formulation. The pharmacokinetic characteristic tmax is presented as mean (± SD). The results of the bioequivalence analysis are given in Table 1. The parametric 90 % confidence intervals for the T/R ratio ranged from 87.48–94.72 (point estimate 91.03) for AUC 0-t, 86.67–96.55 (point estimate 91.48) for AUC 0-∞, 92.60–99.31 (point estimate 95.90) for Cmax and 93.05–107.06 (point estimate 99.81) for t½, respectively. The intra-individual variations of AUC 0-t, AUC 0-∞, Cmax and t½ estimated from the coefficients of variation as determined by ANOVA were 8.0 %, 10.86 %, 7.0 % and 14.14 %, respectively.
We found that the 90% CI for $AUC_{0-t}$, $AUC_{0-\infty}$, and $C_{max}$ were within the acceptable bioequivalence range of 80% to 125% [7]. The pharmacokinetic parameters such as $AUC_{0-t}$, $AUC_{0-\infty}$, $C_{max}$, $t_{max}$ and $t_{1/2}$ were comparable with data reported in the literature after oral administration of 2 mg estazolam. $AUC_{0-\infty}$ of 2636.2 ± 1049.5 and 2652.4 ± 1145.6 ng · h/mL, $AUC_{0-\infty}$ of 2789.0 ± 1286.5 and 2859.2 ± 1542.3 ng · h/mL, maximum plasma concentrations of 96.5 ± 13.2 and 99.9 ± 15.1 ng/mL, terminal half-lives of 19.7 ± 6.3 and 19.8 ± 7.8 h as well as the time to reach maximum plasma concentrations ($t_{max}$) between 0.3–6 h were reported by Dal Bo et al. [6]. The observed double peak of pharmacokinetic profile, also reported by Dal Bo et al. [6], was confirmed in this study. The mean ratio of $AUC_{t-\infty} / AUC_{0-\infty}$ of 11.9% confirmed that the sampling time was adequate. The highest intra-subject variability in this study was $t_{1/2}$. These results suggest a sample size of 12 subjects as a minimal size that would be necessary in order to conclude bioequivalence with a power of 80% at the 5% nominal level [8].

Conclusion
The two estazolam formulations are equivalent with respect to the rate and extent of absorption and they can be assumed to be therapeutically equivalent and exchangeable in clinical practice.

Keywords
Benzodiazepines, bioavailability, bioequivalence, estazolam, HPLC, two way cross over.

References
Cytotoxicity test of *Curcuma zedoaria* [Berg.] Roscoe to CaSki cell (cervical cancer) *in vitro*

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Introduction

According to WHO, cancer ranks the third as the cause of death in the developed countries right after cardiovascular and infection. One of the most occurred cancers on women is cervical cancer which is the second biggest cause of death after breast cancer (1). Indonesia is rich in various traditional herbal medicine that has anticancer activity, among them is *Curcuma zedoaria* [Berg] Roscoe) which has been used empirically by public to treat cancer and tumor. According to research result, *Curcuma zedoaria* has some effects: analgesic, antioxidant, anti mutagenic, anti tumor, anti inflammation, and cytotoxic to some cancer cell cultures. It has some chemical contents such as: curcuminoid (curcumin, demetoksicurcumin, bisdemetoksicurcumin), volatile oil, (mono dan sesquiterpen), isoflavon, polisaccharide, and other groups (2,3).

Some traditional medicines from *Curcuma zedoaria* have been marketed lately and indicated to treat several kinds of disease such as cervical cancer. The widely sold traditional herbal medicine found in the market must be effective, have good quality, thus safety that are authentic and scientifically should be tested. It is a concern that those traditional herbal medicine has been mixed with other materials so that the cytotoxic effect is not maximum. For that matter, cytotoxic testing in vitro to one of the dosage form *Curcuma zedoaria* as dry extract in which it is written on the packaging that it is useful to prohibit cervical cancer. Therefore it can be scientifically proven whether the the dosage form can be used to prohibit cervical cancer or not.

In this research, the Ca Ski (human cervical cancer cell that has human papiloma virus type 16) is used because the occurrence of cervical cancer due to human papiloma virus (HPV) type 16 is high. Besides that, the cytotoxic test using Ca Ski cell is still rare to be performed. This research has the purpose to test whether the dosage form *Curcuma zedoaria* as dry extract (Zf) has cytotoxic effect to CaSki cell *in vitro* in comparison to positive control (cisplatin and *Curcuma zedoaria*).

Material and method

a. Tool

Cell culture flask, 24 wells plate, cell incubator with CO₂ 5%, liquid Nitrogen tank, microscope (Nikon TMS), hemocytometer, dan spectrophotometer UV-VIS (Shimadzu UV 265).

b. Material

*Curcuma zedoaria* dosage form as dry extract (Zf branded); CaSki cell ATCC cell lines CRL-1550 from Institut Sains Biologi, Fakultas Biologi dan Sains University Malaya; ethanol extract of *Curcuma zedoaria* and cisplatin (Platosin®).
c. Method

**Cytotoxic test on CaSki cell**

Cell culture in culture flask that has been incubated for 6 days was taken out from cell incubator then washed three times with PBS solution, then trypsin and PBS were added. Incubation was done for 5 minutes in the cell incubator, then medium RPMI 1640 was added. Cell and liquid were pipetted, then was put into the centrifuge tube and was centrifuged on 1000 rpm for 5 minutes. Then the supernatant was taken out and the acquired pellet was suspended by adding RPMI 1640 medium.

After that 250 µl cell suspension was put into medium RPMI 1640 (cell density 8000 sel/ml) then it was incubated for 5 days in the cell incubator at 37°C. Afterward test solution and DMSO blank were added until the end concentration of 200; 150; 100; and 50 µg/ml was acquired. The positive control solution has end concentration of 100; 70; 40; and 10 µg/ml, then it was incubated for 24 and 48 jam at 37°C in the cell incubator.

At the end of incubation, 200 µl of red netral was added into each wells, then was incubated again for 2 hours at 37°C in the incubator. After 2 hours, the culture medium in each wells were pipetted and discharged, then each well was washed with 1 ml of PBS. Then 2 ml of 1% SDS was added into each wells, it was incubated again for 30 minutes at 37°C in the cell incubator. The volume of each wells was then pipetted and was put into the cuvette and the absorbance was measured at 536 nm by using spektrofotometer UV-VIS (4,5).

**Result and discussion**

Cytotoxic test showed that at the highest concentration (200 µg/ml) test solution and its comparison had lethal cell percentage of 32.15 and 94.25% with LC50 value of 687.32 and 39.97 µg/ml after 24 hours of incubation. The highest lethal cell percentage of the test solution and its comparison after 48 hours of incubation was 43.26 (200 µg/ml concentration) and 99.45% (150 µg/ml concentration) with LC50 value of 318.31 and 22.59 µg/ml. The positive control has the highest lethal cell after 24 and 48 hours of incubation of 99.85 and 100% with LC50 value of 0.044 and 0.023 µg/ml.

LC50 value (concentration that caused 50% of lethal cell) was achieved by using linear regression analysis. After 24 hours of incubation, test solution and positive control had LC50 value of 39.97 and 0.044 µg/ml. After 48 hours of incubation, the test solution and positive control in a row had LC50 value of 22.59 and 0.023 µg/ml.

Besides the percentage of lethal cells, the prove of citotoxicity can also be seen from CaSki cell morphology. Microscopic observation using blue tryphan and showed the morphology differentiation between before and after treatment with the test solution (fig 1 and 2).

![Figure 1. CaSki cell without treatment](image1)

![Figure 2. CaSki cell after treatment with test solution 100 µg/ml](image2)

**Summary**

The dry extract dosage form of *Curcuma zedoaria* has weak cytotoxic effect to CaSki cell in vitro with LC50 value of 687.32 and 318.314 µg/ml after 24 and 48 hours of incubation.

**Keywords**

Cancer, CaSki cell, *Curcuma zedoaria*, Cytotoxicity test, LC50.
Reference


Determination of carvedilol in human plasma in vitro using HPLC-fluorescence

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Introduction
Carvedilol (1-Carbazol-4-yloxy-3-[2-[2-methoxyphenoxy]ethylamino] propan-2-ol) is antagonist β-adrenoreseptor nonselective and antagonist α1- adrenoreceptor that does not have intrinsic simpatomimetic activity. Carvedilol is used as anti hipertension drug and congestive heart failure that reduce the risk of death to severe to severe heart failure patients (Phuong, N.T., dkk 2004; Packer, M. 2001; Vanderhoff, B.T., 1998). In oral administration, cavedilol is absorbed well in the digestive line and it reaches peak concentration in plasma in 1-2 hours. The concentration of carvedilol in plasma is around 2.69 – 85.1 ng/ml. In general, the half time of carvedilol is around 7-10 hours (Konishi, H. 2003) and the limit of quantification of carvedilol in plasma or serum is 0.25-3.6 ng/ml (Ptacek, P. 2002).

Considering its trace concentration in plasma, then a more sensitive analysis method needs to be developed. In this research, the determination of carvedilol in human plasma was developed by using only 0.5ml plasma and the content was determined by using High Performance Liquid Chromatography-Fluorescence. The extraction method was using liquid-liquid extraction using dietil eter and separation with reversed phase column (RP-18) and phosphate-acetonitril as mobile phase. The method was validated for its specificity and selectivity, limit of quantification, precision and accuracy, and stability (FDA, 2001). Method’s robustness was showed on sample analysis for pharmacokinetic study.

Material and method
A. Material
Carvedilol (Cadila Pharmaceutical, Gujarat, India) and Propranolol HCl as internal standard (Badan Pengawas Obat dan Makanan, Indonesia). Asetonitril (HPLC grade, Merck), triethylamine, phosphate acid 85%, Potasium di hydrogen phosphate, diethyl eter, methanol, and sodium hidroxide (Merck (Darmstadt, Germany).

B. Tool
HPLC system comprises of Shimadzu instrument (Kyoto, Japan) : pump LC 10A, controller system SCL-10Avp, data processing and software Class VP( Shimadzu), oven column CTO-10A, autoinjector SIL-10AD, and fluorescence detector RF-10AXL. The separation was done using Lichrospher column 5µm ODS 125x4 mm and guard column 5µm, RP-18 (Merck, Darmstadt, German).

C. Chromatographic condition
The mobile phase was comprised of 70% phosphate buffer, pH 2 (contain 1% of triethylamine) and 30% acetonitril. The flow rate was 1 ml/minute at column temperature 35°C, detected on exication wavelength of 238 nm and emission wavelength of 350 nm.
D. Sample preparation
Sample was stored in freezer at -20°C and was thawed prior sample preparation. 20 µL Propranolol as internal standard (500 ng/ml) was added into 0.5ml plasma. After being shaken for a while, 150 µL of sodium hydroxide and 5ml of diethyl ether were added, then it was shaken with vortex for 5 minutes, centrifuged for 5 minutes at 3000rpm. The organic phase (± 4 ml) was moved and dried using vacuum at 40°C. The residue was dissolved in 200 µL of mobile phase and was put into HPLC vial.

E. Method validation (FDA, 2001)
The validation method includes specificity and selectivity test, linearity and determination of LOD and LOQ, accuracy and precision, and stability test that comprises of stock solution, short term, long term, freeze and thaw, and auto sampler stability.

Result and discussion
A. Specificity and selectivity
Specificity and selectivity test on 6 blank plasma showed that chromatogram was free from interference peak, with bias value of <20%. Propranolol as internal standard was detected at retention time of ± 3.3 minutes, while Carvedilol was detected at retention time of ± 7.5 minutes.

B. Linearity and stability
The limit of quantification was 1.00 ng/ml. Linear calibration curve was between 1.00-80.16 ng/ml with 0.9997 coefficient of correlation. Short term stability test was performed by preparing 3 sets of samples (low, medium, and high).
In the freeze and thaw stability test, 3 concentrations (low, medium, high) were stored at -20°C and were measured at the 3rd cycle of freeze and thaw in order to check Carvedilol stability at room temperature after thawing until analysis. The bias value result was <12%. For autosampler stability, 3 sample concentrations were measured in duplo at the 0 hour and were placed at room temperature (25°C), then the samples were analyzed at the 24th hour. There was no significant decrease of carvedilol concentration.
During the long term stability testing, 3 concentrations were placed at a temperature of -20°C for 65 days and were analyzed using fresh calibration curve. The bias value result was <8%.

C. Precision and accuracy
On precision and accuracy within day as many as 5 sets of quality control sample (QC) with 3 concentrations (low, medium, and high) were analyzed using calibration curve sample in 1 batch. The resulted precision and accuracy was <12% and <14%. On day-to-day variation of precision and accuracy, 5 sets were analyzed using sample calibration sample in 5 different batches. The resulted precision was <5% and the accuracy was <9%.

D. Application on biological sample
From the validation result of bioanalysis method, this analysis method is valid and can be used to establish carvedilol level in plasma sample in bioequivalency study. Plasma sample was collected periodically for 24 hours after oral administration of 25mg carvedilol to 24 healthy volunteers. On Figure 1 the average concentration of carvedilol in plasma can be seen. The maximum carvedilol in plasma can be reached in 1 hour after drug administration and the elimination half time was 8 hours.
Summary
Carvedilol can be determined in plasma by using HPLC-fluorescence by using mobile phase consists of 70% of phosphate buffer, pH 2(contain 1% of trietilamin) and 30% of acetonitril. The flow rate was 1ml/minute at 35ºC column temperature, after it was extracted with diethyl eter.
The valid method was used in determination of carvedilol level at 1.00-80.16 ng/ml range using 0.5 ml plasma. This method resulted sensitivity level and high selectivity for pharmacokinetic study and fulfilled the FDA criteria.

Keywords
Bioequivalence, carvedilol, HPLC-fluorescence, human plasma, propranolol HCl.

Reference
Effect of AHA (Lactic acid) on in vitro caffeine skin penetration as anti cellulite agent in cream, gel and ointment

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Introduction
Skin penetration is of great interest to personal care formulators for many reasons, from toxicology concerns to innovative delivery opportunities. With the introduction of nanotechnology to the industry, issues surrounding skin penetration have become more complex. The medical industry has spent much time focused on the mechanisms to increase and decrease skin penetration.

This investigation is focused on ‘Cellulite’, the superficial pockets of trapped fats cause uneven lumps, bumps and dimples, or “orange peel” skin found at the thighs, buttocks and abdomen of post-adolescent women, but rarely seen in men (Rawlings, 2006), is defined as a localized metabolic disorder of the subcutaneous tissue which provokes an alteration in the female body shape caused inferiority because of ugly body appearance at the swimming pool or other fit centre. Cellulite appears when there is a damage on blood vessel and lymph vessel, decreasing microcirculation of blood flow, increasing lymph fluid on dermis and accumulation of fat on subcutaneous adipose tissue and change of collagen matrix surrounded (Rona et al. 2006; Baumann, Leslie. 2002). Lifestyle (sport, diet, alcohol, smoking, stress) and age also cause cellulite formation. The solution to overcome this problem is to use the topical dosage forms (cream, gel, or ointment) containing agents capable of distributing or reducing local fat accumulation by lipolytic action, thereby improving the aesthetic appearance of the skin. Among the common agents for treatment of cellulite as slimming agents are xanthine derivates such as caffeine or aminophyllin which can block the antilipolytic action of adenosine, a potent endogenous inhibitor of lipolysis (Rawlings, 2006; Cho Suk Hyung, 1997). Other known method in lipolysis stimulation are achieved by inhibiting phosphodiesterase in order to prevent or at least limit the degradation of cAMP.
Topical dosage form will be effectively functioned if the active ingredient can penetrate into the deeper layer of the skin either through transepidermal or transfollicular route. There are many factors influencing drug penetration through skin, one of the many is the hydrated skin. The hydrated skin will be more permeable that make the drug easier to penetrate (Lachman et al. 1994).
Anti cellulite dosage forms distributed in market often contained AHA besides caffeine as the active ingredients to overcome cellulite. Actually AHA is used as a keratolytic agent or moisturizer in a topical dosage form (Idson, Bernard. 1992), but so far, there is no information whether it will enhance or lower the caffeine penetration from the dosage form. The effect of AHA (lactic acid) to the in vitro penetration of caffeine from cream, gel, and ointment dosage form will be evaluated on this investigation.

In this study, cream, gel, and ointment of caffeine containing AHA and without AHA were made. All formulas were evaluated for its physical stability during eight weeks at 29±1°C, 40±1°C, and 4±1°C, including organoleptic observation, pH, globul’s diameter, viscosity, consistency, phase separation test by freeze thaw method and mechanical test. The in vitro penetration of caffeine was measured using the Franz-type diffusion cell.
penetration of caffeine from cream, gel, and ointment were evaluated using Franz Diffusion Cell through skin membrane of Sprague Dawley female rat.

**Materials and methods**

**Materials**
The main materials are caffeine anhydrate (Jilin, China), lactic acid (Purac, Spain), materials for cream, gel and ointment, and female rat strain Sprague-Dawley weight ±150 gram, 2-3 month age (Institut Pertanian Bogor, Indonesia).

**Instrumentation**
The main instrumentation are Franz Diffusion Cell with receptor compartment volume of 14.0 mL (Bengkel Gelas Institut Teknologi Bandung, Indonesia), Shimadzu UV-1601 Spectrophotometer (Shimadzu Scientific Instrument Inc., Japan), and instrumentations used to evaluate the dosage forms

**Methods**
First step is making preparation of cream, gel and ointment by procedures commonly done in pharmaceutical laboratory and then doing the evaluation of the dosage forms including organoleptic appearance (odor, color, phase separation), homogeneity, pH, viscosity and rheology, consistency and measuring mean globule diameter. The physical stability test was done to evaluate the capability of those dosage forms to be resistant at stressing condition for higher or lower temperature (±29°C, 40±2°C, 4±2°C) every two weeks for the period of 8 weeks, freeze thaw/cycling test for 6 cycles and mechanical test (centrifugation) for 3750 rpm as long as 5 hours.

Diffusion test was done using rat skin membrane clamped into a Franz Diffusion Cell system, then 1 gram of cream/gel/ointment was put on the membrane between donor and receptor compartment containing phosphate buffer pH of 7.4 and stirred at constant rotation and maintained at 37°C. The receptor fluid samples as much as 0.5 mL were collected every 1h up to 8 h. After each withdrawal, the receptor fluid was substituted with the same volume of phosphate buffer. Sample was accurately measured by spectrophotometer at maximum wavelength.

**Results and discussion**
The data of analysis was done by the equation:

\[
Q = \frac{C_n \times V - \sum_{i=1}^{n-1} C_i \times S}{A}
\]

Q= cumulative amount penetrated (µg/cm²); V= cell volume = 14.0 mL; S= sample volume = 0.5 mL; A= membrane surface area = 1.8376 cm²; \(C_n\)-= amount penetrated at-\(n^{th}\) sampling (µg/ml); \(\sum C_i\)= amount penetrated from the first sample withdrawal interval up to \(n-1^{th}\).

All the dosage forms were good appearance, relatively stable to stress condition and interaction among the ingredients

![Graph](image-url)
From the figure above, it was showed that AHA can enhance the percutane penetration of caffeine compared to the one without AHA, which can increase the cell proliferation of stratum corneum lead to enhancement of cell turn over, decreasing the thickness of stratum corneum and enhancing the thickness of viable epidermis. AHA can also decreasing the cohesion of corneocyte by ionic bond, hydrating stratum corneum and increasing skin water content, opening the tight structure of stratum corneum and swelling the keratin fibers, making the skin become more permeable and enhancing the caffeine penetration in turn (Kielhorn et al. 2006).

**Conclusion**
- Gel has the highest caffeine penetration followed by cream and ointment.
- AHA can enhance the caffeine percutane penetration

**Keywards**
AHA (Lactic acid), anti cellulite, caffeine, skin penetration, Franz Diffusion Cell.

**Acknowledgement**
This research is donated by the grant of Dana RUUI DRPM-UI Year 2008 Contract no. 240G/DRPM-UI/N1.4/2008 Direktorat Riset dan Pengabdian Masyarakat Universitas Indonesia. The author thanks to PT Cognis Indonesia, PT Perdoni (Uniqema), PT Kimia Farma for supporting the materials.

**References**
Effect of cream, gel and ointment dosage forms on in-vitro skin penetration of caffeine as an anti cellulite using Franz Diffusion Cell

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Introduction

Cellulite, a superficial pockets of trapped fats cause uneven dimpling or “orange peel” skin found at the thighs, buttocks and abdomen of post-adolescent women, rarely seen in men, is one of the problems on skin which is quite complex for some women even men, and emerging the feel of inferiority. Cellulite appears when there is a damage on blood vessel and lymph vessel, decreasing microcirculation of blood flow, increasing lymph fluid on dermis and accumulation of fat on subcutaneous adipose tissue and change of collagen matrix surrounded lead to accumulation of fat on subcutaneous layer (Rona et al. 2006). Lifestyle (sport, diet, alcohol, smoking, stress) and age is also contributed to cause cellulite formation. One of the solution to overcome this problem is to use the topical dosage forms (cream, gel, ointment) containing active ingredients capable of distributing or reducing local fat accumulation by lipolytic action, thereby improving the aesthetic appearance of the skin. Among the common agents for treatment of cellulite as slimming agents are xanthine derivates such as caffeine or aminophyllin which can block the antilipolytic action of adenosine, a potent endogenous inhibitor of lipolysis which can inhibit phosphodiesterase enzyme lead to lipolysis (Baumann, Leslie. 2002). Other known method in lipolysis stimulation are achieved by inhibiting phosphodiesterase in order to prevent or at least limit the degradation of cAMP.

Certain drugs act on the fatty tissue, connective tissue and on the microcirculation, can be used topically, systemically, or as transdermal administration. When using topical treatments, the concentration and pharmacological/pharmacokinetic characteristics of the active drugs must be considered, as well as the nature of the vehicle. The interaction of the drug with the vehicle and the skin, the way the drug is applied, and other biological and environmental factors may also affect the response to treatment. Because the stratum corneum is the main barrier to drug penetration, formulations for topical use may include so called skin enhancers, substances which, when included in the formulation, significantly increase cutaneous penetration. Skin enhancers can be common solvents (water, alcohol, methyl alkyl sulphoxide) or surfactants. They may also be phytosomes, phospholipid molecules which, when attached to the active drug, increase their liposolubility, or liposomes –lipid vesicles filled with active drugs (Rossi&Vergnannini, 2000).

So far there is no information about the influence of cream, gel and ointment on skin penetration of active ingredient to reduce cellulite phenomenon. For this purpose caffeine is formulated into different kinds of topical dosage form like cream, gel, or ointment. This investigation was done to perform the amount of caffeine penetrated from cream, gel and ointment dosage form, and the penetration was in vitro tested through Franz diffusion cell using Sprague-Dawley rat abdomen skin as membrane diffusion. The test was done for 8 hours with 11 times samples withdrawn, and the absorption of each sample was measured by spectrophotometer UV-Vis at wavelength 272.5 nm.
Materials and methods

Materials
The main materials are caffeine anhidrate (Jilin, Cina), lactic acid (Purac, Spain), materials for cream, gel and ointment, and female rat strain Sprague-Dawley weight ±150 gram, 2-3 month age (Institut Pertanian Bogor, Indonesia).

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The data of analysis was done by the equation:

\[ Q = \frac{C_n V + \sum C_i}{A} \]

Q= cumulative amount penetrated (µg/cm²); V= cell volume = 14.0 mL; S= sample volume = 0.5 mL; A= membrane surface area = 1.8376 cm²; Cn= amount penetrated at-nth sampling (µg/ml); \( \sum C_i \)= amount penetrated from the first sample withdrawal interval up to n-1th.

All the dosage forms were good appearance, relatively stable to stress condition and interaction among the ingredients.

From the figure above, it was showed that gel gives the highest penetration because it has water and alcohol (glycerol, propylene glycol) in huge amount, which can hydrating stratum corneum and increasing skin water content and opening the tight structure of stratum corneum and swelling the keratin fibers, making the skin become more permeable and enhancing the caffeine penetration in turn (Kielhorn et al. 2006).
Conclusion
Gel has the highest caffeine penetration followed by cream and ointment.

Keywords
Anticellulite, caffeine, cream-gel-ointment, Franz Diffusion Cell, skin penetration.

Aknowledgement
This research is donated by the grant of Dana RUUI DRPM-UI Year 2008 Contract no. 240G/DRPM-UI/N1.4/2008 Direktorat Riset dan Pengabdian Masyarakat Universitas Indonesia. The author thanks to PT Cognis Indonesia, PT Perdoni (Uniqema), PT Kimia Farma for supporting the materials.

References
Validation Of O\textsuperscript{6}-Methylguanine Analysis Method By High Performance Liquid Chromatography – Fluorescence Using Strong Cation Exchange

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Introduction
Alkylation\textrightarrow{the DNA base as nucleophile center by alkylating agent will produce adduct that can give cytotoxic and mutagenic effect. The generated mutagenic effect is related with the forming of O\textsuperscript{6}-alkylguanine that can cause point mutation in which when it is accumulated will cause cancer (Harahap, Y. 2003, Herron, D. C. et. al.,1979). Some methods have been used to determine adduct such as Gas Chromatography, High Performance Liquid Chromatography, Mass Spectroscopy, Electrochemical Detection, and Radioactive Labelling (Poirier, M. C., et al. 2000). High performance liquid chromatography (HPLC) is the most appropriate method to analyze the nucleic acid components and its derivatives in a biology sample (Pimenov, A. M., 1988). DNA base and its alkylated derivatives have almost similar chemical structure so they also have almost similar polarity. Therefore, the separation method using HPLC in this research is using the strong cation exchange column.

Previous research has proved that guanine, nucleoside, nucleotide, and some of their alkylated derivatives have the highest intensity to have fluorescence among other purin and pirimidin bases (Udenfriend S. et al, 1962). The previous research had also proved O\textsuperscript{6}-alkylguanine have highest fluorescence intensity when being detected by HPLC-fluorescence detection without being derivatized first, while N\textsuperscript{7}-alkilguanine and other adduct needs derivatisation to have high fluorescence intensity (Harahap, Y. 2003).

This research was conducted to get the optimum condition and validation the analysis method of O\textsuperscript{6}-alkylguanine using high performance liquid chromatography (HPLC) with strong cation exchange and fluorescence detector

Material and method
A. Tool
A set of HPLC which consists of column (Supelcosil LC-SCX 5 µm, 250 x 4.6 mm), pump (Shimadzu LC-10AD vp), oven column (TC 1900), fluorescence detector (Shimadzu RF-10A xl), system controller (Shimadzu SCL-10A vp) and recorder (Shimadzu Class-VP); syringe 100 µl (Hamilton); eluen filter 0,45 µm (Whatman).

B. Material
O\textsuperscript{6}-methylguanine, N\textsuperscript{7}-methylguanine, N\textsuperscript{3}-methyladenine, guanine, adenine, cyclophosphamid and DNA calf thymus (Sigma Aldrich); Ammonia 25 % p.a, asam format p.a, hydrochloride acid p.a, Tris, ammonium chloride, ethanol, methanol and dimethylsulphoxide (Merck), Aquabidestilata (Wida Wi)
C. Procedure

1. Chromatographic condition
The optimum condition to analyze O⁶-methylguanine in this research was High Performance Liquid Chromatography (HPLC) with strong cation exchange column Supelcosil LC-SCX (5 µm, 250 x 4.6 mm), mobile phase was ammonium formate-methanol (94:6) with 30 mM final concentration of ammonium formate, pH 3.95, flow rate was 1.2 mL/minute, column temperature 30°C, and was detected at 300 nm excitation wavelength and 370 nm emission.

2. Selectivity test
Standard solution of O⁶-methylguanine, N⁷-methylguanine, N³-methyladenine, guanine and adenine were injected as much as 20.0 µL into HPLC, then the retention time of each standard was recorded and the resolution value was calculated.

3. Calibration curve, limit of detection (LOD), and limit of quantification (LOQ)
O⁶-methylguanine solution with 5.0 until 500.0 ng/mL concentration (20.0 µL each) was injected into HPLC, then the coefficient of correlation was calculated, after that the LOD and LOQ could be determined.

4. Accuracy and precision test
O⁶-methylguanine solution with concentration of 50.0; 100,0; and 300.0 ng/mL (20.0 µL each) was injected into HPLC. The procedure was repeated six times, then % diff, deviation standard and coefficient of variance could be calculated.

5. Reaction of calf thymus DNA with cyclophosphamide in vitro
0.5 mL calf thymus DNA (50 mg/ 12.5 mL) was reacted with 4.0 mg of cyclophosphamide in 1.0 mL mixture of dimethylsulphoxide and 0.01 M Tris-HCl pH 8.0. Then the mixture was incubated at 37°C for 6 hours. Afterwards, the alkylated DNA was precipitated with 3.0 mL of ethanol absolute and then centrifuged with 3000 rpm for 10 minutes. The supernatant was discarded and washed the pellet with 1.5 mL of 70 % ethanol. Then the DNA pellet was hydrolysed with 1.0 mL of 0.1 N hydrochloride acid at 70°C for 30 minutes. Finally 20.0 µL of the aliquot was injected to HPLC.

Result and discussion
The retention time of O⁶-Methylguanine, guanine, adenine dan N⁷-methylguanine were 8.908; 3.725; 5.442; and 5.517 minutes with resolution more than 1.5. The result showed that this method was selective to determine O⁶-methylguanine in sample. The calibration curve was linear at concentration of 5.05 until 505.0 ng/mL with the coefficient of correlation was higher than 0.999. The regression coefficient function from calibration curve was 1.1569%. This showed that the used concentration resulted good linearity. The LOD was 4.5752 ng/mL and the LOQ was 15.2506 ng/mL.

The result of all accuracy tests showed that % diff between -2 until 2%. The precision test data for O⁶-methylguanine with concentration of 50.5; 101.0 and 303.0 ng/mL showed coefficient of variation of 0.3719; 0.4153; and 0.5687% respectively. In this research, the application of reacting calf thymus DNA with cyclophosphamide in vitro was also performed. The performed procedure was also similar with the procedure in the previous research (Harahap, Y, 2003), and hydrolyzation was performed with 0.1 N hydrochloride acid. The reaction between calf thymus DNA with cyclophosphamide after 6 hours of incubation at 37°C, resulted O⁶-methylguanine.
Conclusion
The validated analysis method could separate DNA components and analysed O6-methylguanine following the reaction of calf thymus DNA with cyclophosphamide.

Keywords
Calf thymus DNA, cyclophosphamide, guanine, O6-Methylguanine, validation.

Reference
3D simulation of multiple odor sources localization using modified particle swarm optimization

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Introduction

Research in odor source localization problem is grown. Particle Swarm Optimization (PSO) is one of the algorithms which are proposed to solve this problem. Several researches have been done and they give good results. Wisnu et al. [1], modifying PSO standard using detect and response mechanism [2,3,4], charged robot [5,6,7], and wind utilization method, has been successful in solving one odor source localization problem in dynamic environment. Furthermore, Aditya et al. [8] developed modified PSO (MPSO) [1] in order to increase its performance so that it can be used in multiple odor sources localization problem. MPSO [1] has been modified using robot with odor closing method, spread phase, parallel PSO niching [9], ranged global best I (RGB I) and RGB II [10]. Its result is also satisfactory.

Using 2D simulation environment, Wisnu et al. [1] And Aditya et al. [8,10] has proved their methods were successful in solving odor source localization problem. Unfortunately, their simulation was done only in 2D environment. The model used is very simple and not applicable in real world. Robot’s movement was not including physical model as its movement in real situation. Its collision was also done without physical model. Now, using ODE (Open Dynamics Engine) library, we try to implement 3D and physical model in simulation of multiple odor sources localization. ODE was introduced by Smith [8] as library for simulating physical model of objects in 3D environment. Its result is expected to know if MPSO [7] is applicable in real world.

ODE

ODE is a platform based on OpenGL written in C++ programming language for simulating object in 3D. ODE is fast and stable. Primary author of ODE is Russel Smith

Figure 1. Object
There are features in ODE, like joints and collision detection. Object consists of body and geometry. Body is used for calculation on dynamics and geometry is for calculation on collision detection, as shown in Fig. 1. The shape of body and geometry do not have to be the same. In this paper, we used ODE version 0.10.0. In this version, collision rules of cylinder geometry are not perfectly built. So that, cylinder geometry could not be used for wheel of a vehicle, because it would not have any friction with the ground, which cause robot will not move. For wheel, we could substitute cylinder geometry with ball geometry, but still can draw it as a cylinder.

**Implementation**

Chassis and upper body are joined by fixed joint so that they are bundled as one body. Wheels are connected with hinge2 joint. Hinge2 joint has suspensions features which make it suitable for modeling wheel of a vehicle. Hinge2 joint has 2 orthogonal axes. One has a function like a suspension of wheel, and the other one as a wheel axis. The first one has a parameter of boundary of spin, just like stir of ordinary vehicle. The other one does not have a boundary, because its function as a wheel axis. Every joint in ODE can be attached a motor on it, which makes it spin and it used for moving the robot. Suspension parameter for hinge2 joint are decided as shown on following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Nilai</th>
</tr>
</thead>
<tbody>
<tr>
<td>dParamSuspensionERP</td>
<td>0.01</td>
</tr>
<tr>
<td>dParamSuspensionCFM</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Design of the robot is shown in Fig. 2.

![Robot measurement](image)

After implementing robot and its environment in 3D simulation including physical model, we utilized MPSO algorithm for searching multiple odor source in dynamic environment. Its results show that MPSO is applicable in real situation. Fig. 8 is a visualization of the new software based on ODE to deal for single odor source while Fig. 9 is a visualization for multiple odor sources. Therefore the visualization of new software based on ODE is shown in Fig. 3.
Conclusions

We have implemented MPSO algorithm in 3D environment in order to model robot movement and environment in searching multiple odor sources. We have moved one step further to implement MPSO in real robot for searching odor source in real world. The result of this simulation is not analyzed yet. Furthermore, this simulation must be analyzed in order to assess its effectiveness.

Keywords

3D simulation, ODE (Open Dynamic Engine), Particle Swarm Optimization, robotic.

References

Ad Hoc On-Demand Distance Vector (AODV) routing protocol performance evaluation on hybrid ad hoc network: Comparison of result of NS-2 simulation and implementation on testbed using PDA

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Introduction

In Mobile Ad hoc NETwork (MANET), node supplemented with wireless equipment has the capacity to manage and organise autonomously, without the presence of network infrastructures. The hybrid ad hoc network, enable several nodes moved freely (mobile) to developed communication instantly and independently from infrastructure. They could access to the Local Area Network (LAN) or to the Internet. Functionalities of ad hoc network very depend on the routing protocol that determines route around node.

Ad hoc On-demand Distance Vector (AODV) was one of routing protocols in the ad hoc network which is reactive. This protocol was one of the protocols that were often researched and used.

In this Research, AODV protocol investigation was conducted by developing a testbed using Personal Computer, several Laptops (the Linux Red Hat operation system 9.0 and Fedora Core 2), and Personal Digital Assitant (PDA). This research also made a complete package by mean of cross compilation for PDA iPAQ.

The hardware used as follows: Laptops, PC Desktops, PDAs, Hewlett Packard iPAQ Series 5 (Intel XScale 400 MHz, RAM 128 MB, ROM 48 MB, Wireless, Infra red, Bluetooth (integrated build-in) The software used in testbed are Linux (Red Hat 9.0, Fedora Core 2), Linux Familiar v0.7.2 (kernel 2.4.19-rmk6-pxa1-hh36), AODV-UU[2], Monmothia Cross Compiler [7], Ethereal [6], Iperf [10], Iptables [8]. We used NS-2 as our network simulator.

In this research, we used Personal Computer with 2 NIC, eth0 and wlan0. Eth0 is a device connected to the infrastructure by wire; wlan0 is a device which communicates to ad hoc network as depicted in Figure 1.

We make a script for gatewaying ad hoc network to infrastructure (hybrid). The purpose of this script is that all packets from the ad hoc network could be forwarded to the infrastructure (LAN or Internet). Iptables is used for packet filtering. Scenario in Figure 2 enforce multihoping. We have only one collision domain in our testbed. To avoid collision only one station can send at the time. This can be done using Iptables.
The command for accepting all packets from wlan0 forward to eth0 (POSTROUTING) from all IP address to destination (LAN and Internet) are described as:

```
iptables –t nat -A POSTROUTING -s 0/0 -0 eth0 -j MASQUERADE
```

This script allows all nodes in ad hoc network to access LAN or Internet.

**Result and discussion**

All experiment was performed indoor in the Mercator Laboratory of Postgraduate Building, Faculty of Engineering, and Universitas Indonesia.

AODV can effect directly to the outcome. When the route to destination cannot be found, or when a node wait for RREP, the packet will be buffered. If a route can not find RREQ_RETRIES, then all packets in buffer should be dropped and message “Destination Unreachable” sent.

End-to-end delay is the time needed for the packet transmitted by a node and received by destination. End-to-end delay is the sum of time spent for transmission, propagation, and process and queuing at every node in network. The result shows 1,004.3 ms for the average end-to-end delay. Figure 4 shows the routing overhead for 900 seconds.
Conclusion

Scalability and reliability are difficult to achieve simultaneously. In general, results obtained from the simulation of AODV protocol using Network Simulator NS-2 are packet delivery ratio 99.89%, end-to-end delay 0.14 seconds and routing overhead 1,756.61 byte per second. Afterwards results from simulation were compared to results from testbed. Results obtained from testbed are packet delivery ratio 99.57%, end-to-end delay 1.004 seconds and routing overhead 1,360.36 byte per second.

Keywords
Ad hoc hybrid, MANET, protocol routing AODV.

References
Andi Bayu Wirawan, Eka Indarto, Mudah Membangun Simulasi dengan Network Simulator-2, Andi Offset, 2004
ANN models for determining bio-gasoline octane number based on input data conditions

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Introduction

Bio-gasoline exhibits several merits when compared to that of the existing petroleum fuels. It has fuel properties similar to that of gasoline and is produced easily and renewably from the crops. However, the constraint that often appears in the research on bio-gasoline is determining the octane number (ON) for predicting the quality of the bio-gasoline. It is not always possible to conduct engine test to determine ON because of the cost of the reference fuels and the more effort required. Hence, there have been many attempts either to calculate the ON itself or to derive an alternative parameter that could provide an indication of the ignition quality.

The application of ANN in engineering field is interesting and increasing one. In this study, an attempt made to predict the ON of bio-gasoline using ANN models. They operate like a ‘black box’ model and do not require detailed information about the system being tested. Instead, they learn the relationship between the input parameters and the controlled and uncontrolled variables by studying previously recorded data, similar to the way a non-linear regression might perform. The input data are the physical properties of bio-gasoline namely density and temperature on 50% distillation or TT50, while the output is octane number of bio-gasoline. It tried to using new data for a octane number above 92. The range of data is 0.73 - 0.8865 kg/m3 for density, 217 - 320°C for TT50, and 72.53 to 109.07 for octane number.

There are three ANN models using in this study. These are multi-layer feed-forward (MLFF) which comes from the previous development of back-propagation model, radial basis (RB), and generalized regression neural network (GRNN). The MLFF model has one layer with 2 input neurons (X1 and X2), one hidden layer with 4 neurons and one layer of output (Y). Network architecture produced the predicted optimum target. The RB model has "sum-squared error goal" of 2 and "spreads meant" of 0.01. Meanwhile, in the GRNN model, which is the development of RB model, used default functions.
Results and discussion

1. Tests using validation data in the range of training data (density and the TT-50)

The simulation results in Table 1 show that the GRNN model is the best in determining the ON when the density inputs are in the range. The MLFF model has smaller error (5.4%) than the RB model (6.2%). RB model also produces the same value for all variation of the density inputs. This is caused by the tendency of the RB model to choose ON slightly smaller than the octane number data in the database, if variation of input data produces a small ON. This means that the GRNN model should be used if the data density is in the range of available data.

The same results also appear on the temperature variations of TT-50 in the range of data in the software. The GRNN model produces the best value, with the average error of 0.5%. Meanwhile, the MLFF model is in the second rank with an average error of 3.1%, and the RB model provides the biggest error, at 8.1%.

Table 1: Error variations in the density and TT50 are in the range of training data

<table>
<thead>
<tr>
<th>No</th>
<th>Density Variations</th>
<th>TT50 Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRNN</td>
<td>MLFF</td>
</tr>
<tr>
<td>1</td>
<td>10.2%</td>
<td>3.8%</td>
</tr>
<tr>
<td>2</td>
<td>4.4%</td>
<td>9.9%</td>
</tr>
<tr>
<td>3</td>
<td>3.4%</td>
<td>11.1%</td>
</tr>
<tr>
<td>4</td>
<td>0.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>5</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>


2. Tests using validation data LESS THEN OUT of range of training data (density and the TT-50)

The simulation results are shown by Table 2. From the table 2, the MLFF model is better than other models. The error of MLFF model is the smallest (3%), followed by the GRNN model (5%), and the RB model generates the biggest error, at 18.7%. In this case, the RB model can not determine the large ON. ON produced by the RB model are have the same value for all variations of density, at 72.15. This ON is smaller than ON data in the database, at 72.15. This ON is smaller than ON data in the database, at 72.53.

Table 2: Errors with density and TT50 variations are smaller outside the range of data input

<table>
<thead>
<tr>
<th>No</th>
<th>Density Variations</th>
<th>TT50 Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRNN</td>
<td>MLFF</td>
</tr>
<tr>
<td>1</td>
<td>17.6%</td>
<td>5.7%</td>
</tr>
<tr>
<td>2</td>
<td>2.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>3</td>
<td>2.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>4</td>
<td>2.3%</td>
<td>3.1%</td>
</tr>
<tr>
<td>5</td>
<td>0.5%</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

It means, if someone has data where the TT-50 data from bio-gasoline is at smaller outside TT-50 in the database, then it should choose the MLFF model for determining ON, because of the level of average error is the smallest (7.6%). The GRNN model also can not determine ON at the four data input. The results of determining ON is 0 (zero). The neurons owned by GRNN model could not be able to determine the data input at outside the training data. Actually, when the TT-50 approaching the smallest temperature data owned by the training data (in the database), at 249°C, the GRNN model could be able to determine ON accurately. The level of error is only 0.9%. But then, the TT-50 is farther from its smallest value will produce very bad result (fail). These results also prove that the neurons developed by the MLFF model is able to capture the unknown data input (in the training data). Although the results still have errors high enough, but will be
more reliable than the others.

3. *Tests using data validation GREATER THEN OUT of range of training data (density and the TT-50)*

Simulation results are indicated by Table 3. From the table, all of the ANN model have relatively small error, but the GRNN model is the best due to has smaller an average error than the others. At the high density, ON is small, in such a way that the RB model has a relatively small error. However, the results of its ON are all the same, at 72.15. The highest error occurred at the smallest TT-50 (307°C). It means that the model can not be able to predict ON of bio-gasoline at small value of TT-50. The RB model is the best for the TT-50 condition at higher outside of the training data. The level of average error of the RB model is the smallest (1.2%). Followed by the MLFF model at 8.3%, and the GRNN model has the highest errors on average, at 40.6%.

<table>
<thead>
<tr>
<th>No</th>
<th>Density Variations</th>
<th>TT50 Variations</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>GRNN</td>
<td>MLFF</td>
</tr>
<tr>
<td>1</td>
<td>2.4%</td>
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<td>2.3%</td>
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<td>1.4%</td>
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<tr>
<td>5</td>
<td>0.6%</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>1.3%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

4. **Conclusions**

a. None of the three ANN models tested, generally can be used for all the data input

b. There are condition in application of the three ANN models for determining ON of bio-gasoline:

1) Use MLFF model if the data of density and temperature TT-50 is smaller at outside the range of training data

2) Use RB model if the temperature TT-50 is greater at outside the range of training data

3) Use GRNN model if the data density and the TT-50 are in the range of training data, and the density is higher at outside the range of training data as well.

**References**


Introduction
It argues that the field of Innovation Management has become detached from the act of invention (i.e. idea generation) because of an assumption brought by cognitive theories of creativity that hold the location of ideas 'exclusively' within the human brain. This 'assumption', grounded in cognitive theory, is believed to be the reason for low levels of research, as it seems like a problem area already solved. This position has caused a lack of research into idea generation, and is challenged by way of an alternative view based on a relationship between intentionality and causality, which is offered as a way to develop new perspectives that open the field to further enquiry.
This paper shares findings that offer the field of Innovation Management a different lens to view the relationship between ideas, invention and innovation by distinguishing different types of ideas and assembles them in a framework that links intentionality (purpose and function) to causality (outcome and processes).

Research methodology
This paper seeks to stimulate further research into ‘practical’ idea generation by challenging the current. It builds on many years of Action Research in major technology projects. The basis for different types of ideas was proven using predicate calculus logic and a survey using a statistical test known as the one-proportion test.

Result and discussion
The distinction of the word ‘idea’ into one of the four mutually exclusive categories aids the management of idea generation: ideas as purposes, outcomes, processes and functions (Figure 1).
The ability to consider alternative ways or processes that could perform the same essential work with added benefit stimulates enquiry and further exploration of the origin of ideas is shown in Figure 2.

Figure 2 – Functional thinking enables Innovation

Thus our theory on idea generation is defined as:

“A good idea is the product of a complete functional understanding, optimal selection of processes, and alignment between purpose and outcome.”

Conclusion

This paper has offered an alternative theory as to where ideas originate, and hopes to stimulate further research into the act of idea generation and the exploration of why some idea generation techniques are better than others. It has also offered one way to manage such a process using Bayesian logic.

Keywords

Function, idea generation, innovation, process, value.

References

A conceptual model for mitigating delay in construction projects using a project learning approach

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Introduction

There is universal agreement that construction delay is a common phenomenon in the construction industry worldwide. Poor or lack of project knowledge management continues to plague the construction industry, especially in relation to project delays. The value of knowledge in the construction industry becomes noticeable as the success and failure of each completed project depends on the knowledge contribution and integration of project parties. As knowledge is the product of learning process, the extent of learning effort in the project environment will have a significant effect on the product value. Project learning thus serves as a professional best practice in the construction industry. The core characterizations of professional expertise include an understanding of the processes behind the activity, a profound understanding of the ways in which the problems and complexity of the work are addressed and the materials used and continuous development. The use of project learning can lead to the development of professional expertise by cultivating a culture of continuous learning through experience and through narratives about others to create, maintain and improve the content of existing knowledge.

This paper shows how knowledge management can be used to reduce the impact of construction projects delay using a project learning approach.

Research methodology

Given the little research was done on delay mitigation using project learning approach, exploratory research serves as an appropriate approach to gain information with the phenomenon of the research area. Data collection was initiated in four-stages. These included literature survey, preliminary survey, case study and interview survey.

Result and discussion

The project learning approach contributes towards positive impacts on project schedule performance. The conceptual model incorporates knowledge on knowledge management, project learning, lessons learned feedback and supervisory control principles. The results indicate that the application of project learning is a way to align the project schedule performance to client and market needs while maintaining the contractor’s core competency. The delay mitigation model is designed specifically for the use in construction projects and with an intention to deal with major delay factors caused by lack of knowledge and poor management of lessons learned. To assure an effective project learning process throughout the project period, project manager, engineer or experienced personnel should act as a project learning supervisor to ensure each project activities are performed in a knowledge-based manner.
The research has implications for both practitioners and academic researchers. For practitioners, this study highlights the importance of project learning to improve the level of competency of contractors for future projects. For academic researchers, there is a need to highlight and draw the practitioners’ attention to the significance of project learning in the development of project performance competency.

Conclusion
Poor management of project knowledge in the construction industry encourages difficulty of access to valuable and quality knowledge in performing project tasks. This in turn will lead to repeated mistakes, slow and wrong decision making, and as a consequence, it will lead to an increase in time and delay events. The application of project learning thus should be managed with due care and due diligence to grasp the maximum value of project learning.

Keywords
Conceptual model, construction project, knowledge management, project delay, project learning.

References


**A thick Su-8 mask for microabrasive jet machining on glass**

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**Introduction**

Glass is widely used in many fluidic applications because of its high resistance to chemicals as well as its transparency. Microabrasive jet machining (µ-AJM) is a process that uses impact energy from high-pressure air, containing microabrasive particles, to remove material on workpieces. As a fast and flexible technique for micropatterning of glass, µ-AJM is usually combined with a patterned mask, which is chosen from various types of high-erosion-resistant materials to material with excellent photolithographic properties. Introduced by IBM in 1989, the epoxy-based SU-8 photosensitive resist has been used in a wide range of applications for fabricating high aspect ratio structures using optical lithography.

The advanced properties of SU-8 make it potentially suitable as a mask for the µ-AJM process. The excellent photolithography properties of SU-8 will allow complex micro-pattern to be fabricated and its transparency allow aligning process for a multi stage fabrication process. Its capacity for high degree of cross-linking brings out the creation of a thick mask, and as scarifying layer, this will permit high aspect ratios erosion result. By applying thick SU-8 mask, a microchannel profile on glass using the µ-AJM process was obtained.

**Experimental details**

Commercially available NANO™ SU-8 2100 formulation from MicroChem Corp. (USA) was used. Soda-lime glass slides 1 mm thick, with a Knoop hardness of 585 kg/mm²±20, were cut into 25×25mm² shapes square as target substrate. It cleaned in a hot Piranha solution (75% H₂SO₄ : 25% H₂O₂), and dehydrated at 200°C to form a hydrophilic surface which increased mask adhesion. Aluminum oxide (Al₂O₃) with an average grain size of 17.5 μm was used as abrasive particles for the µ-AJM process. Some description are shown on Fig.1.

![µ-AJM equipment and schematic structure, close loop on nozzle on substrate, and Alumina abrasive grain](image)

**Figure 1.** µ-AJM equipment and schematic structure, close loop on nozzle on substrate, and Alumina abrasive grain

<table>
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<tbody>
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<td>0.18×3.75 mm</td>
</tr>
<tr>
<td>Stand-off distance</td>
<td>30 mm</td>
</tr>
<tr>
<td>Air pressure</td>
<td>300 kPa</td>
</tr>
<tr>
<td>Flow rate</td>
<td>0.8 g/min</td>
</tr>
<tr>
<td>Scanning speed</td>
<td>0.3 mm/s</td>
</tr>
<tr>
<td>Number of scans</td>
<td>10 times</td>
</tr>
</tbody>
</table>

Table 1. Process experimental parameters
The total process flow of the microchanneling process using μ-AJM is shown in Fig. 2. It is composed of three steps:

a) A masking process of SU-8 on glass substrate, by photolithography method. The sample will be covered by SU-8 mask which containing required micro patterns for μ-AJM.

b) The abrasive jet machining process by using micro abrasive grains to selectively machined uncovered area by SU-8 mask (or the micropattern). The process parameters, such as the distance between the nozzle and workpiece, the diameter of the nozzle, the blasting air pressure, and the flow rate of the microabrasives were maintained constant throughout the process. The process parameters used in these experiments are listed in Table 1.

c) The mask removal and cleaning process. Any remaining mask adhering to the workpiece surface was removed after the machining process was complete. A Piranha solution (75% H₂SO₄ : 25% H₂O₂) was used for this process.

Result and discussion

Mask pattern and thickness
The quality of a mask can be determined by sharpness of the pattern and evenness of the surface, as shown in Fig. 2. For fabricated mask at thickness ≥300µm and above, wavy surface appeared after PEB, which affected resolution greatly; changes the dimensions of micro-patterns if compared to those on the master film. To much UV dosage will burnt the polymer mask, to low dosage will lower concentration of catalyst, which led to a non-uniform cross-link reaction. Empirically, on 600 mJ/cm² UV light exposure, the best mask quality was obtained at the thickness of 250µm.

Microchannel results
A thick mask was sacrificed to achieve the desired channel depth on target substrate. After the μ-AJM process, a semicircular-shaped channel with an average width of 190 µm and a depth of 70 µm was obtained. Erosion profile and measurement result showed in Fig.4.
From micro hardness tests, the mask was much more ductile. So, we expected to achieve a deeper channel depth by increasing the scanning time of the µ-AJM process. Fig. 5 shows the observations of the machining result obtained with a scanning electron microscope (SEM). The mask suffered an under-cut after the µ-AJM process when the scanning time was doubled; this result was different from the expected result.

In 2000, Henk et al. introduced the ‘Blast lag’ effect of the abrasive blasting process by using a patterned-mask. It is defined as small channel etches occurring at a slower rate than the wider channels. Therefore, it seems in our case, the blast lag effect occurred when reached 70 µm channel depth. But here, SU-8 mask got eroded not only on top/surface layer, but also on the wall near the open area of the target material, resulting in the mask under-cut profile and the widening of the channel width. This phenomenon, which looks like the blast lag effect, should be a reference for choosing parameters in this work.

The micro-channel produced from by µ-AJM in this process is two-dimensional (planar) profile. By this method, a trial to obtain a through hole on glass slide was also performed. As single result, this kind machining result on a glass slide cannot be evaluated as a 3D feature, but in future work, the combination of side-by-side microchannels and through holes with a bonding process is expected to produce a single piece device with a close-microchannel in it.

Conclusions

The results of this study using a thick SU-8 mask to fabricate microchannels on glass employing the µ-AJM process are summarized as follows:

1. For a thickness around 250 µm, SU-8 2100 can be used as a mask on a glass substrate to obtain a good micropattern and highly repeatable results.
2. The erosion profiles of the channels show an arc-shape. Thus, it is very difficult to machine accurate square-type (common result type of familiar wet etching process) channels because of the basic characteristics of the µ-AJM process. However, if a method for obtaining an ultra-thick SU-8 mask with a homogenous cross-link structure and good pattern resolution can be elucidated, then erosion profiles at that thickness can be explored.
3. As a result of the wear of the mask film and the “blast lag effect” at the boundaries, the measured dimensions of the machined samples were slightly larger than those of the masking patterns used.

Acknowledgments

This work was supported by grant No. R01-2004-000-10556-0 from the Basic Research Program of the Korea Science and Engineering Foundation (KOSEF).

Keywords

Abrasive jet machining, microchannel, SU-8 mask.

References

Boosting with kernel base classifiers for human object detection

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Introduction
Human object detection is an important issue to address because of the many applications of human object detection system, i.e., surveillance system, visual search engine, and intelligent vehicles. Many interesting human object detection methods have been proposed in the literatures. Oren and Papagergiou (1997) use wavelet templates to detect human object. Papagergiou and Poggio (1999) pioneered the use of overcomplete sets of Haar wavelet features in combination with a Support Vector Machine (SVM). Mohan et al. (1999), create four component classifiers for detecting heads, legs, and left/right arms separately. The research commonly used Support Vector Machine (SVM) method for human object detection. SVM method has high accuracy for human object detection but the speed of testing is slow. Other method for human object detection is Boosting. Laptev improves the accuracy object detection using boosted histograms. Arras et al. (2007) used boosted features for detecting people in 2D range data. Viola et. al used Boosting for movement human object detection. Boosting method has comparably low accuracy for human object detection but the speed of testing is fast.
The real time applications of human object detection requires high accuracy of detecting human and high speed of testing. To overcome the problem, this research proposes Boosting with kernel base classifier for human object detection in order to improve the accuracy of the conventional boosting classifier.

Proposed K-Boosting: Boosting with kernel base classifiers
This section discusses the new proposed method for human object detection called K-Boosting (or Kernel Boosting). The proposed K-Boosting employs the quadratic kernel as base classifiers for Boosting, therefore it has high accuracy and fast testing time. The quadratic kernel of SVM is a quadratic function of dot product of the training data samples. Having quadratic function, the kernel is able to form a complex non-linear decision function so that SVM has high classification accuracy. Otherwise, the Boosting method has fast classification time. The decision function of Boosting method is a linear combination of prediction of its base classifiers. Having this simple linear combination, this method requires much less classification time.

Base on the above analysis, a new boosting with kernel function as base classifiers (called K-Boosting) is proposed. The kernel function in K-Boosting is used to improve the classification accuracy. Meanwhile the simple linear combination of base classifier function of Boosting makes the classification time of K-Boosting is fast. The schematic illustration of the proposed method is represented in Figure 1. First, initialize the weight $w_a$ of training data with the same value. Then, do iterate from 1 until M of base classifiers with kernel function. The update weight coefficient $w_a$ that increase weight coefficient value for misclassify the
training data and decrease weight coefficient value for correct classify the training data. Finally, when desired number of base classifiers has been trained, they are combined to form a committee using coefficients that give different weight to different base classifiers.

![Figure 1. Schematic illustration of the K-Boosting framework](image)

**Experimental results and evaluation performance**

In the experiment, a dataset of 250 positive samples and 375 negative samples is used. Each of these samples is divide two parts, i.e., training dataset and testing dataset. These samples are obtained from capturing image with 3-5 meter distance with variability in different locations. The positive samples are images of human with variability in different colours and garment types. The negative samples are images of natural scenery and buildings that are not contain any human.

Performance of the proposed K-Boosting, Boosting and SVM for human object detection problem are compared. To evaluate the system performance, the two scenarios are carried out. The first scenario uses a training dataset with 450 samples and uses a testing dataset with 175 samples that the sizes of images are 128 x 64 pixels. The first scenario aims to measure the accuracy and computational time of training process and testing process of the proposed method that is compared with Boosting and SVM. In the first scenario, the result of accuracy and computational time of training and testing process is presented in Table 1.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Accuracy of (percentage)</th>
<th>Computational time of (second)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>training</td>
<td>testing</td>
</tr>
<tr>
<td>K-Boosting</td>
<td>97%</td>
<td>83%</td>
</tr>
<tr>
<td>SVM</td>
<td>97%</td>
<td>82%</td>
</tr>
<tr>
<td>Boosting</td>
<td>87%</td>
<td>67%</td>
</tr>
</tbody>
</table>

This result shows that the testing accuracy of the propose method is comparable to that SVM method but higher about 16% than Boosting method. The testing time of the propose method is comparable to that of conventional Boosting but higher than SVM method.

The second scenario uses a training dataset with 450 samples and uses a testing dataset with the size of images those are larger than samples of training dataset. In the second scenario, the system starts detecting human object in images by selecting 128 x 64 windows from top left corner of the images. The system detects area of image of active window. If the result of human object detection are positive class then the system draw a red box. The result of the second experiment is shown in Figure 2.

![Figure 2. The result of human object detection of image with size 176 x 234 using (a) K-Boosting (b) SVM and (c) Boosting](image)
Figure 2 show the result of image with size 176 x 234 and consist of five human objects. The area of image that consist of human objects are signed with red boxes. In Figure 2 (c), there are three red boxes that are false detection. The false detection is caused area of false detection in image has similarity features with human object. This shows that the proposed K-Boosting has better performance than the conventional Boosting.

**Conclusion**

In the experiment, the testing accuracy of the proposed K-Boosting method is about 83%. This result improves the accuracy about 16% from that of the conventional Boosting that is about 67%. The accuracy detection of large image of K-boosting is comparable to that of SVM method. In Boosting method, the result of human object detection of large image show that there are some false detection in image test. The false detection is caused area of false detection in image has similarity features with human object. The experiment shows that the proposed K-Boosting has a high accuracy that is comparable to SVM and a fast testing time that is comparable to Boosting, therefore the proposed method can be applied for a real time application. The research can be extended to the Internet domain to create a visual web search engine. Besides that the proposed method can be further used in state of the art surveillance systems and car driver assistance systems.

**Keywords**

Boosting, human object detection, kernel, support vector machine.

**References**

Can we extract the pion electromagnetic form factor from a $t$-channel diagram only?

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Introduction

In nuclear physics pions occupy a special place. Being the lightest meson in its family, pions play the major role in strong interaction. In fact, pions were the first mesons predicted by Yukawa as the mediator of the strong nuclear force. However, despite intensive investigations for decades, our understanding of the pion structure is far from complete. This is reflected, e.g., by the incomplete available data base of the pion electromagnetic form factor $F_{\pi}(Q^2)$ in a considerably wide range of virtual photon momentum transfer $Q^2$. We understand that $F_{\pi}(Q^2)$ is nothing but a Fourier transformation of the charge distribution $\rho$. At very small $Q^2$ the behavior of $F_{\pi}(Q^2)$ has been accurately determined by scattering of high energy pions from atomic electrons, Amendolia et al. (1986). At higher $Q^2$ values one should consult pion electroproduction off a nucleon. With the continuous and excellent electron beams available at modern accelerators, such as CEBAF at JLab, it is now possible to measure pion electroproduction observables with unprecedented accuracy, at certain kinematics inaccessible with previous technology. Thus, it is possible to extract $F_{\pi}(Q^2)$ with high accuracies using the current experimental data. However, it is important to note that these extractions:

- rely heavily on the $t$-channel dominant assumption, although the assumption has never been directly checked
- are model dependent
- are plagued with the model uncertainties, which come from the extrapolation of the form factor cut-off to the physical limit.
- are strategy dependent

It is the purpose of the present work to revisit a simple method, à la Chew-Low, which is based only on the first assumption. This will also serve as an alternative method, which is obviously easy to check and eliminate the above shortcomings.

Theoretical model

The only assumption made in our work is the dominance of the $t$-channel of pion electroproduction. This channel is depicted in Fig. 1. By using the standard procedure we can obtain the reaction amplitude as

$$M = \frac{2ieg_\pi F_{\pi}(k^2)F_h(t)\bar{u}(p')\gamma_5\left(k^2q \cdot e - k \cdot qk \cdot e\right)u(p)}{k^2(t - m_\pi^2)}$$

where $k^2 = -Q^2$, $e$ is the proton charge, $\varepsilon$ denotes the virtual photon polarization, while $m_\pi$ and $g_\pi$ are the pion mass and coupling constant, respectively. The hadronic and electromagnetic form factors are denoted by $F_h$ and $F_{\pi}$ respectively, while the Mandelstam variable $t$ can be written as
\[ t = (k - q)^2 = k^2 + m_{\pi}^2 - 2k \cdot q \]

Figure 1. The t-channel diagram that dominates the contributions to the pion electroproduction process. The electromagnetic and hadronic form factors are denoted by \( F_\text{e} \) and \( F_h \), respectively.

From the reaction amplitude we can calculate the longitudinal differential cross section which reads

\[
\frac{d\sigma_L}{dt} = \frac{e^2 g_\pi^2 F_\pi^2(k^2)F_h^2(t)}{8\pi W(s - m_{\pi}^2)(t - m_{\pi}^2)^2 |k|^3} (q_0 - \frac{1}{2}k_0)^2
\]

This cross section can be compared with the current experimental data of pion electroproduction from Horn et al. (2006) and Tadevosyan et al. (2007), and therefore the pion form factor \( F_\pi(Q^2) \) can be easily extracted.

**Result**

The result of the present work is displayed in Fig. 2, where we compared the extracted form factor with the result of previous works and a monopole parameterization as well as the Maris & Tandy model (Maris and Tandy, 2000). The numerical results of our extraction are given in Table 1. It is obvious that our result is in good agreement with the extracted form factor of previous works. At \( Q^2 = 1.6 \text{ GeV} \) the extracted form factor has a relatively larger error bar. This is understood from the fact that the used data have large \( t \) and \( W \), thus contributions from other channels beyond the t-channel could not be neglected. We also note that the result from Horn et al. (2006) has much smaller error bars, since they do not quote the model uncertainties in their result. As shown in the last column of Table 1, these uncertainties could lead to large error bars in the extracted form factors.
Table 1. The extracted pion form factor obtained in this work. Note that in the last column the model uncertainty is indicated by the second error bars.

<table>
<thead>
<tr>
<th>( Q^2 (\text{GeV}^2) )</th>
<th>( F ) (this work)</th>
<th>( F ) (previous work)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.60</td>
<td>0.438 ± 0.066</td>
<td>0.433 ± 0.017 ± 0.137</td>
</tr>
<tr>
<td>0.70</td>
<td>0.395 ± 0.076</td>
<td>0.473 ± 0.023 ± 0.038</td>
</tr>
<tr>
<td>0.75</td>
<td>0.396 ± 0.088</td>
<td>0.341 ± 0.022 ± 0.078</td>
</tr>
<tr>
<td>1.00</td>
<td>0.341 ± 0.074</td>
<td>0.312 ± 0.016 ± 0.035</td>
</tr>
<tr>
<td>1.60</td>
<td>0.194 ± 0.124</td>
<td>0.233 ± 0.014 ± 0.013</td>
</tr>
<tr>
<td>1.60</td>
<td>0.276 ± 0.036</td>
<td>0.243 ± 0.012</td>
</tr>
<tr>
<td>2.45</td>
<td>0.153 ± 0.042</td>
<td>0.167 ± 0.010</td>
</tr>
</tbody>
</table>

Keywords
Electromagnetic form factors, electroproduction reactions, eta mesons, K, Pi.

References
Tadevosyan V. et al., (2007) Determination of the Pion Charge Form Factor at \( Q^2 = 0.60 – 1.60 \) (GeV/c)^2. Physical Review C 75, 055205.
Classification of polarimetric-SAR data using fuzzy maximum likelihood estimation clustering with consideration of complementary information based-on polarimetric parameters, target scattering characteristics, and spatial context

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Introduction

Fully Polarimetric-Synthetic Aperture Radar (polarimetric-SAR) sensors are becoming more important in remote sensing applications due to: (i) its all-weather, day and night operational capability; and (ii) its sensitivity of the polarization state of the backscattered wave to physical characteristics of the ground target [4,12]. The utilization of multi-polarized wave in polarimetric-SAR system allows us to extract additional information which can give better land use/cover classification results than single-channel/polarization SAR data [4,9,12]. Unsupervised classification is an important technique for automatic analysis of polarimetric-SAR data, since it can be performed regardless the availability of ground truth information. In the literature, many unsupervised classification approaches for polarimetric-SAR have been proposed. Basically, there are two types of algorithms. The first type of algorithm is based on the analysis of physical scattering properties [6], and the second one is based purely on statistical clustering of polarimetric-SAR data [1,7]. Some limitations of these methods in recognizing more detail object discrimination have been reported. To overcome these problems, it is advisable to use multisensor data [3,11]. Another limitation of these methods is that they performed on a pixel-by-pixel basis, which usually produced noisy classification results ("salt-and-pepper" effect even in homogeneous areas).

This paper proposed an unsupervised classification scheme based on fuzzy maximum likelihood estimation (FMLE) clustering algorithm [8] that integrates complementary information of several polarimetric parameters and target scattering characteristic features, and spatial contextual information.

Methodology

The scheme of the proposed methodology for polarimetric-SAR image analysis is shown in Fig. 1. In brief, the processing steps include: (i) Image speckle filtering; (ii) Feature extraction based on combination of polarimetric parameters (9 features) and target scattering characteristics (3 features); (iii) Feature selection and reduction; (iv) Image clustering; (v) Post-processing using spatial contextual information; (vi) Region object labeling using ground truth information.

The feature selection is performed by maximum noise fraction (MNF) transformation, [2,5] which reduced from 12 features to 4 features (in this case study). The unsupervised classification used two methods for comparison, i.e. fuzzy maximum likelihood estimation (FMLE) and fuzzy K-means (FKM) clustering methods [8,10].
Experimental data
The experimental data is a fully polarimetric, single look complex E-SAR (L-Band). The data covered the area of Penajam, East Kalimantan, Indonesia. The area of study is shown in Fig. 2.

Experimental results
The unsupervised classification using FMLE clustering was applied to polarimetric parameters alone (a), to the target scattering characteristic features (b), and to the MNF reduced features (c). The FMLE clustering result [8] (d) was also compared to the FKM clustering result [10] (e).

Conclusions
An alternative method for unsupervised classification of polarimetric-SAR data has been proposed. The method was designed by integrating the combined features extracted from
polarimetric covariance matrix and Cloude’s polarimetric decomposition (which characterize the target’s scattering mechanism) with spatial contextual-supported FMLE classifier. The proposed method has been tested using a fully polarimetric, single look complex ESAR (L-Band) data acquired on the area of Penajam, East Kalimantan, Indonesia. Experimental results show that the proposed method improves land-cover discrimination performance, and provides robust and homogeneous classification results but still preserve edge and other fine structures.

**Keywords**
Fuzzy maximum likelihood estimation (FMLE) clustering, maximum noise fraction (MNF) transformation, polarimetric-SAR, polarimetric parameters and decomposition, unsupervised classification, wave scattering mechanism.

**References**
Classification of synthetic aperture radar image based on pulse coupled neural networks

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Introduction
The monitoring of land cover on a certain area could be done by analyzing optical-sensor remote sensing images. The optical-sensor image is relatively easy to interpret, but it has cloud cover problem. On the other hand, the Synthetic Aperture Radar (SAR) images are cloud free but they are more difficult to interpret because of their geometric and speckle noise. SAR image analysis is usually done based on texture features instead of color, because a SAR image is a single-band gray-level image. This paper explores an approach for analyzing SAR image using Pulse Coupled Neural Network (PCNN). Karvonen [3] has used PCNN for segmenting a SAR image of Baltic Sea into ice regions and open water regions. The image is happened to be quasi homogeneous image. The coordinate of sea ice region was transmitted to an ice-breaker ship to help the trade ships to pass the Baltic Sea. The PCNN has difficulties in segmenting image into regions when the sea-ice region was broken into small-size ice regions, so that the SAR image became a textured image. In the study carried out by Karvonen [3-5], the input image is a homogeneous image and has only two classes of object, the sea ice and the open water areas. This paper will explore the use of PCNN to classify land areas in a SAR image where the SAR image is a textured image and has more than two classes of land cover object. When a PCNN is used to classify two-class problem, the first iterations will give the area of class 1 (which has bright intensities) and the second iterations will give the area of class 2 (which has darker intensities). This paper contributes a scheme that uses a PCNN for segmenting a textured image with more than two classes of object.

Methodology
The research on PCNN was reported by Eckhorn in 1990 followed by Johnson et al. in 1994 [2]. PCNN is a mathematical model of cortex system of mamalia. The mathematical model of cortex system consists of five equations. The system works iteratively until an object is seen. Each neuron of PCNN, consist of receptive field, modulation field, and pulse generator [3-5]. This study has compared the result of using a PCNN to segment an original gray-level SAR image and transformed Gray Level Co-occurrence Matrix (GLCM) [1] textured-feature SAR images as shown in the diagram of Fig. 1. The input SAR image is firstly filtered to reduce the speckle noise. A standard filter is used. The SAR image is then used as an input to the PCNN, and the iteration process is conducted. To be able to recognize more than two classes of object, the proposed method has done more iteration. Each time an object has been recognized, the input for the next iteration is subtracted by the object pixels just have been recognized. To be able to process a textured image, instead of using the original gray-level SAR image, a transformed texture-feature SAR images are used. Three features of GLCM [1] were used. They included dissimilarity, correlation and angular second moment features. Each of the texture images followed the iterated process by the PCNN.
Experimental data

The experimental data for this study is a SAR image acquired on a certain area in Kalimantan by ESAR airborne system. It is using the L band and the transmission mode vertical and horizontal polarisation (L-VH). The image is shown in Figure 2.

Experimental results

The first experiment has used the gray-level SAR image as the input to the PCNN. The forest area appeared at the fifth iteration, the open area appeared at the seventh iteration, and finally the darkest water area appeared at the eighth iteration. The total percentage of the recognized land areas is 162.99% (shown in Table 1) which is exceeded 100%. It explained that there were recognition error. The segmented image is shown in Fig. 3.

On the other hand, the used of input texture-feature SAR image gave better recognition result. The forest area best appeared in the dissimilarity-feature image, the open area best appeared in the correlation-feature image, and finally the darkest water area (sea, river, and swamp area) best appeared in the angular second moment feature image. The fused segmented image is shown in Fig. 4 and recognition accuracy is shown in Table 2. Fig. 3 has black pixels (unrecognized pixels) in the homogeneous water area, while in Fig. 4 the black pixels shown in the forest area. The segmented images can furtherly be corrected in a postprocessing step using majority or morphology filters.

<table>
<thead>
<tr>
<th>Object Class</th>
<th>Recognized Pixels (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>70.02</td>
</tr>
<tr>
<td>Open area</td>
<td>48.24</td>
</tr>
<tr>
<td>Water area</td>
<td>44.73</td>
</tr>
<tr>
<td>Total</td>
<td>162.99</td>
</tr>
</tbody>
</table>

Figure 1. Block diagram of experimental design.

Figure 2. Airborne SAR image acquired from Kalimantan in L Band polarization L-VH.

Figure 3. Segmented image using SAR image.

Figure 4. Fused segmented image.
Conclusions

This paper proposed a scheme for segmenting a textured and multi-object SAR image using PCNN. To obtain more than two classes of land cover object, in the next object recognition process the PCNN uses an input image where the just recognized object pixels are excluded from the image. The process is repeated until all objects are recognized. To be able to process a textured image, instead of using the original SAR image as an input, the PCNN has three GLCM texture-feature input images. The three GLCM features include dissimilarity, correlation and angular second moment. The final segmented image is constructed by fusing the best single-object images obtained from processing the three GLCM-feature images. The recognition rate can reach 99.33%.

Keywords
Classification, PCNN, SAR, segmentation, texture.

References
Color and texture fusion for multispectral image segmentation

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Introduction
Feature extraction and selection process is an important process in remote sensing image segmentation and classification [10,12]. Features that are frequently used in multispectral image analysis include gray level or color and texture features. Pixel gray level values can be represented as gray level histogram and has an important role in the process of object recognition and interpretation. On the other hand, texture can describe the attraction between a pixel and the other pixels around it and has also been widely used in remote sensing image analysis.

Several techniques have been developed for texture feature extraction that includes statistical method, filtering technique, or wavelet decomposition [10]. The implementation of image classification using texture features alone gives a satisfying result on heterogeneous landscape unit. In contrary, the use of texture features tends to show unsatisfying result on homogenous landscape unit. Classification error usually occurs in the transition areas between texture units. Color features give a better classification result on the homogenous landscape unit than on the heterogeneous landscape unit. The use of color information alone tends to give a noisy classification result especially in the heterogeneous area. It is important to identify the best texture features from the literatures and combine them with the best color features to obtain an optimal remote sensing thematic image.

Belongie et al. [1] have used the Expectation Maximization (EM) algorithm using augmented vector of texture and color features. An augmented-vector approach may cause the strengths of each feature space cancelling out instead of complementing each other [2,6,7]. In [2,6,7], they have used a data fusion based on texture and color features using maximum decision rule. Huber [5] has introduced several schemes for combining decision rules. Fusion can also be carried out at the level of information [11].

This paper synthesizes and proposes a framework to investigate the use of color and texture features for analyzing a multispectral image. The discussions includes the methodology for analyzing multispectral image using texture and color features, the experimental data, experimental results and analysis. Finally, this paper is closed by a concluding remark.

Methodology for image analysis using texture and color features
The proposed processing framework can be illustrated as a diagram in Fig. 1. Two potential models for texture feature extraction are used in this study. They are the Grey Level Co-occurrence Matrix (GLCM) and the Gabor Filter (GF) models. The GLCM is a second order statistical method, that represents the joint probability density of the intensity values between two pixels. Eight GLCM features are used. They include energy, entropy, contrast, cluster shade, correlation, homogeneity, inverse difference moment, and maximum probability [4].
The other GF model uses a technique for energy filtering to enhance some textural properties of an image. In the spatial domain, a Gabor Filter function is a Gaussian function modulated by a sinusoidal function. A total number of scaling factor on wavelet decomposition and a total number of orientations are chosen [8,9]. The related GF features are then computed. Color feature is represented in RGB model which is found to be the best in a comparison study done by Jolly and Gupta [6].

Two approaches have been used in setting up the input GLCM, GF, and RGB features to the EM algorithm. The EM algorithm [3] attempts to segment the data using a soft membership function as a weighted sum of a number of Gaussian distributions called a Gaussian Mixture Model (GMM). The generation of this GMM is achieved through an Expectation-Maximization technique, which aims to find the maximum likelihood estimate for an underlying distribution from a given dataset when the data is incomplete. The data input to the EM algorithm has been set up based on the individual feature and based on the augmented feature vector.

Several segmented images are produced: (i) one segmented image using the augmented feature vector of the GLCM, GF, and RGB [1]; (ii) three segmented images using one feature model of the GLCM, GF, or RGB feature, respectively; (iii) one segmented image as a result of composing the GLCM-based, GF-based, and RGB-based classified images (known as an information fusion scheme) [11]; and (iv) four segmented images using Product, Sum, Max, and Majority-vote operator, respectively, applied to the decision rules using the GLCM, GF, and RGB features [5].

All of the segmented images are filtered in the post-processing step to obtain the best result of thematic images. The process consists of: (i) morphology filtering to improve the segmentation result; and (ii) region merging and association labelling. The later process is a finishing touch process which is done based on a visual perception and the ground truth image. Finally, the classification result was evaluated based on its overall classification accuracy.

**Experimental data**

A Landsat TM multispectral data of the city area of Dessau, Saxony-Anhalt, Germany (source: eCognition User Guide 2005) shown in Fig. 2 is used for experiment. The data
contain images of three spectral bands, namely Red, Green and Blue, and a ground truth image. A corrected ground truth image is created to differentiate the clear cut area or open area in the forest area (which has white color in Fig. 2c) from the vegetation area. The dimension of the images is 166 x 166 pixels.

**Experimental results and analysis**

In the case study, the best result is the classified image as the result of data fusion of RGB and GLCM model features using Sum operator, follows by the classified image as a result of information fusion using the three-model features as shown in Table 1. The related thematic images are shown in Fig. 3.

<table>
<thead>
<tr>
<th>No.</th>
<th>Features used in Data Fusion</th>
<th>Overall Accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Product</td>
</tr>
<tr>
<td>1</td>
<td>GF and GLCM</td>
<td>53.07</td>
</tr>
<tr>
<td>2</td>
<td>RGB and GF</td>
<td>55.54</td>
</tr>
<tr>
<td>3</td>
<td>RGB and GLCM</td>
<td>64.06</td>
</tr>
<tr>
<td>4</td>
<td>RGB, GF and GLCM</td>
<td>62.74</td>
</tr>
</tbody>
</table>

**Table 1. Data and information fusion.**

**Concluding remarks**

The case study has suggested a scheme for multispectral image analysis based on a data fusion of RGB and GLCM features using Sum operator.

**Keywords**

classification, color, data fusion, feature extraction, multispectral image, information fusion, segmentation, texture.

**References**


Defining relative qualities over a number of object oriented softwares

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Introduction
The advanced of software engineering has shifted software development from procedural to object oriented (OO) paradigm. It results in changes on how software design is evaluated. In procedural, algorithm complexity is the main indicator of software design [9]. However, the metrics of software complexity are considerably not appropriate for object oriented software [4]. There have been many researches to develop set of metrics for systems developed using OO approach. Several studies show the adoption of these metrics to support OO programming such as Ada and Classic-Ada [10], C++ and Eiffel [3].  
The adoption of the OO paradigm is to produce better and cheaper software. The main structural mechanisms of this paradigm, namely inheritance, encapsulation, information hiding or polymorphism, are the keys to foster reuse and achieve easier maintainability. However, the use of language constructs that support those mechanisms can be more or less intensive, depending mostly on the designer ability. We can then expect rather different quality products to emerge, as well as different productivity gains.  
A measurement tool is required to produce quantitative values representing OO program’s qualities. Christariny developed Metrics Calculator for Java program based on Abreu’s metrics [7]. Nurmaya improved the usability of the calculator [12] and utilized it for explorative experiments on the applicability of the Confidence Interval Good OO Design (CIGOOD) proposed by Abreu in [2]. The drawback of CIGOOD was revealed by Nurmaya, i.e. the measurement result is much dependent on the quality of sample programs taken as the statistical population of the method. This paper presents a new method of defining rank of qualities over a set of Java programs using the Analytic Hierarchy Process (AHP) introduced by Thomas Saaty [15].

Object oriented metrics
There are two major sets of metrics for OO, i.e. Metrics for Object Oriented Design (MOOD) [2] to represent quality of an integrated system and Method for Object Oriented Software Engineering (MOOSE) [6] to measure quality of classes as components of an OO system. The MOOD used in this paper consists of the following metrics: Method Hiding Factor (MHF), Attribute Hiding Factor (AHF), Method Inheritance Factor (MIF), Attribute Inheritance Factor (AIF), Polymorphism Factor (POF) and Coupling Factor (COF), whereas the MOOSE are Weighted Method per Class (WMC), Depth of Inheritance Tree (DIT), Number of Children (NOC), Coupling between Object Classes (CBO), Response Set for A Class (RFC) and Lack of Cohesion in Methods (LCOM).

Methodology
We proposed the use of Analytic Hierarchy Process (AHP) for interpreting a set of metrics as a single quantitative value describing the quality. AHP is a mechanism for multi criteria
decision making based on ratio scales from paired comparisons [15]. By organizing and assessing alternatives against a hierarchy of multifaceted objectives, AHP provides a proven, effective means to deal with complex decision making. We use AHP since it lends itself to the nature of complexity in defining software quality based on the OO metrics, whose weights will vary according to the property of quality being examined. AHP splits the overall problem to solve into many evaluations of lesser importance, while keeping at the same time their parts in the global decision.

3.1. Decomposition
Each metric of the MOOSE refers to the property of design quality in object-oriented paradigm as efficiency (LCOM, CBO, DIT, NOC), understandability (WMC, RFC, DIT), reusability (WMC, LCOM, CBO, DIT, NOC), testability (WMC, RFC, DIT, NOC) and maintainability (RFC) [14]. Some literatures define property of design quality using several additional metrics, such as in [1], [5] and [11]. However, this paper focuses only on MOOSE and MOOD-based design quality. The decision hierarchy for the quality rank has three different levels. The top level describes the overall decision, i.e. selecting the highest quality program. The middle level describes the factors that are to be considered. The lowest level of the decision hierarchy reveals the OO metrics suitable to support the middle factors. The decision hierarchy for defining quality rank is shown in Figure 1.

3.2. Weighting
The key to using AHP is pair wise comparison. Each pair of the parameters are compared and given value based on a scale that ranges from equally preferred (1) to extremely preferred (9). From the hierarchy, we produced weights of elements for each criterion. Metrics of MOOSE and MOOD are considered as equally preferred one to the other since they all together constitute the properties of good object oriented software. Further discussion and details of process using the metrics can be reviewed on [6] for MOOSE and [8] for MOOD.

3.3. Evaluation
The experiment was conducted to measure quality of five open source ERP programs available in [13]. They are Adempiere 3.2, OpenBravo 2.5.3, Plazma 0.1.5, FreedomERP 1.1.3.5 and JAllInOne 0.9.0.6. Christariny’s Metrics Calculator was used to measure MOOSE and MOOD of the five sample programs. Consistency ratio (CR) is important in AHP, since it defines the consistency of preference assignment of all parameters involved in the process. CR obtained from this experiment is 0.0784. It is less than 0.1 and hence the comparison is called consistent.

3.4. Defining rank
Having the weighted and values of each parameter, we can complete the overall measurement and rank of quality based on the properties defined previously. It turns out that both metric sets (MOOSE and MOOD) result in relatively equal rank of qualities. The result is also supported by the fact that Adempiere and Openbravo are the two most frequently downloaded open source ERP programs [13].
Table 4. Rank of quality based on MOOSE and MOOD

<table>
<thead>
<tr>
<th>Application</th>
<th>MOOSE</th>
<th>MOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adempiere</td>
<td>0.1275</td>
<td>0.4233</td>
</tr>
<tr>
<td>Openbravo</td>
<td>0.1209</td>
<td>0.4202</td>
</tr>
<tr>
<td>Plazma</td>
<td>0.1194</td>
<td>0.3014</td>
</tr>
<tr>
<td>FreedomERP</td>
<td>0.1066</td>
<td>0.2855</td>
</tr>
<tr>
<td>JAllInOne</td>
<td>0.0309</td>
<td>0.1043</td>
</tr>
</tbody>
</table>

Conclusion

It has been shown that combination of object oriented metrics and AHP is a powerful tool to measure quality of software design. Although it can not produce absolute value of quality, the quantitative results can give an estimation figure of quality rank over a set of Java codes. Although the two OO metric sets are defined for different measurement purposes, MOOSE for individual class quality and MOOD for integrated system quality, apparently both produce a relatively equivalent rank of quality over five ERP programs. However, it can not be concluded that the difference of two quantitative values represents the quality gap of the two software designs. There is a lot more explorative experiment needs to conduct for more comprehensive conclusion.

Keywords

Analytic Hierarchy Process (AHP), MOOD, MOOSE, object oriented metrics.

References

Introduction

Adsorption on a solid adsorbent is the fundamental processes in the field of separation processes, purification of gases, and adsorption cooling. The understanding of the thermodynamic property fields of adsorbent plus adsorbate system is important because it enables the adsorption processes to be analyzed (Saha, B.B., et al, 2006).

Information concerning the relevant adsorption equilibrium and characterized of adsorbent is generally an essential requirement for the analysis and design of an adsorption separation process. For practical application, the adsorption equilibrium must be known over a broad range of operation temperatures (Lee, Jong-Seok, et al, 2002).

At least, there are two methods to know the adsorption equilibrium, first is direct method (gravimetric method) and secondly is indirect method (volumetric method).

The main objective of this research is to design and manufacturing kinetic adsorption test rig to investigate the adsorption equilibrium such as capacity and rate of adsorption with indirect method (volumetric method).

Thermodynamical analysis

An adsorbate mass balance on the measuring cell of the sorption kinetic test rig yield (Dawoud dan Aristov, 2003):

$$\frac{d_{ms}}{dt} = \dot{m}_{vv} - \dot{m}_{ads}$$ (1)

Where:

- $d_{ms}$: adsorbate mass flow rate in measuring cell (kg/s)
- $\dot{m}_{vv}$: mass flow rate of adsorbate on adsorbent (kg/s)
- $\dot{m}_{ads}$: mass flow rate of adsorbate in vapor vessel (kg/s)

Assuming an ideal gas behavior for the adsorbate during the whole sorption process, both the rate of adsorbate flow from the vapor vessel to the measuring cell and the time rate of...
variation of the mass of the vapor phase in the measuring cell can be obtained according to the following equations (2) and (3).

\[
\dot{m}_{vv} = \frac{\Delta m_{vv}}{\Delta t} = \frac{m_{vv}(t) - m_{vv}(t + \Delta t)}{\Delta t} = \frac{(p_{vv}(t) - p_{vv}(t + \Delta t)) \cdot V_{vv}}{R_{vv} \cdot T_{vv} \cdot \Delta t}
\]  

(2)

\[
\frac{dm_{d,ms}}{dt} = \frac{(m_{d,ms}(t + \Delta t) - m_{d,ms}(t))}{\Delta t} = \frac{(p_{ms}(t + \Delta t) - p_{ms}(t)) \cdot V_{ms}}{R_d \cdot T_{ms} \cdot \Delta t}
\]  

(3)

By substitution equations (2) and (3) to equation (1) can be obtained:

\[
\dot{m}_{ads} = \frac{\Delta m_{ads}(t)}{\Delta t} = \frac{(p_{vv}(t) - p_{vv}(t + \Delta t)) \cdot V_{vv}}{R_{vv} \cdot T_{vv} \cdot \Delta t} - \frac{(p_{ms}(t + \Delta t) - p_{ms}(t)) \cdot V_{ms}}{R_d \cdot T_{ms} \cdot \Delta t}
\]  

(4)

Knowing the mass of the dry adsorbent sample \(m_{s,dry}\) as well as the starting adsorbate loading \(x_0\), the time variation of the adsorbate loading can be calculated due to equation (5):

\[
x = x_0 + \sum_{t = 0}^{t} \frac{\Delta m_{ads}}{m_{s,dry}}
\]  

(5)

**Methode of design**

Kinetic adsorption test rig as shown at figure 2 consist of pressure vessel, measuring cell, vacuum pump, gas vessel, pressure transmitter, thermocouple Type K, and circulating thermal bath. Design of kinetic adsorption test rig only for pressure vessel and measuring cell.

![Figure 2. Schematic of kinetic adsorption test rig](a) (picture of kinetic adsorption test rig) (b)

**Measurement**

The Adsorption experiments were based on the static volumetric method. In this method, the maximum capacity and adsorption rate of adsorbate on adsorbent were determined by appropriate pressure and temperature measurement. The system pressure was measured by an absolute pressure transmitters (DRUCK, PTX 1400) the pressure range are 0 – 40 bar and its reading uncertainty is ± 0.15 % within the useable measurement range with a high accuracy signal conditioner (ADAM, type 4018). The system temperature was measured by Thermocouple type K. During the experiment, the temperature in pressure vessel and measuring cell were maintained by circulating thermal bath and the temperature controllers of the circulating thermal bathes have an accuracy of ± 0.2°C.

**Experimental procedure**

In order to activate the adsorbent sample, the measuring cell is heated to 150°C and evacuated, in the same time, for 1 h using a vacuum pump (degassing process). During this process, measuring cell is separated from pressure vessel and kinetic adsorption test rig system. After degassing process the measuring cell is cooled down to the required sorption temperature and measuring cell were connected with tube to the kinetic adsorption test rig system.
The temperature of the pressure vessel is adjusted to the required sorption temperature, and then charged with adsorbate (gas) from the gas storage, up to the required starting pressure for the sorption process. The temperature of the connecting piping and valves has to be adjusted and controlled to the required sorption temperature. The first sorption process starts when the valve V2 and V4 is opened (in figure 2a), resulting in decreasing the pressure in the pressure vessel for 30 minutes. During the first sorption process, the temperature of water in circulating thermal bath 2 was prepared to be 10°C. The sorption process starts when the temperature of water in circulating thermal bath is 10°C and was flowed to water jacket of measuring cell. The pressure variation, being measured using the two pressure transmitters P1&P2 are used to determine the amount of the adsorbed gas on the adsorbent sample.

**Repeatability of kinetic adsorption test rig**

Repeatability was done to guarantee that kinetic adsorption test rig can result the capacity and rate of adsorption data in the same value on the same condition as shown at Figure 3.

![Figure 3. CO₂ adsorption on commercial activated carbon](image)

**Conclusion**

1. Kinetic adsorption test rig can be use for research in adsorption engineering to investigate capacity and rate of adsorption data.
2. Kinetic adsorption test rig was manufactured to investigate capacity and rate of adsorption up to 40 bar.
3. Pressure vessel and measuring cell were design for pressure up100 bar.

**Acknowledgment**

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**References**


Diagnosing Pap smear cell image based on association rules

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Introduction
Cervix cancer is the cause of many women death throughout the world. This case frequently happened because of overdue treatment to the patients. Several research works have been done in developing automatic system for cervix cancer identification. Their main goals are to make the identification process to be more simple and faster.

Eric Martin [2] has made a classification of a Pap smear cell into seven classes. Three classes are grouped into normal cells: Normal Superficial, Normal Intermediate, and Normal Columnar. The other four classes are grouped into abnormal cells: Mild Dysplasia, Moderate Dysplasia, Severe Dysplasia, and Carcinoma In Situ. This paper presents a new approach using association rules (AR) that can be used to classify a Pap smear cell image based on the stadium of cervix cancer. A new matching scoring formula based on AR has been proposed on this paper.

This work has used qualitative features in composing association rules (AR) for each class of object. These association rules will then be used as a basis of classification model. Basically, the qualitative features were extracted from the related quantitative features. The intervals of the qualitative features are determined based on the Fuzzy C-Means (FCM) clustering process. This study has selected only five optimal features from the twenty features of Pap smear cell image used by Jantzen [1]. In order to obtain the optimal five features, the Sequential Floating Forward Selection (SFFS) procedure proposed by Pudil et al. [3] was used. The five selected features are: (1) Nucleus brightness, (2) Nucleus Longest Diameter, (3) Nucleus Perimeter, (4) Nucleus Position and, (5) Cytoplasma Maxima. The value of each quantitative feature is transformed into one of three qualitative features, so that in total there will be fifteen (5 x 3) possible values of qualitative features.

Methodology
The classification model construction can be divided into two major steps: (i) create and compute the Association Rules (AR) and the Probabilities (P) of each object as a basis for classification; and (ii) apply the AR to the classification model. These two steps are shown in Fig. 1. Fig. 2 illustrates the detail process of generating AR and computing P, and Fig. 3 shows the detail process in the main model of classification.

Association rules capture information about items that are frequently associated with each other. The objective of mining a set of images for association rules is to identify the rules that satisfy the user’s specified constraint. In the association rule mining process, the user needs to specify the two constraints for the rules: the minimum support and the minimum confidence. The rules with high support and confidence identified among features describe frequently occurring class.

The use of association rules in the classification process needs a measure of similarity. This paper has proposed a new scoring formula for the classification process, since the parameter for relevance feedback used by HaoranYi et al. [4] seems not working well in this study.
The proposed scoring computation is shown in Fig. 4. Kt is the qualitative feature vector of the observed testing image (i-th class and j-th association rule of class i). If an association rule is matched to the observed feature vector then the score is increased. The term “matched” means that the union of antecedent item set and consequent item set is a subset of the observed feature vector. On the other hand, if the probability of the item set is equal to the item set of the observed feature vector then the score is increased.

The weighting factor for matching condition based on the association rules is $n^{|AR_i(j).antecedent|}$, where the value of $n$ is to be selected equal to 2. The larger the exponent value of $|AR_i(j).antecedent|$ means that the more similar the item set of antecedent to the observed feature vector. The weighting factor for matching condition based on probability is $n^5$, where the value of $n$ is also to be selected equal to 2. The value 5 is equal to the number of selected quantitative features that are transformed to qualitative features.

**Experimental data**

The experimental data consist of 917 pairs of Pap smear gray level image and its segmented image [1]. The classification accuracy was determined using k-fold cross validation, with $k = 3$. The experimental scenario has used combinations of training and testing image data (B1, B2, and B3) explained in Table 1.

**Experimental results**

The classification accuracy for the 2-class problem are shown in Table 2, and the average classification accuracy can reach 89.14%. On the other hand, the use of the association-rule approach seems to be not too successful for solving the 7-class problem, where the classification accuracy is only 38.45% in average.
Figure 4. The new formula for scoring

\[
\text{Ext}(\text{QualitativeRuleExtractor}(\text{root})))
\]

For each \(R_r \in \text{Ext}(\text{QualitativeRuleExtractor}(\text{root}))) \) if \( (R_r \cup \text{arbitrary} \cup R_r \cup \text{arbitrary}) \subseteq \text{Ext} \)

\[
\text{Score}(\{\text{Score}(R_r) \forall R_r \in \text{Ext}(\text{QualitativeRuleExtractor}(\text{root}))) \} \cdot \text{Prediction} \cdot \text{Accuracy} \cdot \text{Recall})
\]

End

End

For each \(P \subseteq \text{Ext}(\text{QualitativeRuleExtractor}(\text{root}))) \)

\[
\text{Score}(\{\text{Score}(P) \forall P \subseteq \text{Ext}(\text{QualitativeRuleExtractor}(\text{root}))) \}) \cdot (1 + \text{Prediction} \cdot \text{Accuracy})
\]

End

End

Table 1. Training and testing data for each experimental scenario.

<table>
<thead>
<tr>
<th>Combination</th>
<th>Train Data</th>
<th>Test Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>B1 dan B2</td>
<td>B3</td>
</tr>
<tr>
<td>C2</td>
<td>B1 dan B3</td>
<td>B2</td>
</tr>
<tr>
<td>C3</td>
<td>B2 dan B3</td>
<td>B1</td>
</tr>
</tbody>
</table>

Table 2. Classification Accuracy for 2-Class Problem.

<table>
<thead>
<tr>
<th>No</th>
<th>Combination</th>
<th>Accuracy (%)</th>
<th>No</th>
<th>Class Name</th>
<th>Accuracy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1</td>
<td>90.12</td>
<td>1</td>
<td>Normal Superficial</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Average 100.0</td>
</tr>
<tr>
<td>2</td>
<td>C2</td>
<td>87.77</td>
<td>2</td>
<td>Normal Intermediate</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>98.55</td>
</tr>
<tr>
<td>3</td>
<td>C3</td>
<td>89.54</td>
<td>3</td>
<td>Normal Columnar</td>
<td>45.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42.42</td>
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<td>66.67</td>
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<td></td>
<td></td>
<td>51.51</td>
</tr>
<tr>
<td>4</td>
<td>C4</td>
<td>89.14</td>
<td>4</td>
<td>Light Dysplasia</td>
<td>100.0</td>
</tr>
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<td></td>
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<td></td>
<td>0</td>
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<td>93.44</td>
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<td></td>
<td></td>
<td>97.81</td>
</tr>
<tr>
<td>5</td>
<td>Medium Dysplasia</td>
<td>95.92</td>
<td>5</td>
<td></td>
<td>95.92</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>97.96</td>
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<td>95.92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>96.60</td>
</tr>
<tr>
<td>6</td>
<td>Severe Dysplasia</td>
<td>95.45</td>
<td>6</td>
<td></td>
<td>86.36</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>72.73</td>
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<td></td>
<td></td>
<td></td>
<td>84.85</td>
</tr>
<tr>
<td>7</td>
<td>Carcinoma In situ</td>
<td>94.00</td>
<td>7</td>
<td></td>
<td>92.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>98.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>94.67</td>
</tr>
</tbody>
</table>

Conclusions
The experimental results show quite promising results, with the average classification accuracies of 89.14% for 2-class problem (normal and abnormal) and 38.17% for 7-class more difficult problem. A refinement of recognition steps is proposed for the future work, based on a hierarchical classifier using more qualitative feature intervals.

Keywords
Association rules, classification, Pap smear.

References
Edge antimagic total labeling on paths and unicycles

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Introduction
In this paper we only deal with simple and connected graphs. Let G = (V, E) be a simple and undirected graph with v vertices and e edges. Let V = V(G) be the set of vertices of G and E = E(G) be the set of edges of G.

Hartsfield and Ringel [5] introduced the concept of an antimagic labeling. For a graph G of size e, it is said to be antimagic if there is a labeling from E(G) into \{1, 2, ..., e\} such that all sums of the labels on the edges incident with each vertex v are distinct. Such a labeling is called an antimagic labeling. Paths, cycles, complete graphs, and wheels are the examples of antimagic graphs. We know that K_2 is not antimagic. In fact, Hartsfield and Ringel conjecture that every connected graph other than K_2 is antimagic.

A (v, e)-graph G is defined to be edge-antimagic if there exists a labeling \( f \) from \( V(G) \cup E(G) \) into \{1, 2, ..., v + e\} which satisfies the condition that \( f(u_1v_1) + f(v_1) + f(u_2v_2) \neq f(u_2) + f(v_2) + f(u_1v_1) \) for any pair of distinct edges \( u_1v_1 \) and \( u_2v_2 \) of G. The term of edge-antimagic labeling was introduced by Kotzig and Rosa [6], but it started to get more attention after Enomoto et al work [3]. Many families of graphs have been proved to have an (a, d)-edge antimagic total labeling. As examples see [2, 10]. For the complete survey, see [4]. Several works still left some open problems and some of them have been collected in [1].

A total labeling of G is a bijection \( f: V(G) \cup E(G) \rightarrow \{1, 2, ..., v + e\} \) and the associated weight \( w_f(xy) \) of an edge \( xy \) in G is \( w_f(xy) = f(x) + f(y) + f(xy) \). All labelings considered in this paper are total labelings, and so from now on by a labeling we always mean a total labeling. The labeling \( f \) of G is edge magic if every edge has the same weight. \( f \) is called a super edge labeling if \( f(V) = \{1, 2, ..., v\} \). Sedlacek [9] introduced magic labeling of graphs in 1963, and since then there have been many results in magic labeling, especially in edge magic labeling. For the details see [4].

A bijection \( f: V(G) \cup E(G) \rightarrow \{1, 2, ..., v + e\} \) is called an (a, d)-edge antimagic total ((a, d)-EAT) labeling of G if the set of edge-weights of all edges in G is \{a, a + d, a + 2d, ..., a + (v - 1)d\}, where \( a > 0 \) and \( d \geq 0 \) are two fixed nonnegative integers. If \( d = 0 \) then we call \( f \) a edge-magic total labeling (EMT). An (a, d)-edge-antimagic total labeling \( f \) is called a super (a, d)-edge-antimagic total super (a, d)-EAT) labeling if \( f(V) = \{1, 2, ..., v\} \) and \( f(E) = \{v + 1, v + 2, ..., v + e\} \). Note that if we restrict the domain of \( f \) to \( V(G) \) then we have \((a', d')\)-edge antimagic vertex labeling ((a', d')-EAV labeling).

In this paper we construct an (a, d)-edge antimagic total labelings on paths and unicyclic graphs.

Let \( f: V(G) \cup E(G) \rightarrow \{1, 2, ..., v + e\} \) be an (a, d)-edge-antimagic total labeling of G and \( W = \{wt_f(uv) : wt_f(uv) = f(u) + f(v) + f(uv), uv \in E(G)\} = \{a, a + d, ..., a + (e-1)d\} \)
is the set of edge-weights. Then the minimum possible edge-weight in super \((a, d)\)-edge-antimagic total labeling is at least \(v + 4\). Consequently \(a \geq 6\). On the other hand, the maximum possible edge-weight is at most \(3v + 3e - 3\). Then \(d \leq \frac{3v + 3e - 9}{e - 1}\).

Ba’ca et al. had survey on edge antimagic labeling in [1]. In their survey, they proposed some open problems, one of them is in path \(P_n\), as follows:

- Find \((a, 5)\)-EAT labelings for paths \(P_n\), for the feasible values of \(a\).

Let \(P_n\) be a path with \(n\) vertices, then according to the inequality (1), the following observation is hold.

**Observation 1**
If paths \(P_n\) has an \((a, d)\)-EAT labeling. Then \(d \leq 6\).

Wallis et al proved that all path is an edge magic.

**Theorem 1**
Every odd path \(P_{2k+1}, k \geq 1\), has \((4k + 4, 1)\)-EAT, \((6k + 5, 3)\)-EAT, \((4k + 4, 2)\)-EAT and \((4k + 5, 2)\)-EAT labelings.

In the following theorem, we want to complete the results that we mentioned above.

**Theorem 2**
Every path \(P_n\) has \((n + 4, 4)\)-EAT and \((6, 6)\)-EAT labelings.

**Theorem 3** [2]
If \(G\) has an \((a, d)\)-EAV labeling then

(i) \(G\) has a \((a + n + 1, d + 1)\)-EAT labeling

(ii) \(G\) has a \((a + n + e, d - 1)\)-EAT labeling

**Observation 2**
If \(G\) has a SEMT labeling then \(G\) has an \((a, 1)\)-EAV labeling.

**Observation 3**
If an \(n\)-crown graph \(G = \bigcirc_{m} K_n\) has an \((a, d)\)-EAT labeling then \(d \leq 5\)

Figueroa-Centeno et al.[8] proved that the \(n\)-crown graph has a super edge magic total labeling.

**Theorem 4** [8]
For every two integers \(m \geq 3\) and \(n \geq 1\), the \(n\)-crown \(G = \bigcirc_{m} K_n\) is super magic.

Using the Theorems and Observations above, we can conclude the following result.

**Theorem 5**
Every \(n\)-crown graphs \(G = \bigcirc_{m} K_n, m > 3, n \geq 1\) have an \((a, d)\)-EAT labeling for \(d \in \{2, 4\}\)

**Theorem 6**
If \(n = 1 \ mod \ 4, m\) and \(d\) are odds, there is no \((a, d)\)-EAT labeling for \(G = \bigcirc_{m} K_n\).

In the purpose to solve open problems of \((a, d)\)-EAT labeling of path, we only can find an \((a, 5)\)-EAT labeling for path \(P_n, n \leq 9\). Thus the problem in [1] is still open for \(d = 5\). We list here two problems for further investigation.

**Conjecture 1**
Path \(P_n, n \geq 3\) has an \((a, 5)\)-EAT labelings.

**Open Problems**
Find if there is an \((a, d)\)-EAT labeling, \(d \in \{1, 3, 5\}\), for \(n\)-crown graphs \(G = \bigcirc_{m} K_n, n \neq 1\) mod 4

Note that we found an \((a, 1)\)-EAT labeling for \(G = \bigcirc_{m} K_n\) for small size of \(m\), where \(m\) is even.

**Keywords**
Corona, cycle, edge antimagic total labeling, path.
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Efficient probabilistic reanalysis for assessing imprecise reliability

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Introduction

Large manufacturers spend up to tens of million dollars annually in warranty costs or in fixing unreliable products in the last stages of a product development (Opp et al, 2005). For example, typically, a company’s warranty cost ranges from 2% up to 15% of net sales (McGuire, 1980). Moreover many product manufacturers lose significant market share because they launch unreliable products. Therefore, it is important that product manufacturers are able to predict the reliability of a product as it evolves during the development process and to design the product so that it meets a required reliability target.

Probabilistic approaches are more suitable for making design decisions under uncertainty because they consider all possible realizations of the uncertain variables and their likelihood using probability theory. These approaches enable manufacturers to design reliability into a product, thereby reducing warranty costs and avoiding loss of life. They also enable designers to perform reliability-cost trade offs and to identify the most important uncertainties that affect reliability. Finally, if designers know the reliability of a product as a function of its lifetime, they can recommend to their customers when to retire a product at its zero life.

This study presents a new efficient Monte Carlo simulation approach to calculate the global minimum and maximum probabilities of failure of a system that circumvents the high cost of Monte Carlo simulation and at the same time retains its accuracy and robustness. The idea is based on what we call efficient probabilistic reanalysis. The study considers problems where there is only epistemic uncertainty in the probability distributions of the random variables and the uncertainty is in the parameters of the distributions only. Other sources of uncertainty (e.g. uncertainties in deterministic models used for checking if a design fails for a given value of the random variables) are negligible.

Proposed approach: Efficient reliability reanalysis

The key idea of the efficient reliability reanalysis method is; if the probability of failure is estimated a particular PDF \( f_X(x, \theta) \), then the probability of failure of the same system can be calculated very efficiently for another PDF, \( f'_X(x, \theta) \). Indeed, if one saves the values of the failure indicator function \( I(x_i) \) for the generated sample values, \( x_i \), then one can reuse these values in the following equation to estimate the probability of failure \( PF' \) for \( f'_X(x, \theta) \):

\[
PF' \approx \frac{1}{n} \sum_{i=1}^{n} I(x_i) \frac{f'_X(x_i, \theta)}{g_X(x_i, \theta)}
\]  

The proposed approach, the efficient reliability reanalysis, computes the probability of failure \( PF(\theta) \) for different values of parameters \( \theta \) for approximately the cost of one reliability analysis. The efficient reliability reanalysis can also be used to reduce the computational cost of reliability-based design optimization when design variables are the parameters of the probability distributions of the random variables (an example is a problem where design
variables are the mean values of the thicknesses of the plates of a car body and the thicknesses are random). The same idea can also be used to perform sensitivity analysis of the probability of failure with respect to the probability distributions of the random variables. However, in this study, efficient reliability reanalysis will only be employed to determine efficiently lower and upper bounds of the probability of failure when the parameters of the distributions of the random variables are uncertain and their lower and upper bounds are known.

\[ y(\beta_1, \beta_2, R, \zeta) = \frac{1}{\sqrt{1 - (1/\beta_2)^2}} \left( \frac{1}{(1 - R/(1/\beta_1))^2} - (1/\beta_1)^2 \right) \]

\[ -\frac{1}{\beta_2} + \frac{1}{\beta_2} \left( \frac{1}{(1/\beta_1)^2} - (1/\beta_1)^2 \right) \]

where \( \beta_1 \) is the ratio of the original system natural frequency to the excitation frequency, \( \beta_2 \) is the ratio of the absorber natural frequency to the excitation frequency, \( R \) the mass ratio of the absorber to the original system, and \( \zeta \) the damping ratio of the original system. The system fails when the normalized amplitude \( y \) exceeds a certain maximum allowable value. It is difficult to design a system whose vibration amplitude is less than a maximum allowable level because there is variability in the frequency ratios \( \beta_1 \) and \( \beta_2 \), and the vibration amplitude is sensitive to the values of these frequency ratios.

**Results and discussion**

Table I shows \( PF_{\text{min}} \) and \( PF_{\text{max}} \) with their correspondence standard deviations (the numbers in the parentheses). The large gap between the minimum and maximum failure probabilities shows that epistemic uncertainty in the values of the distribution parameters is significant in this example. The tables show that the proposed PRA method is on average equally accurate as the MC method. However, the standard deviation of the estimates of the PRA method are considerably larger than those of MC.

<table>
<thead>
<tr>
<th>N</th>
<th>m</th>
<th>( PF_{\text{min}} ) (( \sigma_{PF_{\text{min}}} ))</th>
<th>( PF_{\text{max}} ) (( \sigma_{PF_{\text{max}}} ))</th>
<th>( PF_{\text{ave}} ) (( \sigma_{PF_{\text{ave}}} ))</th>
<th>( PF_{\text{ave}} ) (( \sigma_{PF_{\text{ave}}} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>25</td>
<td>0.003069 (0.000209)</td>
<td>0.27554 (0.01437)</td>
<td>0.032 (0.00176)</td>
<td>0.2763 (0.00447)</td>
</tr>
<tr>
<td>1000</td>
<td>25</td>
<td>0.02333 (0.00159)</td>
<td>0.30982 (0.01899)</td>
<td>0.0251 (0.00156)</td>
<td>0.3106 (0.00483)</td>
</tr>
<tr>
<td>120</td>
<td>25</td>
<td>0.03069 (0.00209)</td>
<td>0.33076 (0.01703)</td>
<td>0.032 (0.00176)</td>
<td>0.3274 (0.00548)</td>
</tr>
<tr>
<td>1000</td>
<td>25</td>
<td>0.02333 (0.00159)</td>
<td>0.32771 (0.02001)</td>
<td>0.0239 (0.00159)</td>
<td>0.3294 (0.00471)</td>
</tr>
</tbody>
</table>

As an additional check, we compare the values of the distribution parameters that maximize the probability of failure with the reference values found using numerical integration. The values for which the failure probability is maximum are \( \mu_1 = 1.033, \sigma_1 = 0.052 \) and \( \mu_2 = 1.098, \sigma_2 = 0.055 \) using both the proposed probabilistic
reanalysis and the Monte Carlo method. These are close to the reference values of the distribution parameters that maximize the probability of failure, which are $\mu_1 = 1.032, \sigma_1 = 0.05$ and $\mu_2 = 1.1, \sigma_2 = 0.05$.

Table II shows that the CPU time required by the PRA approach for calculation of $PF_{\text{min}}$ and $PF_{\text{max}}$ is about two orders of magnitude smaller than that of MC simulation. The proposed method is on average fifty six times more efficient than MC method. Note that in practical problems, where calculation of the limit state function is very expensive, the CPU time of the proposed approach will be several orders of magnitude smaller than that of a MC method.

Table 2. CPU Time for Simulation with $n = 10,000$

<table>
<thead>
<tr>
<th>$N$</th>
<th>$m$</th>
<th>PRA</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>25</td>
<td>2.703</td>
<td>151.047</td>
</tr>
<tr>
<td>120</td>
<td>25</td>
<td>8.609</td>
<td>503.594</td>
</tr>
<tr>
<td>36</td>
<td>1000</td>
<td>100.766</td>
<td>6061.500</td>
</tr>
<tr>
<td>120</td>
<td>1000</td>
<td>341.969</td>
<td>20198.47</td>
</tr>
</tbody>
</table>

In summary, the following observations are made based on the simulation results of this example:

1. The proposed approach for estimating the minimum and maximum failure probabilities is accurate and yields comparable results as a standard Monte-Carlo simulation approach.
2. At the same time the proposed approach required about one fiftieth of the CPU time of a standard Monte-Carlo simulation approach. Note that for practical problems, where the calculation of the limit state function is very expensive, the cost of the proposed method should be orders of magnitude smaller than that of a MC method.

Keywords
Dynamic system, efficient reanalysis, imprecise reliability, Monte Carlo.

References
Flame height of the propane flame lift-up

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Introduction

There are many researches on flame height or flame length of diffusion flame. However, researches on flame height for premix flame seem rather limited. Among them Rokke was the one who proposed the determination of premix flame height as a correlation of Froude number. The need for length of flame is depend on the application of the combustion process. Short flame lengths are preferred on rockets. Therefore a tiny injector nozzle was used. On the contrary, long flame lengths are preferred for industrial furnaces for uniformity of heat transfer over the furnace height. For that reason large single nozzles were normally used.

Research on a new phenomenon the so called flame lift-up have been done on the basis of flame stability. Lift-up would be appeared when a ring was placed on top of the exit tube burner using a ring adjuster. Flame lift-up emerged on very lean combustion because AFR for lift-up is higher than AFR stoichiometric. Stoichiometric fuel air ratio of propane or C₃H₈ is 4,02 % by volume than AFR is about 25. AFR for lift-up is about 30.

Consideration to implement this phenomenon on the design of burner should also accommodate flame height. In this paper the investigation of flame height of this phenomenon will be done. As a ground work study variation of AFR, that was resulted from the variation of air flow rate would be investigated to the effect on flame height. Furthermore the influenced of ring position and inside diameter of ring to the flame height would also be studied. The flame height of flame lift-up that was ‘sit’ on the ring was measured based on the image that captured by a camera. Measurements were taken from the base of flame on the ring to the flame tip. The effects of AFR, burning load, position and inside diameter of ring have plotted on graphics.

Methods

The apparatus for this study was similar to other research on propane flame lift-up. This experiment was done on 14 mm inside diameter of barrel, and 3 different rings. The outside diameter of ring was 30 mm and the inside diameter was 7 mm, 10 mm and 14 mm. Ring was placed concentrically above the ring using a ring adjuster. Each ring was investigated on 4 positions, which are 10 mm, 20 mm 30 mm and 40 mm above the ring. For each ring position, fuel flow rate was varied 5 ranges and for each fuel flow rate, air flow rate was controlled until lift-up phenomenon happened. Flame height was capture in the same time.

Result and discussions

The correlation of flame height of lift-up and AFR for ring with inside diameter of 7 mm on 4 ring positions is presented on a graphics. Generally, flame height decreased when the AFR was greater. Take note that it correspond to Rokke correlation that fuel fraction is proportional to flame height. Among the four positions of ring it seems that on 10 mm and 20 mm above the barrel, flame height was rather difficult to be distinguished. However on ring
position of 30 mm and relatively high fuel flow rate, flame height is the highest as it is shown on Figure 1. Flame height without ring near blow off seems higher among other flame height on different position of ring but not on position of 30 mm just as on Figure 2.

![Figure 1. Flame height on 10 mm inside diameter of ring](image1)

![Figure 2. Flame height vs Burning Load on 10 mm inside diameter of ring](image2)

**Conclusions**

This paper has presented a partial result of flame lift-up phenomenon in term of flame height. The correlation has not been elaborated and the result was merely fact finding on the laboratory only. Development of geometric ring and kinetic reaction of fuel related to flame lift-up phenomenon was also a motivating subject for basic research on combustion.

**Keywords**

AFR, Bunsen, flame height, Flame lift-up, premixed combustion.

**Acknowledgements**

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Framework of regression-based graph matrix analysis approach in multi-relational social network problem

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Introduction

One of the first works on SNA can be found in the classic paper of Milgram (1967). It estimates that every person in the world is only six edges away from every other. It sets the stage for investigations into social networks and algorithmic aspects of social networks. Many recent efforts try to leverage social networks for diverse purposes, such as expertise location as in Kautz et al. (1996, 1997), mining the network value of customers as in Domingos and Richardson (2001) and discovering shared interests as in Schwartz and Wood (1993). Previous work in sociology and statistics has suffered from the lack of data and focused on very small networks, typically in the tens of individuals Wasserman and Faust (1994). With the web growing, much potential social network data are available and a lot of research efforts have been put on dealing with such data. Schwartz and Wood mined social relationships from email logs as in Zhou et al. (2002). The ReferralWeb project is proposed in Kautz et al. (1997) to mine a social network from a wide variety of web data and use it to help individuals find experts who could answer their questions. Adamic and Adar (2002) tried to discover the social interactions between people from the information on their homepages. Agrawal et al. (2003) analyzed the social behavior of the people on the newsgroups. Moreover, the web itself can be actually viewed as a large social network. The well-known link analysis algorithms, such as Google’s PageRank in Page et al. (1998) and Kleinberg’s HITS algorithm in Kleinberg (1999), can be seen as social network analysis on the web.

In principle, a community can be simply defined as a group of objects sharing some common properties. Community mining has many similar properties to the graph-cut problem. Kumar et al. (1999) used the bipartite graph concept to find the core of the community and then expanded the core to get the desired community. Flake et al. (2000) applied the maximum-flow and minimum cut framework on the community mining.

Methodology

A regression-based algorithm: The basic idea of our algorithm is trying to find a combined relation which makes the relationship between the intra-community examples as tight as possible and at the same time the relationship between the inter-community examples as loose as possible.

Result and discussion

For each relation, we can normalize it to make the biggest strength (weight on the edge) be 1. Thus we construct the target relation between the labeled objects as follows:

\[ M_{ij} = \begin{cases} 1, & \text{example i and example j have the same label} \\ 0, & \text{otherwise} \end{cases} \]
where, $\tilde{M}$ is a $m \times m$ matrix and $\tilde{M}_{ij}$ indicates the relationship between examples $i$ and $j$. Once the target relation matrix is built, we aim at finding a linear combination of the existing relations to optimally approximate the target relation in the sense of $L_2$ norm. Sometimes, a user is uncertain if two objects belong to the same community and can only provide the possibility that two objects belong to the same community. In such case, we can define $\tilde{M}$ as follows:

$$\tilde{M}_{ij} = \text{Prob} \left( X_i \text{ and } X_j \text{ belong to the same community} \right)$$

Let $a = [a_1, a_2, ..., a_n]^T \in \mathbb{R}^n$ denote the combination coefficients for different relations. The approximation problem can be characterized by solving the following optimization problem:

$$a^{opt} = \arg \min_a \left\| \tilde{M} - \sum_{i=1}^{n} a_i M_i \right\|_2^2$$

(1)

This can be written as a vector form. Since the matrix $M_{m \times m}$ is symmetric, we can use a $m(m-1)/2$ dimensional vector $v$ to represent it. The problem (1) is equivalent to:

$$a^{opt} = \arg \min_a \left\| \tilde{V} - \sum_{i=1}^{n} a_i V_i \right\|_2^2$$

(2)

Equation 2 is actually a linear regression problem as in Hastie (2001). From this point of view, the relation extraction problem is interpreted as a prediction problem. Once the combination coefficients are computed, the hidden relation strength between any object pair can be predicted.

In real applications, the user does not need to specify the relationships between any pair of objects. That is, the vector $v$ need not to be $m(m-1)/2$ dimensional. We assume that $v$ is a $k$-dimensional vector in the following.

Let us first consider the simplest case that:

$$\sum_{i=1}^{n} a_i v_i = \tilde{v}$$

(3)

We define:

$$V = [v_1, v_2, ..., v_n]$$

(4)

Thus, Eq. 3 can be rewritten as follows: $Va = \tilde{v}$

Suppose the rank of $V$ is $\min(k, n)$. We have the following facts:
- When $k < n$, the set of solutions to Eq. 4 forms a $(n-k)$ dimensional vector subspace
- When $k = n$, there is a unique solution to Eq. 4
- When $k > n$, there is no solution to Eq. 4

**Conclusion**

There are a lot of issues that need to be studied further. First, our approach adopts a regression-based graph matrix analysis approach. There are potentially many other approaches that can be explored and compared with this approach. We will expect that future studies may propose even more powerful approaches in relation extraction than what is proposed here.

Second, our relation extraction algorithm has made a lot of simplifications in the analysis. In general, links within the same network and among different networks may carry different weights. For example, one can imagine that the links among co-author networks should be inherently stronger than those among co-proceedings since average size (# of links) in the co-author group is much smaller than that in the co-proceedings group. This is not considered in our simple model. Thus we expect the prediction power will be substantially enhanced if such information is incorporated in the new algorithm.

Third, our query model considers only one simple group of nodes (such as researchers). A more powerful query model may involve and, or, not operators on those groups. For example,
one may like to find those who co-attend the same conference but never co-authored a paper using the not operator. This will be useful for finding referees for conference submissions. These issues may form an exciting frontier for future research.

**Keywords**
Community mining, hidden community information, social network analysis.

**References**
Friction factor analysis of acrylic square duct

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Introduction

One of the characteristics of internal flow in ducts is influenced by the shape of its geometry. In close non-circular cross section duct losses for laminar as well as turbulent flow isn’t only dependent by the roughness of ducts surface but also influenced by the flow characteristics. Flow in close non-circular duct with ratio aspect one or above, are frequently used in atomic reactors, gas-turbine regenerators, and heat exchangers (Hartnett, J.P., et al., 1962). Some studies have carried out by some researchers in the field of fluid mechanics to investigate flow characteristics in several shapes of duct geometry. Several results indicated that the flow friction factor in a certain Reynolds number in a square duct is lower than in circular duct. Therefore, implementation of square duct in closed flow in fluid mechanics field has potential to reduce energy loss due to wall skin friction in the flow and can help to save the flow energy. In the square duct the interaction between the walls and the flow varies with position. The result is non-uniform wall shear stresses. Since the static pressure change along a duct is the same for all of the flow, a mechanism must be present which compensates for the varying wall shear stresses. The mechanism takes the form of secondary flows which move fluid from low to high shear stress regions, evening out the shear stress distribution and causing an exchange between static and velocity pressure as flow is displaced between high and low velocity regions (Miller, 1990).

Darcy-Weisbach formula is valid for steady state, incompressible, fully developed and turbulent flow both circular and square pipe. The purpose of this study is to carry out the friction coefficient ($\lambda$) of close flow in an acrylic square duct 20 x 20 mm for $4.0 \times 10^3 < Re < 2.5 \times 10^4$.

Basic theory

To obtain the friction coefficient ($\lambda$), Darcy-Weisbach formula is valid for steady state, incompressible, fully developed and turbulent flow both in circular and square duct (Hartnett, J.P., et al., 1962)

$$\lambda = \frac{\Delta p (D_h/L)}{\rho u^2/2}$$

$$D_h = \frac{4A}{P}$$

$p$, $D_h$, $L$, $\rho$, $u$, $A$ and $P$ are pressure (N/m$^2$), hydraulics diameter (m), length of duct in the test section (m), density (kg/m$^3$), velocity (m/s), duct cross section area (m$^2$) and duct wet peripheral (m) respectively.

Friction coefficient ($\lambda$) also could also be obtained by The Colebrook-White explicit formula (Munson, 2005),

$$\lambda = \frac{0.25}{\log \left( \frac{e}{3.7D_h} + \frac{5.74}{Re^{0.8}} \right)^{-1}}$$
\( \varepsilon \) is surface roughness, and formula valid for \( 10^{-6} \leq \frac{\varepsilon}{D_h} \leq 10^{-2} \) and \( 5 \times 10^3 \leq \text{Re} \leq 10^8 \)

**Experimental method**

In order to investigate friction coefficient (\( \lambda \)) of an acrylic square duct 20 x 20 mm, experiments were carried out to measure the pressure loss in that duct. Fig. 1 shows the experimental apparatus. Two pressure gauges were attached on both of the two test section edge. The first pressure tap was located 1300 mm from the edge of right side of duct near the elbow in the upstream side in order to assure that the flow has already in fully developed condition before enters the test section (entrance length). The equation of the entrance length \( (l_e) \) according Munson, 2005, is:

\[
\frac{l_e}{D_h} = 4.4 \text{Re}^{1/6}
\]

In this experiment the range of Reynolds numbers was \( 4.0 \times 10^3 < \text{Re} < 2.5 \times 10^4 \). The fluid that was used for this experiment was tap water in ambient temperature. The length of two pressure taps was 600 mm so the value of pressure loss is large enough to be read. In order to control variation of flow capacity for obtaining the Reynolds numbers range valve was installed in the pipe between reservoir and flow meter. The flow meter was used for measuring the water flow capacity for obtaining the velocity of flow. By using Darcy-Weisbach formula it will obtain the friction coefficient (\( \lambda \)).

**Result and discussion**

Experimental result shows in Fig. 2, indicate that for \( \text{Re} < 1.1 \times 10^4 \) the friction factor of square duct of ratio aspect 1 is lower compared by circular pipe, but for \( \text{Re} > 1.1 \times 10^4 \) the friction factor of square duct is higher than the circular pipe. The lower friction factor developed in the range of Reynolds numbers \( 4.0 \times 10^3 < \text{Re} < 1.1 \times 10^4 \) shows that the drag reduction is not in the turbulent flow region but in the transition of laminar to turbulent region flow. It is inferred that drag reduction due to the delaying of transition flow from laminar to turbulent flow is caused by the development of secondary flow in a duct.
Conclusion

The friction factor ($\lambda$) obtained from experimental result of close flow square duct of ratio aspect 1 for $4 \times 10^3 < \text{Re} < 2.5 \times 10^4$ lower 1.3% than circular pipe. The phenomenon in the square duct of ratio aspect 1 is inferred due to the delaying of transition flow from laminar to turbulent flow that are caused by the development of secondary flow in a duct.

Keywords
Friction factor, secondary flow, square duct.

References
Gerasimov-Drell-Hearn sum rule and the discrepancy between the new CLAS and SAPHIR data

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Introduction

The new experimental data of kaon photoproduction \( \gamma + p \rightarrow K^+ + \Lambda \) provided recently by the SAPHIR, Glander et al. (2004), and CLAS, Bradford et al. (2006), collaborations lead to not only a new opportunity to study the dynamics of kaon and hyperon interactions in great detail, but also to a puzzling point: Why do there exist discrepancies between the two data sets in the \( \gamma + p \rightarrow K^+ + \Lambda \) channel, whereas in the \( \gamma + p \rightarrow K^+ + \Sigma^0 \) channel the extracted data from the two collaborations agree quite well? There have been considerable efforts devoted to analyze the consequence of the data discrepancies in the \( \gamma + p \rightarrow K^+ + \Lambda \) process. It is shown by Mart and Sulaksono (2006) that the use of SAPHIR and CLAS data, individually or simultaneously, leads to quite different extracted photo-coupling parameters. Therefore, it is concluded that the current data situation does not allow for a precise determination of the resonance parameters or for the search of the “missing resonances”. By studying the statistical properties of the two data sets Bydzovsky and Mart (2007) showed that the CLAS data are in good agreement with the LEPS data [7], whereas the SAPHIR data are coherently shifted down with respect to both CLAS and LEPS data, especially at forward kaon angles. The relative global-scaling factor between the SAPHIR and CLAS data has been found to be 1.13. Although results of the recent works could reveal certain consequences of using SAPHIR or CLAS data in the database, it is still difficult to determine which data set should be used to obtain a reliable phenomenological model as well as to extract the correct resonance parameters. In view of this, it is important to consider other quantities which can be predicted by the models and can be directly compared with the results from other measurements or model predictions. One of the possible quantities is the contribution of the \( \gamma + p \rightarrow K^+ + \Lambda \) channel to the Gerasimov-Drell-Hearn (GDH) sum rule, Gerasimov (1966), Drell and Hearn (1966).

The Gerasimov-Drell-Hearn sum rule

The sum rule relates the anomalous magnetic moment of the nucleon \( \mu_N \) to the difference of its polarized total photoabsorption cross sections,

\[
\kappa^2_N = \frac{m_N^2}{4\pi^2\alpha} \int_{E_{\gamma}^{thr}}^{\infty} \frac{dE_{\gamma}}{E_{\gamma}} \left[ \sigma_{3/2}(E_{\gamma}) - \sigma_{1/2}(E_{\gamma}) \right]
\]

where \( \sigma_{3/2}(E_{\gamma}) \) and \( \sigma_{1/2}(E_{\gamma}) \) indicate the cross sections for the possible combinations of spins of the proton (1/2) and the photon (1), \( E_{\gamma}^{thr} \) the photoproduction threshold lab energy, \( \alpha = e^2/4\pi = 1/137 \) the fine-structure constant, and \( m_N \) the nucleon mass. For the sake of comparison, however, it is more convenient to define the GDH integral as
With this definition, the GDH sum rule on the proton yields
\[ I_{GDH}^p = -\frac{2\pi^2\alpha\kappa_p^2}{m_p^2} = -204.5 \ \mu \text{b} \]

Besides that we can also calculate the corresponding contribution the forward spin polarizability of the proton,
\[ \gamma_0 = \frac{1}{4\pi^2} \int \frac{dE_Y}{E_Y} \left[ \sigma_{1/2}(E_Y) - \sigma_{3/2}(E_Y) \right] \]

It is interesting that the precise value of this observable is currently less known, since there is no sign that calculations from chiral perturbation theory (ChPT) would converge in this case. For instance, the isobar model predicts \( \gamma_0 = -0.65 \) (in \( 10^{-4} \text{ fm}^4 \)), whereas the analysis from ChPT to order of \( p^3 \) obtains a value of 4.6 and an extension to order of \( p^4 \) yields \( -3.9 \). The latest value obtained from the photoabsorption experiment is \( -0.94 \times 10^{-4} \text{ fm}^4 \).

**Results**

Results of our analysis are summarized in Table 1, where Fit 1 and Fit 2 display the results of using the SAPHIR and CLAS data, respectively, whereas Fit 1a and Fit 2a demonstrate the results after inclusion of the LEPS data. It is clear from this result that the MAID model prefers the use of SAPHIR data rather than the CLAS data. We have also investigated the effects of including the new \( C_x \) and \( C_z \) data that are recently published by the CLAS collaboration and we found that the present finding does not change with this inclusion.

Table 1. Contributions of the \( \gamma + p \to K^+ + \Lambda \) channel to the GDH sum rule for the proton and to the forward spin polarizability obtained in this work compared with the corresponding values of MAID. Also shown the number of data used \( N \) and the \( \chi^2/N \).

<table>
<thead>
<tr>
<th>Observable</th>
<th>MAID</th>
<th>Fit 1</th>
<th>Fit 1a</th>
<th>Fit 2</th>
<th>Fit 2a</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{GDH} ) (( \mu \text{b} ))</td>
<td>1.247</td>
<td>1.309</td>
<td>1.274</td>
<td>-0.845</td>
<td>-0.333</td>
</tr>
<tr>
<td>( \gamma_0 ) (( 10^{-7} \text{ fm}^4 ))</td>
<td>0.939</td>
<td>0.807</td>
<td>0.753</td>
<td>-0.208</td>
<td>0.060</td>
</tr>
<tr>
<td>( N )</td>
<td>319</td>
<td>720</td>
<td>834</td>
<td>1377</td>
<td>1694</td>
</tr>
<tr>
<td>( \chi^2/N )</td>
<td>3.36</td>
<td>0.78</td>
<td>1.02</td>
<td>0.84</td>
<td>0.98</td>
</tr>
</tbody>
</table>

**Keywords**
Electromagnetic production, kaon, hyperon, Gerasimov-Drell-Hearn sum rule.

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Graphconnect: Framework of discovering closed highly connected pattern from semistructured dataset

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Introduction

In social networks, frequent highly connected subgraph in large relational graphs can help identify groups where people are strongly associated. In computational biology, highly connected subgraph could represent a set of genes within the same functional module, i.e., a set of genes participating in the same biological pathways as in Butte et al. (2000) and Spirin and Mirny (2003). Butte et al. (2000) calculates the pair-wise similarity between gene expressions to construct relevance networks in order to discover functional relationships between genes.

The common problem in the above application scenario is to find not only frequent graphs, but also graphs that satisfy the connectivity constraint. This new problem setting has three major characteristics different from the previous frequent graph mining problem defined in Inokuchi et al. (1998), Kuramochi and Karypis (2001), Borgelt and Berhol (2002), Gaol and Widjaja (2006a), Gaol (2006). First, in relational graphs each node represents a distinct object. No two nodes share the same label. In biological networks, nodes often represent unique objects like genes and enzymes. Secondly, relational graphs may be very large. For example, gene relevance networks often have thousands of nodes and millions of edges. Thirdly, the interesting patterns should not only be frequent but also satisfy the connectivity constraint. Previous studies in Washio and Motoda (2003) and Chekuri et al., usually interpret a frequent graph as an object and ignore its internal properties such as connectivity. In order to handle these new challenges, two issues have to be solved: (1) how to mine frequent graphs efficiently in large relational graphs, and (2) how to handle the connectivity constraint. Since frequent graph mining usually generates too many patterns, as observed in Burdick et al. (2001), Zaki and Gouda (2003), Wang et al. (2003), Gaol and Widjaja (2006b), it is more appealing to mine closed frequent graphs only.

Our major contribution is to tackle the connectivity constraint. We develop graph theoretic approach, GraphConnect (a pattern-growth approach), to efficiently discover closed highly connected graphs while still preserving the completeness of the mining result. We apply graph condensation and decomposition techniques in the design of GraphConnect to improve the performance. GraphConnect can reduce the size of candidate graphs in terms of nodes and edges. GraphConnect are targeted to handle different mining requests.
Methodology

We define union, intersection and difference operators for relational graphs.

**Definition 1** (Union, Intersection, Difference). Given two relational graphs, \( G = (V, E) \) and \( G' = (V, E') \), the union of \( G \) and \( G' \), written \( G \cup G' \), is \((V, E \cup E')\). The intersection of \( G \) and \( G' \), written \( G \cap G' \), is \((V, E \cap E')\).

**Definition 2** (Constraint). A constraint is a function, \( C : \{G\} \to \{0, 1\} \), which maps a graph \( G \) to a Boolean value. A graph \( G \) satisfies constraint \( C \) if \( C(G) = 1 \).

**Definition 3** (Degree). The degree of a vertex \( v \) is the number of edges that connect \( v \), written as \( \deg(v) \). The average degree of a graph \( G \) is the average of degree \( v \) for all \( v \in V(G) \). The minimum degree of a graph \( G \) is the minimum of degree \( v \) for all \( v \in V(G) \), written as \( \sigma(G) \).

**Definition 4** (Edge Connectivity). Given a graph \( G \), an edge cut is a set of edges \( E_c \), such that \( E(G) - E_c \) is disconnected. A minimum cut is the smallest set in all edge cuts. The edge connectivity of \( G \), written \( k(G) \), is the size of a minimum cut.

**Definition 5** (K-decomposition). The K-decomposition of an undirected graph \( G \) is a set of subgraphs \( \{g_i\}, g_i \subseteq G \), s.t. \( k(g_i) \geq K \) and \( g_i \cap g_j = \emptyset \). The maximum K-decomposition is a K-decomposition that maximizes \( \sum |E(g_i)| \).

Discussion and result

We have the following claim and Corollary about edge connectivity, and build GraphConnect Algorithm, incorporating the connectivity constraint. When it extends a frequent graph, GraphConnect attempts to remove the frequent edges that will not be part of highly connected graphs.

**Claim 1** (No Downward Closure Property). Given two graphs \( G \) and \( G' \), \( G \subseteq G' \) and \( k(G) \leq k(G') \) do not imply each other.

**Corollary 1** (Condensation). Let \( G \) be a subgraph of a graph \( G' \), and \( G^* \) be the graph formed from \( G' \) with all vertices in \( G \) condensed into a single vertex. If \( k(G) > k(G') \), then \( k(G^*) = k(G') \).

**Algorithm** \( \text{GraphConnect}(g, D, \text{min} \_\text{sup}, K, C, S) \)

Input: A graph \( g \), a graph dataset \( D \), a minimum support threshold \( \text{min} \_\text{sup} \), connectivity constraint \( K \), the previously discovered frequent graph set \( C \).

Output: The result set \( S \).

1. if \( \exists g' \in C, g \subseteq g' \) and \( \text{support}(g) = \text{support}(g') \) then return;
2. extend \( g \) to \( g' \) as much as possible such that \( \text{support}(g) = \text{support}(g') \);
3. insert \( g' \) to \( C \);
4. \( g^* = g' \);
5. if \( \exists g_o \in S, g' \) is extended from \( g_o \) then condense the vertices of \( g_o \) into a single vertex in \( g^* \);
6. decompose\((g^*, K, S)\);
7. scan \( D \) once, find frequent edge set \( X \), s.t. \( \forall e \in X \) graph \( g' \in \{e\} \) is frequent;
8. for each vertex \( v \in g' \), \( \deg(v) \leq K \) do
9. remove all edges of \( v \) in \( X \);
10. for each frequent graph \( g' \cup \{e\}, e \in X \) do
11. \( \text{GraphConnect}(g' \cup \{e\}, D, \text{min} \_\text{sup}, K, C, S) \);
12. return;

The Algorithm sketches the framework of GraphConnect, which consists of four steps: (Step 1) find the closed graph of a newly discovered graph (Lines 2-3); (Step 2) condense and decompose graphs for highly connected subgraphs (Lines 5-7); (Step 3) remove frequent edges of unpromising vertices (Lines 8-9); and (Step 4) recursively search new graphs (Lines 10-11). We record the intermediate mining results in a set \( C \). Corollary 1 is used to accelerate the computation of edge connectivity in the second step, shown in Line 5.
The conclusion

We introduced a new graph mining problem: finding closed frequent graphs with connectivity constraints in relational graphs. We adopted the concept of edge connectivity and applied graph theoretic results, graph condensation and decomposition, in our algorithm design. We developed GraphConnect, a pattern-growth approach and show any graph will be decomposed at most once in GraphConnect.

Keywords

Closed frequent graphs, closed pattern, connectivity, semistructured data.

References


Graph connectivity in electrical studies

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Introduction
Cluster analysis seeks grouping of elements into subsets based on similarity between pairs of elements. The goal is to find disjoint subsets, called clusters, such that two criteria are satisfied: homogeneity: elements in the same cluster are highly similar to each other, and separation: elements in different clusters have low similarity to each other. The process of generating the subsets is called clustering. The similarity level is usually determined by a set of features of each element. These often originate from noisy experimental measurements, and thus give inaccurate similarity values.

Cluster analysis is a fundamental problem in experimental science, where one wishes to classify observations into groups or categories. It is an old problem with a history going back to Aristotle as in Hansen and Jaumard (1997). It has applications in electrical, biology, medicine, economics, psychology, astrophysics and numerous other fields. The application that motivated this study was wiring in electrical studies.

In this paper we present a novel clustering algorithm. The approach presented here is graph theoretic. The similarity data is used to form a similarity graph in which vertices correspond to elements and edges connect elements with similarity values above some threshold. In that graph, clusters are highly connected subgraphs, defined as subgraphs whose edge connectivity exceeds half the number of vertices.

Methodology
Previous graph theoretic approaches: Due to its wide applicability, cluster analysis has been addressed by numerous authors in various disciplines in the past. The cluster separation and homogeneity goals described above can be interpreted in various ways for optimization. Numerous approaches exist depending on the specific objective function chosen as in Jardine and Sibson (1971), Anderberg (1973), Sneath and Sokal (1973), Hartigan (1975), Sokal (1977), Mirkin (1996) and Hansen and Jumard (1997).

We briefly review the approaches that are most related to our work.

Matula (1969, 1970, 1972, 1977) was the first to observe the usefulness of high connectivity in similarity graphs to cluster analysis. Matula’s approach is based on the cohesiveness function, defined for every vertex and edge of a graph G to be the maximum edge-connectivity of any subgraph containing that element. The components of the subgraph of G, obtained by deleting all elements in G of cohesiveness less than k, are precisely the maximal k-connected subgraphs of G. In Matula (1970) suggested finding clusters by using a constant value k. The drawback in this approach is that different real clusters may have different connectivity values. Later Matula (1972) suggested identifying as clusters maximal k-connected subgraphs (for any k) which do not contain a subcomponent with higher connectivity. This may cause the splitting of some real clusters that contain several highly cohesive parts.

Minimum cuts in capacitated similarity graphs were also used by Wu and Leahy (1993). The number of clusters K is assumed to be known for their algorithm. The K-1 smallest cuts in G
are computed, e.g., using the Gomory-Hu algorithm in Gomory and Hu (1961) and their removal produces a K-partition of the data. The resulting K-partition of G has two desirable properties: (1) it minimizes the largest inter-subgraph mincut among all possible K-partitions of G. (2) the maximum mincut between any pair of vertices in the same subgraph (intra-subgraph mincut) is always greater than or equal to the mincut between vertices in two different subgraphs (inter-subgraph mincut). We also compare the two approaches with ours.

**Results and discussion**

Herewith the improved HCS algorithm

\[ \text{HCS-loop}(G(V, E)) \]

\[
\text{begin} \\
\text{for (i=1 to } p \text{) do} \\
\text{remove clustered vertices from G} \\
H \leftarrow G \\
\text{repeatedly remove all vertices of degree } < d, \text{from } H \\
\text{until } \text{no new cluster is found by the HCS call } \text{do} \\
\text{HCS(H)} \\
\text{perform singletons adoption} \\
\text{remove clustered vertices from } H \\
\text{end until} \\
\text{end for} \\
\text{end}
\]

The algorithm, together with the heuristics, was implemented and tested on both simulated data, with very good results.

We used the following score to evaluate the quality of clustering. A clustering solution for a set of n elements can be represented by an n × n matrix M where \( M_{ij} = 1 \) iff i and j are in the same cluster according to the solution and \( M_{ij} = 0 \) otherwise. If T denotes the matrix of the true solution, then the Minkowski score of M is \( \|T - M\|\|T\| \) as in Sokal (1977) and Jadine and Sibson (1971). Hence, a perfect solution will obtain a score of zero, and the smaller the score the better the solution.

The algorithm was first applied to simulate of wiring synthetic data expression. An extant greedy algorithm used in practice on such data was also applied for comparison. On ten different groups, of datasets, varying in sizes from 60 to 980 elements with 3-13 clusters and high noise rate, HCS achieved an average score below 0.2. In comparison, the greedy algorithm deteriorated from an average score of 0.4 for the smallest problems to 1.4 for the largest. Stability of the solution quality as measured by the variance of the score, was also much smaller in our algorithm. HCS also manifested robustness with respect to higher noise levels.

**Conclusion**

A clustering algorithm based on high connectivity in graphs was presented, and its generated solutions with desirable properties for clustering was demonstrated. The algorithm has low polynomial complexity. It is also efficient in practice: Our initial implementation, after some heuristic improvements, handles well problems with up to thousands of elements in a reasonable computing time, see also Tsai (1998).

Our novel definition of highly connected subgraphs gives a stopping criterion, by defining clusters as subgraphs with connectivity that is above half the number of vertices. It gives clusters with provable good properties and it precludes the need to know in advance the number of clusters as in Wu and Leahy (1993).

The HCS algorithm generates clusters with diameter two. This is a strong indication of homogeneity, as any two vertices are either adjacent or share one or more common neighbors. This property is not satisfied by the solutions in Matula (1972) and Wu and Leahy (1993).

Possible future improvements include finding maximal highly connected subgraphs (e.g. using Matula’s cohesiveness function in Matula (1972)) and finding a weighted minimum cut
in an edge-weighted graph. Further theoretical questions on the properties of the algorithm are also of interest: Can we determine the optimal value of the threshold on the similarity values that is used to form the similarity graph: Can we determine a probabilistic threshold for the level of noise under which good (or perfect) clustering is guaranteed, with high probability. Proving additional (deterministic or probabilistic) properties of HCS clusters is also of interest.

Keywords
Algorithms, clustering, diameter, graph connectivity, minimum cut.

References
Kaon contribution to the Gerasimov-Drell-Hearn sum rule on the proton

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Introduction

Although it has been explored for more than four decades, the internal structure of the nucleon is still an open topic of investigations nowadays. It is believed that this internal structure is responsible for the ground state properties of the nucleon and its resonance spectra at higher energies; two different phenomena which are not all independent but related by a number of sum rules. One of them is the Gerasimov-Drell-Hearn (GDH) sum rule, Gerasimov (1966), Drell and Hearn (1966). Meanwhile, the spin structure of the nucleon has been commonly investigated by scattering polarized lepton beams off polarized targets. The results are then translated in terms of the spin structure functions \( g_1(x, Q^2) \) and \( g_2(x, Q^2) \), where \( x = Q^2 / 2m_N \) the Bjorken scaling variable, \( m_N \) the nucleon mass, \( Q^2 \geq 0 \) the squared momentum transfer, and \( \nu \) the virtual photon laboratory energy. It was then found that the integral of \( g_1 \) is significantly below the prediction of the quark model, which therefore led to the conclusion that less than half of nucleon spin are due to the constituent quarks (spin crisis). Interestingly, the spin structure functions \( g_1 \) and \( g_2 \) can be expressed in terms of the (generalized) GDH integrals, which therefore opens a new connection with the currently intensive studies of meson photo- and electroproduction since the total (virtual) photoabsorption reaction comprises several inelastic channels involving meson productions.

GDH sum rule on the proton

The sum rule relates the anomalous magnetic moment of the proton \( \mu_p \) to the difference of its polarized total photoabsorption cross sections,

\[
\kappa_p^2 = \frac{m_p^2}{4\pi^2\alpha} \left[ \int_{\nu_{thr}}^{\infty} \frac{dv}{v} (\sigma_{3/2}(v) - \sigma_{1/2}(v)) \right]
\]

where \( \sigma_{3/2}(v) \) and \( \sigma_{1/2}(v) \) indicate the cross sections for the possible combinations of spins of the proton (1/2) and the photon (1), \( \nu_{thr} \) the photoproduction threshold lab energy, \( \alpha = e^2 / 4\pi = 1/137 \) the fine-structure constant, and \( m_N \) the nucleon mass. For the sake of comparison, however, it is more convenient to define the GDH integral as

\[
I_{GDH} = \int_{\nu_{thr}}^{\infty} \frac{dv}{v} (\sigma_{1/2}(v) - \sigma_{3/2}(v))
\]

With this definition, the GDH sum rule on the proton yields \( I_{GDH}^P = -204.5 \) \( \mu_b \). Besides that we can also calculate the corresponding contribution the forward spin polarizability of the proton,
\[ \gamma_0 = \frac{1}{4\pi^2} \int_{\nu_{thr}}^{\infty} d\nu \left[ \sigma_{1/2}(\nu) - \sigma_{3/2}(\nu) \right] \]

and its longitudinal-transverse polarizability
\[ \delta_0 = -\frac{1}{2\pi^2} \int_{\nu_{thr}}^{\infty} d\nu \frac{\nu}{\nu^2 - Q^2_0} \lim_{Q^2 \to 0} \left[ \frac{\nu}{Q} \sigma_{TL}(\nu, Q^2) \right] \]

For the extension of the GDH sum rule to finite \( Q^2 \) there exist several versions. Here we will only use the forms which do not contain the longitudinal-transverse terms, thus provides the simplest generalization of the sum rule. Moreover, this choice seems to be the natural choice in terms of the quark structure functions \( g_1 \) and \( g_2 \). Within this choice the three possible forms read
\[
I_A(Q^2) = \frac{m_p^2}{8\pi^2\alpha} \int_{\nu_{thr}}^{\infty} d\nu (1-x) \left[ \sigma_{1/2}(\nu) - \sigma_{3/2}(\nu) \right] \frac{d\nu}{\nu} = \frac{2m_p^2}{Q^2} \int_0^{x_0} \left[ g_1(x) - \gamma^2 g_2(x) \right] dx
\]
\[
I_B(Q^2) = \frac{m_p^2}{8\pi^2\alpha} \int_{\nu_{thr}}^{\infty} d\nu \frac{1}{\nu^2} \left[ \sigma_{1/2}(\nu) - \sigma_{3/2}(\nu) \right] \frac{d\nu}{\nu} = \frac{2m_p^2}{Q^2} \int_0^{x_0} \frac{1}{\nu^2 + \gamma^2} \left[ g_1(x) - \gamma^2 g_2(x) \right] dx
\]
\[
I_C(Q^2) = \frac{m_p^2}{8\pi^2\alpha} \int_{\nu_{thr}}^{\infty} d\nu \frac{1}{\nu^2} \left[ \sigma_{1/2}(\nu) - \sigma_{3/2}(\nu) \right] \frac{d\nu}{\nu} = \frac{2m_p^2}{Q^2} \int_0^{x_0} \frac{1}{1-x} \left[ g_1(x) - \gamma^2 g_2(x) \right] dx
\]

where \( \gamma = Q/\nu \).

Results

Figure 1 compares the predictions of two Kaon-Maid models used in this calculation with experimental data. Obviously, the model with missing resonance can nicely describe the SAPHIR data. The numerical result for the GDH integral is given in Table 1, where we have performed the integrations up to \( \nu = 2.2 \) GeV. The present calculation with Model 1 is consistent to our previous work, while the refined result from Model 1 shows a smaller value of 2.93. Note that these contributions are positive, since the sign of \( \sigma_{TT} \) is in general negative, thus decreasing the absolute value of the total GDH if combined with contributions from single-pion, double-pion, and \( \eta \) photoproduction. If we replace the estimated 4 \( \mu b \) contribution in the previous work with this value, the total contributions are then shifted by 1 to the value of \(-201 \pm 10 \mu b\), thus still consistent with the sum rule within the error-bar.

![Figure 1. Total cross-sections as a function of the photon laboratory energy \( \nu \). Dashed curves represent the results from a model without the missing resonance \( D_{13}(1895) \) (Model 1), while solid curves are obtained after including these resonances in the model (KAON-MAID, Model 2). Open circles correspond to the CLAS data (Bradford et al., 2006), solid squares are due to the new SAPHIR data (Glander et al., 2004).]
Table 1. Contributions of the three kaon reaction channels to the GDH sum rule for the proton in µb. For comparison, the GDH sum rule yields the value of -204.

<table>
<thead>
<tr>
<th>Model</th>
<th>$K^+\Lambda$</th>
<th>$K^+\Sigma^0$</th>
<th>$K^0\Sigma^+$</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>1.65</td>
<td>1.74</td>
<td>0.06</td>
<td>3.45</td>
</tr>
<tr>
<td>Model 2</td>
<td>1.25</td>
<td>1.38</td>
<td>0.30</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Figure 2. Contributions of the kaon hyperon final states to the GDH integrals for the proton $I_A$ (solid lines), $I_B$ (dashed lines), and $I_C$ (dotted lines).

The contributions of kaon–hyperon final states to the generalized GDH integrals for the proton $I_A$, $I_B$, and $I_C$ predicted by Model 1 and Model 2 are shown in Fig. 2. Since the integrands consist only of $\sigma_{TT'}$, the behavior of this cross-section is clearly reflected in the integrals. From this figure we may conclude that the contributions from kaon–hyperon final states are quite small compared to the case of pion, and therefore will not significantly affect the result and conclusion given by the previous work (e.g. increasing the positive part of the total integral by about 1% at most).

In the case of the spin and longitudinal-transverse polarizabilities, contributions from kaon channels are found to be also small.

Keywords
Electromagnetic reactions, kaon, hyperon, Gerasimov-Drell-Hearn sum rule.

References
Glander K.H., et al. (2004) Measurement of $\gamma + p \rightarrow K^+ + \Lambda$ and $\gamma + p \rightarrow K^+ + \Sigma^0$ at photon energies up to 2.6 GeV. European Physics Journal A 19, 251-273.
Low-density instability of multicomponent matter with trapped neutrinos

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Introduction
At low densities both the relativistic and the non-relativistic mean-field models predict a liquid-gas phase transition region for nuclear matter leading, for dense star matter, to a non-homogeneous phase commonly called the pasta phase, which is formed by a competition between the long-range Coulomb repulsion and the short-range nuclear attraction. This transition has substantial consequences on the properties of stellar matter and neutrino transport. Considerable efforts have recently been devoted to comprehending the uniform ground-state stability of multi-component systems consisting of electrons, neutrinos, protons, and neutrons as a good approximation of this transition, not only in the zero-temperature approximation but also for finite temperature (Mart and Sulaksono, 2006). It is obvious that to understand the physics inside non-homogeneous (unstable) regions such as the mechanism of nuclear creation with slab-like or rodlike shape, we have to go beyond the mean-field approximation. Attempts in this direction are discussed in Napolitani et al. (2007). Moreover, in collapsing supernova cores and at sub-nuclear densities, the nuclear shape transition from spherical to other exotic shapes has significant effects on the neutrino mean free path. However, how these effects modify the neutrino mean free path is not yet fully understood.

The RMF models
To describe multicomponent matter, we use the Lagrangian density
\[ L = L_N + L_M + L_{HP} + L_L \]
where the first three terms describe the nucleons in the mean-field level and the last term indicates a free Lagrangian for leptons. The first term is the Lagrangian for nucleons interacting with each other via meson exchanges. The second term is the Lagrangian for mesons, containing also their nonlinear self-coupling information. The third term is added to accommodate the Horowitz-Piekarewicz isovector nonlinear term (Horowitz and Piekarewicz, 2001). In this study we investigate two RMF models, namely, the G2 parameter set of Furnstahl, Serot and Tang (1996) (also known as the ERMF model) and the Z271 parameter set of Horowitz and Piekarewicz (2001). The effective Lagrangian density of the Furnstahl-Serot-Tang model has been constructed to fulfill the symmetries of quantum chromodynamics and is expanded in powers of the fields and their derivatives up to order \( \nu = 4 \).

The longitudinal dielectric function
The longitudinal dielectric function can be written as
\[ \varepsilon_L(q, q_0) = \det[1 - D_L(q)\Pi_L(q, q_0)] \]
The uniform ground state system becomes unstable to small-amplitude density fluctuations with perturbation momentum \( q \) when \( \varepsilon_L(q, q_0) = 0 \). Note that in Eq. (2) \( q_0 \) is the time-component of the four-momentum \( q_\mu \) and \( q = |\vec{q}| \). The critical density \( \rho_c \) is the largest density for which the above condition has a solution. For matter consisting of protons, neutrons, and electrons, the longitudinal meson propagator is given by
In this form, mixing propagators between isoscalar-scalar and isoscalar-vector (dsv), isoscalar-vector and isovector-vector (dvρ), isoscalar-scalar and isovector-vector (dsρ) are present due to the nonlinear mixing terms in the model, in addition to the standard photon, omega, sigma and rho propagators (dg, ds, dv, and dρ).

**Results**

In Fig. 1 we show the effect of the electron absence (indicated by “−e” in the figure) on the onset of instability by switching off the electron contribution in the case of matter without neutrino trapping using the G2 parameter set, with and without a Coulomb contribution. Note that the latter is indicated with “−Coulomb” in the figure. The effect of the electron presence on the size of the instability region is found to be negligible in both cases. This is because the number of electrons is too small in matter without neutrino trapping and, therefore, the effect of the attractive Coulomb interaction generated by electrons and protons is too weak to produce a visible impact on every point at the onset of instability. Such behavior is observed even in the limit of q close to zero (see Fig. 2). However, the repulsive Coulomb interaction from the presence of protons, even in very small number, enlarges moderately the stability region of this matter in the range of 0.05 ≤ ρ/ρ₀ ≤ 0.4, which is clearly shown in Fig. 2. Furthermore, Fig. 1 emphasizes and shows the important role of the Coulomb interaction in stabilizing matter without NT for almost zero perturbation.

![Figure 1](image)

Figure 1. Onset of the instability of neutrinoless matter obtained by using the Furnstahl-Serot-Tang model with and without (symbolized by −) Coulomb interaction and electrons contributions. Note that the solid (red) and dash-dotted (blue) curves [as well as the dashed (green) and dotted (black) ones] are coincident.
Figure 2. Longitudinal dielectric function for matter without neutrino trapping obtained by using the Furnstahl-Serot-Tang model with and without (symbolized by $-$) Coulomb interaction as well as electron contributions. Note that the dashed (green) and dotted (black) curves are coincident. All curves have been calculated by using $q = 0.01 \text{ fm}^{-1}$.

**Keywords**
Neutrino interactions, neutrino scattering, neutron stars.

**References**
New constructions of A-magic graphs using labeling matrices

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Introduction

Let \( G = (V, E) \) be a simple graph. For an arbitrary Abelian group \( A \), a mapping \( f: E \rightarrow A^* \), with \( A^* = A - \{0\} \), is called a labeling of \( G \). This labeling induces a mapping \( f^*: V \rightarrow A^* \), defined as \( f^*(v) = \sum_{u \in N(v)} f(uv) \), where \( N(v) = \{u \in V | uv \in E\} \) is a neighborhood of \( v \in V \). Note that \( f^*(v) \) is also known as the weight of the vertex \( v \). We call a labeling \( f \) A-magic labeling if for every \( v \in V \), \( f^*(v) = k \), where \( k \) is a constant in \( A \). The number \( k \) is called the magic constant of \( G \). Using this definition, edge labels do not have to be the same.

Let \( f: V \rightarrow A^* \) be an A-magic labeling of \( G \), with \( A \) an arbitrary Abelian group. Let \( \{v_1, \ldots, v_n\} \) be the set of the vertices of \( G \). A labeling matrix of \( f \), denoted by \( Af(G) = (a_{ij}) \), is a matrix in which each row and each column represents the vertices of \( G \) and the entry \( ij \) is a label of the edge \( v_iv_j \). Thus \( a_{ij} = \begin{cases} f(v_i,v_j), & \text{if } v_i v_j \text{ is an edge of } G \\ 0, & \text{if } v_i v_j \text{ is not an edge of } G \end{cases} \)

In this paper we have the following results.

**Theorem 1**

Let \( G_1 \) and \( G_2 \) be A-magic graphs with labeling matrices \( Af_1 \) and \( Bg_2 \), respectively. If \( G_1 \) and \( G_2 \) have the same magic constant \( k \) then \( G_1 \cup G_2 \) is an A-magic graph.

**Theorem 2**

Let \( G_1 \) and \( G_2 \) be A-magic graphs with labeling matrix \( Af_1 \) and \( Bg_2 \), respectively. If \( G_1 \) and \( G_2 \) have the same number of vertices and have disjoint edges then the composition of \( G_1 \) and \( G_2 \) is an A-magic graph.

**Theorem 3**

Let \( G_1 \) and \( G_2 \) be A-magic graphs with labeling matrix \( Af_1 \) and \( Bg_2 \), respectively. If \( G_1 \) and \( G_2 \) have the same magic constant \( k \) then the graph \( G^* = G_1 * G_2 \), as defined above, is an A-magic graph.

In this paper we show three different constructions to generate new classes of graphs using combinations of labeling matrices of known A-magic graphs. There are still more combinations of labelings that could be obtained using labeling matrices.

**Keywords**

A-magic labelling, labeling matrix.

**References**


On consecutive edge magic total labeling of graphs

Introduction

Let $G = (V,E)$ be a finite (non-empty) graph, where $V$ and $E$ are the sets of vertices and edges of $G$. An edge magic total labeling is a bijection $\alpha$ from $V \cup E$ to the integers $1, 2, \ldots, n+e$, with the property that for every $xy \in E$, $\alpha(x) + \alpha(y) + \alpha(xy) = k$, for some constant $k$. Such a labeling is called an $a$-vertex consecutive edge magic total labeling if $\alpha(V) = \{a+1, \ldots, a+n\}$ and a $b$-edge consecutive edge magic total labeling if $\alpha(E) = \{b+1, b+2, \ldots, b+e\}$.

Sedláček [2] introduced magic labeling of graphs in 1963, and since then there have been many results in magic labeling, especially in edge magic labeling. For new results in graph labeling see [1].

In this paper we introduce consecutive edge magic labeling and studied some properties of such labelings.

Define $M = a+n$. Let $\gamma : V \cup E \rightarrow 1, 2, \ldots, M$ be a super edge magic labeling for a graph $G$.

Define the labeling $\gamma' : V \cup E \rightarrow 1, 2, \ldots, M$ as follows.

$\gamma'(x) = M + 1 - \gamma(x), x \in V,$

$\gamma'(xy) = M + 1 - \gamma(xy), xy \in E.$

Then $\gamma'$ is called the dual of $\gamma$. From [6] we know that the dual of an edge magic labeling for a graph $G$ is also an edge magic labeling.

Let $V(G) = \{x_1, x_2, \ldots, x_n\}$ be the set of vertices in $G$ with labels in $\{1, 2, \ldots, n+e\}$. A symmetric matrix $A = (a_{ij}), i, j = 1, \ldots, n$, is called an adjacency matrix of $G$ if

$a_{ij} = 1$ if there is an edge between $x_i$ and $x_j$.

$0$ if there is no edge between $x_i$ and $x_j$.

A bijection $a : V(G) \rightarrow \{1, 2, \ldots, n\}$ is called an $(a, d)$-edge-antimagic vertex (EAV) labeling of $G = G(V,E)$ if the set of the edge-weights of all edges in $G$ is $\{a, a+d, \ldots, a+(e-1)d\}$, where $a > 0$ and $d \geq 0$ are two fixed integers. Note that a graph that has EAV labeling can be represented by a special adjacency matrix. If $G$ is an EAV graph then the rows and columns of $A$ can be labeled by $1, 2, \ldots, n$. $A$ is symmetric and every skew-diagonal (diagonal of $A$ which is traversed in the “northeast” direction) line of matrix $A$ has at most two “1” elements.

The set $\{a(x) + a(y) : x, y \in V(G)\}$ generates a sequence of integers of difference $d$. Each entry “1” in a skew-diagonal line has a one-to-one correspondence to an element of the edge-weight set $\{a(x) + a(y) : x, y \in V(G)\}$.

If $d = 1$ then the non-zero off diagonal lines form a band of consecutive integers. In this paper, EAV labeling always refers to an $(a, 1)$-EAV labeling.

Let $G$ be an $a$-vertex consecutive edge magic graph and $\beta$ be an $a$-vertex consecutive edge magic labeling of $G$.

Then $\beta(x) \in \{a+1, a+2, \ldots, a+n\}$, for every $x \in V(G)$, $0 \leq a \leq e$. If $a = 0$ then the labeling is called a super edge magic labeling. In this paper we consider $a$-vertex consecutive edge magic labeling for $1 \leq a \leq n-1$. For further results, see [1,6].
In this paper we have the following results.

**Theorem 1.** The dual of an a-vertex consecutive edge magic labeling for a graph G is an (e−a)-vertex consecutive edge magic labeling.

The following theorem characterises the graphs that can have a-vertex consecutive edge magic labeling.

**Theorem 2.** If G has an a-vertex consecutive edge magic labeling, a ≠ 0 and a ≠ e, then G is a disconnected graph.

Furthermore, we can prove that G cannot be a union of any three trees.

**Theorem 3.** If a ≠ 0 and a ≠ e, and G has an a-vertex consecutive edge magic labeling β then G cannot be the union of three trees T_1, T_2, and T_3, where |V(T_i)| ≥ 2, i = 1, 2, 3.

**Observation 5.** Let G be an a-vertex consecutive edge magic graph, a ≠ 0, and a ≠ e. If G consists of

- two trees then the number of isolated vertices is one;
- one tree and one unicyclic graph then the number of isolated vertices is two;
- two unicyclic graphs then the number of isolated vertices is three;
- otherwise the number of isolated vertices is at least three.

**Theorem 6.** There is an a-vertex consecutive edge magic graph for every a and n.

**Theorem 7.** Every union of r stars with r − 1 isolated vertices has an s-vertex consecutive edge magic labeling, where s = min{\(|V(S_1)|, \ldots, |V(S_r)|\)}.

Let G be a b-edge consecutive edge magic graph and let γ be a b-edge consecutive edge magic labeling of G.

Then γ(xy) ∈ {b + 1, b + 2, \ldots, b + e}. The super edge magic labeling is a special case of b-edge consecutive edge magic labeling, when b = n. Since the vertex labels in a b-edge consecutive edge magic labeling, 1 ≤ b ≤ n − 1, do not form a set of consecutive integers, it follows that the row/column of the adjacency matrix of b-edge consecutive edge magic graph are labeled according to the vertex labels of G, not consecutively as 1, 2, \ldots, n.

**Theorem 8.** Every b-edge consecutive edge magic graph has edge antimagic vertex labeling.

Considering the dual labeling property, if a graph G has a b-edge consecutive edge magic labeling, a similar result in the dual also holds.

**Theorem 9.** The dual of a b-edge consecutive edge magic labeling for a graph G is an (n − b)-edge consecutive edge magic labeling.

A caterpillar is a graph derived from a path by hanging any number of leaves from the vertices of the path. The caterpillar can be considered as a sequence of stars S_1 ∪ S_2 ∪ \cdots ∪ S_r, where each S_i is a star with centre c_i and n_i leaves, i = 1, 2, \ldots, r, and the leaves of S_i include c_{i+1} and c_{i+2}, i = 2, \ldots, r − 1.

**Theorem 10.** Every caterpillar has a b-edge consecutive edge magic graph for every b.

**Theorem 11.** If a connected graph G has a b-edge consecutive edge magic labeling, where b ∈ \{1, 2, \ldots, n−1\}, then G is a tree.

**Corollary 12.** A double star S_{n_1, n_2} has a b-edge consecutive edge magic labeling for some b ∈ \{1, 2, \ldots, n\} and

- if b = 1 then S_{n_1, n_2} is a star;
- if b > 1 then b = n_2 + 1

The previous result can be generalised as follows.

**Theorem 13.** Every caterpillar has a b-edge consecutive edge magic labeling, where

\[ \left\lfloor \frac{r+1}{2} \right\rfloor + \sum_{i \text{ odd}} n_i - 2 \text{ if } i \text{ is odd} \]

\[ \left\lfloor \frac{r+1}{2} \right\rfloor + \sum_{i \text{ even, odd}} n_i - 2 + (n_r - 1) \text{ if } i \text{ is even} \]
Theorem 14. Every \( \bigcup_{i=1}^{r} S_i \cup \{x_1, \ldots, x_{r-1}\} \) where \( S_i \), \( i = 1, \ldots, r \) is a star and \( \{x_1, \ldots, x_{r-1}\} \) are isolated vertices, has an \( r \)-edge consecutive edge magic.

Keywords
A-vertex consecutive edge labeling, b-edge consecutive edge labeling.

References
On implementing voice over IP on Universitas Indonesia wide area network and Indonesian higher education network infrastructure

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Introduction

Electronic-based learning environments (ELE) are being increasingly used at all levels of the educational system at the Universitas Indonesia. With the improvement of infrastructure and integrated applications to manage academic and administrative matters of the Universitas Indonesia, the whole stakeholders of the University has increasingly participating to use the facilities to be member of the open sourcing and informing society in the world. The use of the state of the art resources such as Global Distance Learning Network, Teleconference facility, Voice over IP, computer and other pervasive equipment such as laptop, PDA, and smartphone’s have been witnessed at the Universitas Indonesia. It has been used to support the university stakeholder’s continuous learning effort using global resources available through the social networking environment using the Internet. Information and Communication Technology (ICT) infrastructure is the backbone of the University’s data, voice, video and all traffic of communications. The advancement of the infrastructure will affect the development of the university. In order to provide a world class learning environment, the infrastructure provided must be able to support ‘any time, any place’ learning paradigm in addition to the conventional brick and chalk method.

Indonesia higher education network (Inherent) was started in the year 2006 to facilitate the interconnection, by providing the Intranet for higher education institution in Indonesia. Each university can build their own facility and then later on share their achievement to other universities. This paper focuses on the idea of implementing an integrated ICT infrastructure development to support the use of electronic numbering for the members of Inherent. We also provide the design of the infrastructure and step by step methods to enable the provision of a unique number for Inherent Voice over IP (VoIP) service.

Implementation

We propose the use of ENUM solution with private ENUM root domain e164.inherent-dikti.net for the integration of VoIP service between INHERENT members. At least 6 universities is ready to joint this activity (VoIP integration through ENUM), i.e. Universitas Indonesia (UI), Bandung Institute of Technology (ITB), Gadjah Mada University (UGM), Bogor Institute of Agriculture (IPB), Surabaya Institute of Technology (ITS), Brawijaya University (UB).

Result

This paper examines the phenomenon of the introduction of the state of the art learning environment at UI and then spread out to other Universities in Indonesia, i.e VoIP. We describe the design of implementing University and Inter-University wide Voice over IP infrastructure through Indonesia’s Higher Education Research Network (Inherent), as an effort to build up a Next Generation Network application and services. It can be expected that
the socialization and wider deployment of the VoIP system among the Inherent administrator and users will lead to a more efficient and cheap way of communication through Internet Protocol Services.

Figure 1. INHERENT Topology 2008 [Telkom08]

Figure 2. VoIP Network Topology Universitas Indonesia

Figure 3. VoIP interconnection through ENUM

**Conclusion**

The ability to expand the network and deploy new applications within the existing infrastructure is the expectation of all universities in order to provide a strong education system. The integration of VoIP network becomes a model for the service-integration between universities in the INHERENT network. Scalability and global accessibility becomes the main issue in the integration of VoIP network infrastructure in INHERENT. One solution to address the issue is using ENUM. ENUM solution implements the integration of VoIP network and services between universities of INHERENT members. Further activity required to answer and analyze the following issues:

- The security of VoIP service infrastructure.
- IM interconnection based on SIP and jabber, and its global interconnectivity.
- Allocation and implementation of public enum (2.6.e164.arpa) from Department of Post and Telecommunication, to answer the needs of global accessibility.

**Keywords**

DNS, electronic based learning environment, ENUM, ITAD, Next Generation Network, Voice over IP.
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Optimization of RS codec synthesis using selected variants of VHDL-based GF arithmetic operators

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Introduction
The advance of digital technology has contributed much toward modern communication system. Two important aspects of information exchange are security and data correctness, in which Galois Field (GF) concept plays an important role, i.e. in cryptography [9][14] and error correction codes (ECC) [13][16]. Performance of applications in these two fields is determined by the efficiency of GF arithmetic operators involved in the system [5]. There has been many research works to improve GF operators’ efficiency, i.e. multiplication [15], division [4] and inversion [17]. In fact, GF operators are not performing their functions individually or independently, they are parts of a functional integration at the system level instead. Is operator efficiency beneficial to the application level performance?

This paper reports an experimental result of implementing Reed Solomon Encoder and Decoder (Codec) RS(15,11) 4-bit based on six variants of GF operator. The purpose of the experiment is to obtain an RS Codec configuration whose throughput is the most optimum. The implementation was achieved using VHDL by means of two synthesis tools: the Xilinx ISE 8.2i and the Altium ProChip Designer.

Previous research
Similar to the ordinary algebra, GF algebra has a number of arithmetic operations, such as: addition, subtraction, multiplication, division, inversion, square and square root. In digital circuit, GF addition and subtraction are simply implemented by exclusive-OR logic operation. GF arithmetic operators are characterized by:

1. operation types: multiplication, division, inversion, square or square root
2. processing types: serial or parallel
3. representation basis: standard/polynomial (PB), normal (NB) or dual (DB)

The advance of digital technology has shifted performance measurement mechanism from the running time of software algorithm [1] to VLSI complexity, i.e. the number of components and their total delay [15]. GF arithmetic operators used in this experiment are the best in term of speed as investigated in previous research. Specifically for RS Codec implementation, the encoder algorithm refers to the circuit in [6], decoder’s Syndrome Calculator (SC) in [10], Key Equation Solver (KES) in [8], Error Evaluator (EE) in [11] and Error Corrector (EC) in [16].

Motivation
Previous research focused on efficiency improvement of GF operators. However, literatures on GF-based implementation at system level are merely experience sharing without any
analysis on the consequences of GF operator variants involved in the system. This paper comes up with the following research questions. What level of optimization can be achieved at application system level? Is performance improvement gained at operator level can be obtained linearly at the application level? Will an application take benefit by employing all best variant of GF operators? Preliminary hypothesis argues that combining all operators, each of which is the most efficient variant, is not a simple mechanistic process. Obtaining synergic efficiency at system level requires careful considerations on several factors such as: basis representation conversion, generator polynomial selection as well as the architecture selection, interconnection between GF operators and dependency of sequential operator processes within the system.

**Methodology**

A set of experiments was designed to examine whether the best variants of GF operator can be combined to construct the most efficient application. The best variant is the one having fastest process in its class. As a case study, encoder and decoder for RS(15,11) 4-bit were developed. GF operators used in the experiment were implemented as the most efficient for each combination of two parameters: representation basis (Polynomial, Normal or Dual), and processing structure (parallel or serial).

<table>
<thead>
<tr>
<th>Variant</th>
<th>Structure</th>
<th>Basis</th>
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<tbody>
<tr>
<td>1</td>
<td>Parallel</td>
<td>Polynomial</td>
</tr>
<tr>
<td>2</td>
<td>Serial</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Parallel</td>
<td>Normal</td>
</tr>
<tr>
<td>4</td>
<td>Serial</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Parallel</td>
<td>Dual</td>
</tr>
<tr>
<td>6</td>
<td>Serial</td>
<td></td>
</tr>
</tbody>
</table>

The RS Codec is implemented into six versions, each of which was constructed based on the six variants shown in Table 1. They were implemented using structural VHDL and synthesized using Xilinx ISE 8.2i and Altium ProChip Designer. The synthesis process results in maximum combinational path or total delay that defines the maximum frequency possibly supplied to the system. Hence, the system throughput can be calculated based on the data capacity proceeded per time unit, expressed in Mega Byte per second (MBps). Throughput is then used as an indicator of the system performance. An optimal system is defined as the one having biggest throughput among the six versions of the system.

**Results**

Practically the overall RS Decoder performance requires a uniform representation basis for the whole symbols. It has been learnt that the speed of decoding process is defined by Syndrome Calculator as the first module in the sequence of processes. To combine four modules (SC, KES, EE, and EC) into one integrated system, cycle rate must conform to the slowest component. It is shown that both synthesis tools produce the best RS Decoder, i.e. the one using serial operation and GF element representation in dual basis although the best multiplier is in parallel PB.

Experiment results show that employing the best operators does not always produce the most efficient system. This phenomenon is shown consistently by Xilinx and Altium synthesis tools. Simple and common logic saying that parallel process is faster than serial is not always correct. This is caused by the fact that the synthesis tools do some improvement or limited optimization to the VHDL structural design.

Multiplication turns to be dominant in RS Codec. Examination on the results shows that multiplication with fixed bit operand is optimized by removing unnecessary components in the system [7]. For specific configuration of RS Codes, multiplications have several parameters fixed during the system lifecycle. Hence the implementation into FPGA boards decreases significantly the delay so that processing rate can be faster.

It is examined that optimization was not applied to parallel multiplications although they also have constant operands. It is due to the fact that the tools optimize constant bit only, whereas
parallel multiplier signal is implemented as an $m$-bit bus. Superiority of DB multiplier over PB and NB is the delivery of product in fully serial. DB serial multiplier delivers the product bit by bit as the binary of operand enters from MSB to LSB. Therefore, variant 6 saves 1 cycle compared to variant 2 and 4 that delivering the product after the whole cycle for $m$-bit completed. Therefore, variant 6-based system proceeds addition serially as the product is delivered from index $m-1$ to 0. In general, this finding supports several statements in the literature that multiplication with constant operand can be more efficient [2]. It was examined as well that optimization does not apply to serial NB multiplier. In serial NB multiplication, the values of both operands change dynamically during the lifecycle of the system due to the rotation of internal registers [7].

**Conclusion**

This paper reports that an optimal performance of RS Codec does not always involve the best variant or the most efficient GF operators. System performance is also influenced by the operator composition and distribution, interaction between them and types of internal process within the system. Superiority of serial based system compared to parallel one is contributed by the synthesis tool that optimizes serial operators whose operands are constant. It is interesting to examine further the consistency of this optimization in other GF based applications, such as cryptography. Explorative experiments are required for real symbol width, $m = 8$ bit such as the one used by NASA RS(255,223) 8-bit [12] and Rijndael AES with cipher-key 8-bit [3]. It is hypothetically predicted that higher performance ratio would be obtained by serial variants over the parallel ones. It is because of additional combinational path in parallel operators that results in bigger delays. Meanwhile, serial operators requires only several additional cycles with constant minimum periods.

**Keywords**

Error Correction Codes, FPGA synthesis, Reed Solomon, VHDL.

**References**

Performance evaluation of IP based multimedia services in UMTS

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Introduction
This paper presents our work in the performance evaluation of UMTS network based on simulation. Enhanced UMTS Radio Access Network Extensions for NS-2 (EURANE) developed by SEACORN has brought us to the higher phase of UMTS simulation in third generation wireless telecommunication system. Wireless 3G is designed to be able to deliver various kinds of multimedia packages through an IP network for the purpose of easier interconnection with fixed network with various existing multimedia services. Multimedia services with their bandwidth consumption characteristics are able to be sent through a UMTS network with the existence of High Speed Data Packet Access (HSPDA) in Release 5. Quality of Service (QoS) is a major concern in multimedia services. This paper shows the performance analysis of a number of multimedia services and their QoS using HSPDA in UMTS. The experiments were based on EURANE extension for NS-2. From the simulation conducted, we found that Unacknowledged Mode (UM) in Radio Link Control (RLC) will perform better for QoS class number 1 (VoIP) and 2 (Video Streaming), while Acknowledged Mode (AM) mode are more suitable for QoS class number 3 (web server) and 4 (FTP).

In this paper we simulate 12 users in 3 different environments accessing 4 multimedia data services in an Enhanced-UMTS. This simulation is conducted using NS-2 version 2.30 and additional patch for EURANE version 1.60 which was developed by IST-SEACORN [1, 3]. The simulation architecture of E-UMTS can be seen on Figure 1. There are 3 environments used in this simulation: Indoor, pedestrian, and Vehicular Environment

Result
Throughput in AM and UM has significant differences. Throughput in AM has smooth difference for every service class in every environment. While in UM, only services with high priority have good enough quality, i.e. VoIP and streaming video. The possibility is that it that was caused by no guarantee for every sent data.
An interesting result shown from the number of packet graph in both AM and UM modes. In both of these modes, video streaming service have a large number of packet compared with other priority services. The possibility is because the number of sent packet are different, which is 3760 for VoIP application, and 96 for video streaming application. Graph visualization of packet loss in AM is depicted in Figure 4, while the graph of packet loss in UM is depicted in Figure 5.

The significant difference between delay in AM and UM mode is shown in web service and FTP services, even in Indoor user environment, there is delay rise high enough in AM mode. On the other side, a smooth delay available in AM mode where the delay value increase periodically based on its priority grade. Delay visualization in AM can be seen at Figure 6, while in UM can seen at Figure 7.
Based on simulation result and analysis which have been conducted, UM operation mode is not suitable enough to be used for web service and FTP services, because the throughput value is near 0 and has big enough delay. On the other side UM operation mode is suitable for VoIP and video streaming service, even if compared with AM operation mode. AM operation mode is suitable to be used for web service and FTP services. We can conclude that UM mode is suitable for high priority QoS while AM mode is suitable for low priority QoS in UMTS HSDPA network.

**Keywords**

3G, EURANE, HSDPA, Multimedia Services, NS-2, QoS, UMTS.

**References**


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Photo and electroproduction of the hypertriton on He-3

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Introduction
The hypertriton is a bound state consisting of a proton, a neutron, and a Λ hyperon. Interest in the hypertriton comes mainly from the fact that it is the lightest and the most loosely bound hypernucleus. The separation energy into a Λ and a deuteron is only 0.13 ± 0.05 MeV, whereas the total binding energy is 2.35 MeV. Being the lightest hypernucleus, the hypertriton is obviously the first system in which the YN potential, including the interesting Λ−Σ conversion, can be tested in the nuclear medium. This is also supported by the fact that neither the ΛN nor the ΣN interaction possesses sufficient strength to produce a bound two-body system, and the available YN scattering data are still extremely poor. Therefore the hypertriton is expected to play an important role in hypernuclear physics similar to that of the deuteron in conventional nuclear physics. The hypertriton can be produced by using kaon induced reaction. In this work we theoretically calculate the cross sections of the photo- and electroproduction of the hypertriton.

Theoretical model
The process of the hypertriton electroproduction is shown diagrammatically in Fig. 1. It is obvious from this diagram that nuclear transition matrix element in the laboratory frame can be written as

\[ \left\langle f \left| J^\mu \right| i \right\rangle = \sqrt{\frac{3}{2}} \int d^3\vec{p} d^3\vec{q} \Psi_f^*(p, q') J^\mu \Psi_i(p, q) \]  

(1)

where the integrations are taken over the three-body momentum coordinates \( \vec{p} = \frac{1}{2}(\vec{k}_2 - \vec{k}_3) \) and \( \vec{q} = \vec{k}_1 \), while the hyperon momentum inside the hypertriton is \( \vec{q}' = \vec{k}_1 + \frac{2}{3}(\vec{k} - \vec{q}_K) \). The factor of \( \sqrt{3} \) on the right hand side comes from the antisymmetry of the initial wave function. The transition current \( J^\mu \) is related to the elementary operator (see Fig. 1) by the relation \( M_{fi} = e_{\mu} J^\mu \). Using the standard notations for the He-3 and hypertriton wave functions we can recast Eq. (1) to
\[ \langle f | J^\mu | i \rangle = \sqrt{6} \sum_{\alpha\alpha'} \sum_{mn'n''} (Lm_L Sm_S | Jm_j)(Lm_L Sm_S | J'M_j')(\frac{1}{2} m_s | jm_j) \]

\[ \times (l'm_l' \frac{1}{2} m_s | j'm_j')(\frac{1}{2} m_s | jm_j)(jm_j jm_j | \frac{1}{2} M_i)(J'M_j' j'm_j' | \frac{1}{2} M_f) \]

\[ \times (\frac{1}{2} - m_s' \frac{1}{2} m_s | nm_{n'})(-1)^{n-1/2-m_s'} \delta_{LL} \delta_{m_l m_L} \delta_{SS} \delta_{m_s m_S} \delta_{m_s m_S} \delta_{T0} \]

\[ \times \int p^2 dp d^3 \bar{q} \phi_{\alpha'}(\bar{p}, \bar{q}) \phi_\alpha(p, q) Y_{l' L'}^l (q') Y_{l L}^l(q)(J^\mu)^m_n \]

where \([J^\mu]^m_n\) is the completely frame independent elementary operator. Hence, we can construct the spin-averaged tensor

\[ W_{\mu\nu} = \frac{1}{2} \sum_{M_i M_f} \langle f | J^\mu | i \rangle \langle f | J^\nu | i \rangle * \]

The differential cross section can be calculated by using

\[ \frac{d\sigma_T}{d\Omega} = \frac{\alpha q_K M_H}{2W} W_T \]

with \( W_T = (W_{xx} + W_{yy}) / 4\pi \).

**Results**

In this work, we use the elementary operator of Kaon-Maid (Mart and Bennhold, 2000). A comparison of the results of our model with experimental data, Dohrmann et al. (2004), is shown in Fig. 2. It is found that off-shell effects are important in the case of electroproduction. This fact is clearly exhibited in Fig. 2, where we can see that the “final hyperon on-shell” assumption can nicely shift the cross section upward to reproduce the experimental data at \( \theta_{c.m} = 2.7^\circ \) and \( 9.5^\circ \). Obviously, this finding is in contrast to the phenomenon observed in pion photoproduction off \(^3\)He (Tiator et al., 1980), where the assumption that the initial nucleon is on-shell yields a better agreement with experimental data. However, the present finding can be understood as follows: The hyperon binding energy in the hypertriton is much weaker than the binding energy of the nucleon in \(^3\)He. Therefore, shifting the hyperon in the final state closer to its mass shell moves the model closer to reality. The experimental data point at \( \theta_{c.m} = 18.9^\circ \) seems, however, to be very difficult to reproduce. Although the elementary cross section at this kinematics slightly increases, the nuclear suppression from the two nuclear wave functions is sufficiently strong to reduce the cross sections at \( \theta_{c.m} > 10^\circ \).
At $W = 4.30$ GeV and $W = 4.50$ GeV the various off-shell assumptions yield quite different phenomena compared to those in the case of photoproduction. In the case of photoproduction the assumption that the final hyperon is on-shell yields the smallest cross sections, whereas the opposite situation occurs in the case of electroproduction. Again, this behavior originates from the longitudinal terms. It is found that, for all $W$ of interest, the longitudinal cross sections are larger than the transverse ones. In the former, the off-shell effects are more profound and the assumption that the hyperon in the final state is on-shell always yields the largest cross section. Such behavior does not show up in the transverse cross sections. In fact, by comparing the transverse cross sections we can clearly see that the result presented here is still consistent with that of the photoproduction. We have also found that, although the phenomenon of the dominant longitudinal cross sections originates from the contribution of the missing resonance $D_{13}(1895)$, the fact that the final-hyperon on-shell assumption always yields the largest cross section is not affected by the omission of this resonance.

**Keywords**
Electromagnetic reactions, hypernuclei, hypertriton, strangeness.

**References**


Ring temperature effect on propane flame lift-up

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Introduction

Flame lift-up phenomenon initially found on the premix combustion using Bunsen burner incorporated a ring above the tube burner. Research on this phenomenon has been done starting on preliminary study on determining AFR for lift–up and impact of position of ring to AFR for lift-up. Research on flame height of flame lift-up has also been done on the basis of AFR, position of ring, inside diameter of ring and material of ring. Currently the impact of material ring has been investigated. Two different materials on the same dimension of ring have been applied. Eliminating the effect of flow field by setting dimension of ring and fuel flow rate on the same value, it has been found that flame height on ring made of ceramic was higher compare to flame height on ring made of stainless steel. AFR for lift-up was also changes drastically. Then temperature of ring should be considered affecting the flame height. Therefore this research will further study the ring temperature whenever lift-up appeared.

Methods

The apparatus for this study was similar to other research on propane flame lift-up. The difference is on the addition device for measuring surface temperature of ring. Thermocouple and infra red thermograph were used to measure temperature of the ring surface. Infrared thermograph was directly connected to a computer so that the image can be analyzed using an image processing software as it is shown on Figure 1.

![Figure 1. Measurement of ring temperature](image-url)
Result and discussions

Datas of ring temperature were presented in comparison graphic of temperature of ring made of stainless steel and temperature of ring made of ceramic. It shows that when lift-up, temperature of ring made of ceramic is lower than temperature of ring made of stainless steel. There is something very interesting, that temperature of ring made of stainless steel at 30 mm position above burner tip is the highest of all heights. But on the contrary for temperature of ring made of ceramic, in this position is lower of all position, especially in low burning load. This result give a prediction that ring temperature is in the opposite way to flame length. Based on previous study, it has been found that flame length on lift-up events for ring made of ceramic was longer than flame length ring made of stainless steel. From AFR when lift-up event, it seems that the raising of AFR is proportional to the raising of ring temperature. This result is match with the previous study, that lower AFR number means lower flame temperature, and so was the ring temperature.

But, in the same burning load, it did not show the same thing. In the previous study it was found that AFR was defined by ring position. Closer ring position resulted in higher AFR.

Conlusions

The lift-up phenomenon is not only affected by flow field, but also the ring temperature. On high fuel flow, ring temperature tends to rise when lift-up. Using ring made of stainless steel, the ring temperature is higher than using ring made of ceramic when lift-up happens. Higher ring temperature results in higher AFR, this means that on ring made of ceramics the fuel burnt leaner than using stainless steel ring, since it need more air to burn it. For ring made of ceramic, the heat that accepted from the reaction rate is released to burn the fuel, but this is need to be proven in the future.

Keywords

Flame lift-up, premixed combustion, ring temperature.

Acknowledgements

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Smart health application implementation on UI Javacard based smart card

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Introduction

In this work, a JavaCard application called Smart Health has been developed on the Universitas Indonesia's Smart Card. This application has two functions. First, to read medical records from JavaCard and second, to write medical records into the JavaCard. Medical record which will be saved in the JavaCard was split into six categories. Smart Health application has three main parts, JavaCard applet, connector applet, and terminal module. JavaCard applet is a program to control the reading and writing process on JavaCard. It also controls JavaCard memory allocation. Connector applet is an interface program to connect the JavaCard applet with the terminal module. Terminal module is a Graphical User Interface (GUI) module. User interacts with the Smart Card application using this module. Smart Card is a card with an embedded microprocessor inside the card. It can be programmed to create application, perform task, and store information. Smart Card has a protocol called Application Protocol Data Unit (APDU), used to control data communication process. JavaCard is one of a technology in developing Smart Card. JavaCard is based on Java programming language to create JavaCard application.

In this work, a Smart Card application called Smart Health has been developed. The type of Smart Card used in this application is JavaCard. JavaCard is a Java based Smart Card which uses Java programming language to create applications. Our Smart Health application works to keep the medical information and has two main functions, i.e. to read medical records from JavaCard and to write medical records into the JavaCard. Medical record which will be saved in the JavaCard has been split into six categories. The application also includes personalization of the Smart Card holder. Smart Card has a computer chip or microprocessor inside. This card can be programmed to do some task and store information. Card Acceptance Device (CAD), such as card reader, is needed to connect the card and a computer. There are two types of Smart Card, namely, Intelligent Smart Card and Memory Card. Intelligent Smart Card has the ability to read, write, and calculate. Memory Card is used only to store information [Surendran, D., 2000].

Figure 1 shows that Physical Characteristics of a smart card.

![Physical Characteristics](image)

Figure 1. Smart Card Physical Characteristics [Chen,Z., Rinaldo Di Giorgio, 1998]

JavaCard is a kind of Smart Card which is capable to run Java based program. By using Java, creating Smart Card application will be much easier. The programmer can make the
application using Java Card Virtual Machine (JCVM) dan Application Programming Interface (API) inside the JavaCard.[Hartanto, A.A., 2007]. The JCVM is built on top of a specific integrated circuit (IC) and native operating system implementation. The JCVM layer hides the manufacturer’s proprietary technology with a common language and system interface. The Java Card Framework defines a set of Application Programming Interface (API) classes for developing Java Card applications and for providing system services to those applications [Chen, Z., 2000]. JavaCard applications are called applets. Multiple applets can reside on one card. Each applet is identified uniquely by its Application Identifier (AID) [Chen, Z., Ronaldo Di Giorgio, 1998].

Smart Health Application Design

The Smart Health application serves the user by providing the card holder’s personal data, read his/hers medical records, and write his/hers medical records. From the user side, Smart Health application is an easy to use application because the application only need few actions from the user. The user only need to input the JavaCard into the card reader, and then the user can read or write medical records by accessing the field at the terminal module. Smart Health application contains two parts, reading the medical records and writing the medical record. To perform this two tasks, the applications must pass through three steps of activity. First, reading the personal data from applet MahasiswaUIApplet. Second, reading the additional personal data from the applet PKMApplet. Third, writing the medical record to the applet PKMApplet. Figure 3 shows the Sequence diagram or reading personal data.

Result and discussions

Memory usage in the JavaCard is still open for further optimization by using data compression. To implement the data compression, an additional library is needed as a tool for executing the data compression process. Compression is done at the connector applet, which processes data array from the terminal module before stored in the JavaCard. In the data retrieval process, data taken from the JavaCard by the connector will be decompressed before being displayed in terminal module. Figure 6 shows the comparison of the data before and after the compression.
The performance of the Smart Health application is tightly related with the processing speed of the JavaCard. In medical data retrieval, the process done by the application is accessing the personal data and medical data stored in the JavaCard’s memory. All data stored in this memory is read one by one, then displayed by the terminal module. In this process, the processing speed of the JavaCard will determine the overall performance of the application. The speed of JavaCard’s microcontroller determines how fast the data retrieval process will be. The overall performance of the Smart Health application greatly depends on JavaCard’s processing speed.

**Conclusion**

The making of a JavaCard application consists of three steps, JavaCard applet programming, connector applet programming, and building the terminal module. JavaCard applet is an integral part in making the application and determines the continuity of the whole application operation. Connector applet is an applet that is used to connect the JavaCard applet with the terminal module. Our results shows that JavaCard applet programming, APDU arrangement to process operation, and memory allocation are the keys in building a JavaCard application.

**Keywords**

APDU, JavaCard, medical record, memory allocation, Smart Card, Smart Health.

**References**


Stimulating innovation using function models: Adding product value

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Introduction

The paper outlines the articulation of a theory of idea generation based around the act of building falsifiable models of reality (i.e., making complex mechanisms explicit). It positions the source of ideas not “singularly” within the human mind but within the relationship between mind and world. In the context of innovation, a function is that which needs to be done in order to achieve a purpose of a system that has been designed. This paper shares insights and offers a theory of ideas that opens the way for researchers and practitioners to explore the ability to manage invention as a capability.

Research methodology

The research began by combining two knowledge bases; philosophical and practical. Identifying the various theories of functionality and followed by hypotheses testing in practice which led to the realisation that there was a need for more reliable methods to model functions and functionality. The development of a proposed theory was then validated in practice. The research combined quantitative and qualitative approaches including the development of deduced arguments using predicate calculus, a participative action research, and three different surveys. The participative action research and grounded theory were integrated in the investigation. For the purpose of this paper, the method of building the arguments is only explained. Deduction logic with predicate calculus was used to develop arguments in order to build a stable foundation for a consistent logic. This method is employed as a logical way to construct a stable base that would strengthen confidence in subsequent arguments and conclusions.

Result and discussion

Identifying functions enables us to propose alternative ways to perform those functions in the act of creation and innovation such that the purpose of modelling functions is to yield improvement. The transformation of function-directed causal relations into manufacturing makes it possible to bridge the gap between physical structure and intentional function in a technological design. A particular concept type will fall into one of four mutually exclusive categories within a particular context, as follows:

- **Context:** Environment in which a system exists. A system is a dynamic entity. The context becomes a transcending framework that directs attention to the way in which we view a system. A single phenomenon can therefore be viewed from different contexts and have different imperatives applied.

- **Purpose:** The principal reason a project, product, or service is needed. A purpose is a final result delivered by a system and is what we want to achieve (overall goal-directedness). Purpose is achieved by the outcomes delivered by processes.
Outcome: A description of the result, effect, or consequence that will occur after carrying out a program or activity. An outcome resides between process and purpose. An outcome is a result of a process. Some outcomes will directly enable a purpose to be achieved. Others may not.

Function: The essential work or essential contribution a designer of a system needs to achieve. In other words, a function is a reason why a ‘thing’ exists in a system. Functions exist in a conceptual sense and require processes to be conducted in order to achieve them. Functions are conceptual and so cannot be measured. It is the process applied to the function that is measured as that is ‘real’ not conceptual. We can select different processes to perform the same function and this is why they are useful to innovation.

Process: A set of activities that can be recognised and measured. A process leads to an outcome. A process is a concrete action in the real world that has been selected to perform either a particular function or many functions. That is, all processes should have at least one function that justifies their use.

Conclusion
The paper concludes by differentiating between “ideas as purposes”, “ideas as outcomes”, “ideas as processes” and “ideas as functions” and the need to model complex mechanisms stimulating a better understanding of the relationship between our thoughts and how things work in the concrete world. Central to this is a clear understanding of essential functions that need to be performed by processes in order to achieve selected outcomes and purpose. Functions exist in a conceptual sense whereas processes are recognisable phenomena in the real-world. A process is a concrete action, in the real world, and has been selected to perform a particular function. An outcome is a result of concrete action (i.e. process leads to outcome). Removing unnecessary processes with no essential contribution (i.e. outcomes that have no value) will result in greater efficiency and effectiveness in a system. In the act of innovation these relations between “Function”, “Process” and “Outcome” are designed to achieve intended “Purpose”.

Keywords
Concept types, function model, innovation, idea generation, value.

References
Strengthening codes of professional ethics in the construction industry

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Introduction
Many parties claimed that construction professionals have been involved in some cases of unethical behaviour. This paper presents an attempt to study the meaning and application of professional ethics in construction industry. This paper describes the ethical problems and issues in the construction industry as well as determines ways to reinforce and strengthen the professional ethics in construction professionals. The paper concentrates primarily on the three key professions within the construction industry, namely architects, quantity surveyors and engineers, seeking their views and experiences on a range of ethical issues surrounding construction industry.

Research methodology
A quantitative approach that comprise of a closed-ended questionnaire survey was used as the main framework for the methodology. Two data analysis methods are applied in this survey, namely: descriptive statistic and t-test. Descriptive statistics are used to describe the basic features of the data in a study and one sample t-test is conducted to validate the findings.

Result and discussion
The result of the study revealed that most of the respondents have perceived that the construction industry is tainted by unethical behaviour and a majority of them are exposed to unethical acts in daily practices. The major ethical issues faced in the construction industry include inadequate safety standards, poor workmanship, and late payments. Furthermore, insufficient legislative enforcement, fierce competition and economic downturn are the main factors that contribute to unethical occurrences. Unethical practices can result in projects when completed are considered unnecessary, unsuitable, overlay complex components, over-priced or delay. Future knock-on effect include unethical conducts detriment to construction and engineering companies by resulting wasted tender expenses, tendering uncertainty, increased project costs, economic damage, fines, and reputational risk. On other hand, the manager’s role model, awareness of social responsibilities, stiffer penalties for those caught in unethical or illegal acts and enforcing codes of ethics has been agreed by respondents as ways to reducing instances of unethical behaviour.

Conclusion
Clear codes of ethical conduct must be widely communicated to the construction industry and implemented at all levels. Apart from that, to cope with insufficient ethical education from professional institutions and schools, industry bodies should unite in a common initiative to
provide guidelines and advice to professionals, especially for those at the start of their career, on how to deal with these issues. Enforcing codes of ethics and introducing training on ethics seem effective solutions to overcome the unethical behaviour. Thus by reducing or avoiding the instances of unethical behaviour, the image and professionalism of the construction industry will be enhanced greatly, locally and globally.

**Keywords**
Codes of conduct, construction professionals, construction industry, professional ethics.

**References**
Super \((a, d)\)-vertex antimagic total labeling on disjoint union of regular graphs

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Introduction

In this paper we consider simple and undirected graphs \(G = G(V, E)\). The set of vertices of \(G\) will be denoted as \(V = V(G)\) and the set of edges \(E = E(G)\), while \(n = |V(G)|\) and \(e = |E(G)|\).

A labeling \(\alpha\) of a graph \(G\), basically is a mapping from elements (vertices, edges, faces) of a graph to set of numbers. A vertex labeling (respectively, edge labeling) is a labeling which its domain is the set of vertices (respectively, the set of edges). A total labeling is a labeling which its domain is \(V(G) \cup E(G)\). For a further explanation of vertex, edge and total labelings, see [4].

The vertex-weight \(wt(x)\) of a vertex \(x \in V\), under a labeling \(\alpha : V \cup E \rightarrow \{1, 2, \ldots, n+e\}\), is 
\[ \alpha(x) + \sum_{y \in N(x)} \alpha(xy)\], where \(N(x)\) is neighbour of \(x\). An \((a, d)\)-vertex-antimagic total (in short, \((a, d)\)-VAT) labeling of \(G\) is a bijection \(\alpha : V \cup E \rightarrow \{1, 2, \ldots, n+e\}\) which the set of vertex-weights of all vertices in \(G\) is \(\{a, a + d, a + 2d, \ldots, a + (n-1)d\}\), where \(a > 0\) and \(d \geq 0\) are integers. If \(d = 0\) then we call \(\alpha\) a vertex-magic total (in short, VMT) labeling. An \((a, d)\)-vertex-antimagic total labeling \(\alpha\) is called a super \((a, d)\)-vertex-antimagic total (in short, super \((a, d)\)-VAT) labeling if 
\[ \sum_{x \in V} \alpha(x) = Kn\] and 
\[ \sum_{y \in E} \alpha(y) = Kn + n + e\].

The concept of the vertex-magic total labeling was introduced by MacDougall et al. [8], while Ba"ca et al. [1] introduced basic properties of \((a, d)\)-VAT labelings. Sugeng et. al [10] studied basic properties of super \((a, d)\)-VAT labeling and showed the construction of such labelings for certain classes of graphs, including complete graphs, complete bipartite graphs, cycles, paths and generalized Petersen graphs. For other results in vertex magic and \((a, d)\)-vertex-antimagic total labeling, see [2–4, 6, 8, 9, 11]. Most of the results on super \((a, d)\)-VAT are on a connected graphs. However, lately there is a direction to study more on such labeling on disjoint union graphs.

If \(G\) is an \(r\)-regular graph, then from Equation (3), we have the following Lemma.

**Lemma 4**

Let \(G\) be an \(r\)-regular graph and has super \((a, d)\)-VAT labeling, then 
\[ a = \frac{n(2 + 4r + r^2) + 2r + 2 - 2(n-1)d}{4} \]

**Observation 1**

Let \(G\) be a \(t\) copies of \(r\)-regular graph \(H\). Let \(G\) has a super \((a, d)\)-VAT labeling and \(|V(G)| = n\), then

(i). If \(d = 1\) and \(r\) is odd, then \(tn = 2 (mod 4)\).
(ii). If \(d = 2\) and

* if \(r, t\) are odd then \(n = 0 (mod 4)\)
* if \(r\) is odd and \(t\) is even then \(n = 0 (mod 2)\) and
* if \(r\) is even then \(t\) and \(n\) are odd.

**Observation 2**

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Let $G$ be a $t$ copies of $r$-regular graph $H$. Let $G$ has a super $(a, d)$-VAT labeling and $|V(G)| = n$, then

(i) If $r = 2$ then $d \leq 2$, for $n \geq 3$.
(ii) If $r = 3$ then $d \leq 2$, for $n \geq 3$.
(iii) If $r = 4$ then $d \leq 5$, for $n \geq 10$.

**Theorem 3**

Let $G$ be a $t$ copies of $r$-regular graph $H$. Let $H$ has an $(a, d)$-VAT labeling and $|V(H)| = n$. If $G$ has a super $(a, d)$-VAT labeling $a(G) = ta(H) + (t - 1)(1 + d + r)/2$.

Gomez in [5] proved that, under some circumstance, if the $r$-regular graph $G$ has super $(a, 0)$-VAT labeling then $t$ copies of $G$ also has super $(a, 0)$-VAT labeling.

**Theorem 4** [5]

Let $t$ be a positive integer. If the graph $G$ is $r$-regular graph that admits a super VMT labeling and $(k - 1)(r + 1)/2$ is an integer, then the graph $tG$ has a super VMT labeling.

While Gomez proved the general case of super VMT labeling of $t$ copies of graphs, in this paper we give construction of super $(a, d)$-VAT labeling for $d = 1$ only, of union of several classes of graphs. The classes of graphs that we consider are cycles, generalised Petersen graphs and circulant graphs. Each classes represents $r$-regular graphs with $r \in \{2, 3, 4\}$, respectively.

The only regular graph with $r = 2$ is a cycle. The following theorem shows that disjoint union of $t$ cycles with odd vertices (does not have to be isomorphics each other) has a super $(a, 1)$-VAT labeling. See Figure 1. for the example.

**Theorem 5**

Let $\{C_{n_j} : j = 1, \ldots, t\}$ be a set of cycles with $n_j$ vertices, where $n_j \geq 5$ are odd integers. Then disjoint union of cycles $\bigcup_{j=1}^{t} C_{n_j}$ has a super $(3 \sum_{k=1}^{t} n_k + 2, 1)$-VAT labeling.

**Theorem 6**

Let $P(n, 1)$ be prism with $2n$ vertices, $n$ odd and $n \geq 3$. Let $t$ be an odd number, then $t$-copies of prism $tP(n, 1)$ has a super $\left( a = (10t + 2)n - \left\lfloor \frac{n}{2} \right\rfloor + 2, 1 \right)$-VAT labeling.

**Theorem 7**

Let $P(n, 2)$ be a generalised Petersen Graph with $2n$ vertices, $n$ odd and $n \geq 3$. Let $t$ be an odd number, then $t$-copies of generalised Petersen Graphs $tP(n, 2)$ has a super $\left( a = \left( 2l + 2 \right) n - \left\lfloor \frac{n}{2} \right\rfloor + 2, 1 \right)$-VAT labeling.

$C_{n_1}(1,m)$ have super vertex magic total labeling. Using modification from this labeling, we can show that $C_{n_1}(1,m)$ has super $(a, 1)$-VAT labeling. Moreover, we prove that disjoint union of $C_{n_j}(1, 2)$, for $j = 1, \ldots, t$, has a super $(a, 1)$-VAT labeling.

**Theorem 8**

Let $\{C_{n_j}(1, 2) : j = 1, 2, \ldots, t\}$ be a set of circulant graphs with $n_j$ vertices. Then disjoint union of circulant $\bigcup_{j=1}^{t} C_{n_j}(1, 2)$ has a super $\left( a = 8 \sum_{k=1}^{t} n_k + 3, 1 \right)$-VAT labeling.

We list some problems for further investigation.

– Find if there is a super $(a, d)$-VAT labeling of disjoint union of $r$-regular graphs other than we have found in this paper for several values of $d$.
– Find if we can generalise the property of $t$ copies of graph $G$, when $G$ has a super $(a, d)$-VAT labeling.

**Keywords**

Regular graphs, super vertex antimagic total labeling.
References


Super edge magic total labeling on unicycle graphs

**Introduction**

Let $G = (V, E)$ be a simple and finite undirected graph with $v$ vertices and $e$ edges. Let $f$ be a bijection from $V \cup E$ to the set $\{1, 2, \cdots, v + e\}$. $f$ is called an edge magic total labeling if for any edge $xy$ in $G$ the weight of edge $f(x) + f(y) + f(xy) = k$, for some constant integer $k$. A super edge magic total labeling is an edge magic total labeling $f$ which $f(V) = \{1, \cdots, v\}$. A graph that has a (super) edge magic total labeling is called a (super) edge magic total graph.

Sedláček introduced the concept of magic labeling in 1963 [7]. However the notion of super edge-magic labeling has been used since it was defined by Enomoto et al. in [4]. We can obtain complete results on edge magic total labeling in Gallian’s survey [5]. According to attack the famous conjecture that said all trees are super edge magic total graphs [4,6], Bača, Lin and Muntaner-Batle [1] and Ngurah, Baskoro and Simanjuntak [2] in separate paper proved the following theorem.

Theorem 1 [1,2]: All path-like trees are super edge magic total graph.

Theorem 2 [8]: All caterpillar-like trees are super edge magic total graph.

The super edge magic total labeling of odd cycle has been constructed by Bača, Lin and Muntaner-Batle [1] and Sugeng and Silaban used the idea of path-like tree for constructed a subclass of tree, they called it caterpillar-like tree, which has super edge magic total labeling [8].

Let $C_n$, $n \geq 4$, be the cycle with $V(C_n) = \{x_i : 1 \leq i \leq n\}$ and $E(C_n) = \{x_ix_{i+1} : 1 \leq i \leq n - 1\} \cup \{x_nx_1\}$. The cycle $C_n$ is called embed to a grid if $C_n$ can be drawn as a subgraph of the two dimensional grid. If $n$ is even then there is no problem to make the embedding, but the even cycle is not a super edge magic total graph. However if $n$ is odd then we have one edge of cycle $C_n$ that is represented as a free line in the grid.

Consider the ordered set of subpaths $S_1, S_2, \ldots , S_t$ which are maximal straight segments in the embedding and it has the property that the end of $S_j$ is the beginning of $S_{j+1}$ for any $j = 1, 2, \ldots, t - 1$.

Suppose that $S_j = P_2$ for some $j$, $1 < j < t$, $V(S_j) = \{u_0, v_0\}$, $u_0 \in V(S_{j-1}) \cap V(S_j)$, $v_0 \in V(S_j)$, $V(S_{j+1}) \cap V(S_j)$, and distance of $u$ and $v$ is one for some vertex $u$ of $S_{j-1}$ and vertex $v$ of $S_{j+1}$. The distance of $u_0$ and $v_0$ in $S_{j-1}$ is equal to the distance of $v_0$ and $v$ in $S_{j+1}$. An edge transformation is replacing the edge $u_0v_0$ by a new edge $uv$.

A unicycle $C$ of order $n$ is called cycle-like when it can be obtained from some embedding of $C_n$ in the two dimensional grid by a set of sequentially edge transformations. Since the labels of vertices of $C_n$ is similar with label of vertices of $P_n$, then the edge transformations prevent the super edge magic total labeling property of a new graph.
Results

Lemma 1 [3]: A graph \( G \) with \( v \) vertices and \( e \) edges is super edge magic graph if and only if there exists a bijective function \( f: V(G) \cup E(G) \rightarrow \{1, 2, \ldots, v+e\} \) such that the set \( S = \{f(x) + f(y) | xy \in E(G)\} \) consists of \( e \) consecutive integers. In such a case, \( f \) extends to a super edge magic total labeling of \( G \) with magic constant \( c = v + e + s \) where \( s = \min(S) \) and \( S = \{f(x) + f(y) | xy \in E(G) \} = \{c - (v + 1), c - (v + 2), \ldots, c - (v + e)\} \).

Theorem 3: All cycle-like unicyles are super edge magic total graph.

Let \( G \) be a corona \( C_n \cdot K_r \). Corona is a cycle \( C_n \) with \( r \) tail on every vertex. If we ignore all the tails and look at the labeling on the cycle itself, then we can do the similar process with caterpillar-like tree as in [8] and we can have the following Theorem. This methods only works if the number of tails on every vertex are the same (=\( r \)).

Theorem 4: All corona-like unicyles are super edge magic total graph.

In this paper we construct and prove two new subclass of unicyclic graphs, cycle-like unicyle graphs and corona-like unicyle graphs, to be a super edge magic total graph by using edge transformation on edges of embedded cycle in a two dimensional grid. If we have quite long tails from every vertex, we can do the same process (edge transformation) and treat the tails as a path, then we can have more exciting graphs. However, this graph still categorize as unicyle graph.

Keywords

Edge magic total labeling, super edge magic total labeling.

References

Traffic Signal Control Modification Based on Self-Organizing in Indonesia

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Introduction
Traffic jam often occurs around the signalized intersection because each takes “stop-and-go cost” to pass through the intersection. Hence, traffic signal control has significant meanings in reducing the traffic jams efficiently. Only local traffic information. Previously, a decentralized control method is arbitrary interconnected one-way traffic network by adjusting the split setting [1]. The studies in [2,3,4] pose the traffic signal control as an optimization problem such as a combination of reinforcement learning to maximize local traffic at each intersection and global optimization by Evolutionary Computational Method [2,5], minimization of the total delay experienced by all network traffic at each section in a given network using a dynamic programming technique [3] and adjustment of green period by reinforcement learning [4].

We describe a traffic signal network using a system of nonlinear coupled oscillators. The self-organization observed in nonlinear coupled oscillators is referred to as “synchronization” or “the phenomenon of entrainment” [6], where oscillators having different natural frequencies are phase locked with some phase delays as a result of their mutual or one-sided interaction. In this signal network control problem, we find it useful to apply a nonlinear coupled oscillator system to achieve desired signal pattern of the network using such a self-organizing phenomenon of collective oscillation. Secondly, we adopted a decentralized control strategy of the cycle time and the split setting of the signals so that the desired offset patterns are self-organized through mutual entrainment based on local traffic demand to achieve efficient traffic flow reducing the cost of the “stop-and-go” at signals [7]. Finally, visualization of simulation demonstrates the effectiveness proposed method under unstructured condition like in Indonesia.

Architecture and Control of Traffic Signal Network
In urban traffic signal network, the coordination of neighboring signals will provide great benefit to road users, but coordinating signals over a wide area is currently regarded as a difficult problem. There are three parameters which characterize signal patterns such as
• Cycle time: The time required for one full cycle of signal phases including red time, blue time and clearance time.
• Green split: The percentage of green time allocated to each direction in one cycle of the signal.
• Offset: The relative time difference between the starting times of green phase on consecutive signals.

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The cycle time is a parameter mainly used for the control of an isolated traffic signal. A signal can reduce the stop-and-go cost by taking longer cycle time when there is high traffic flow at an intersection, so that more cars pass across the intersection without any stops. However, in urban traffic signal networks, each signal cannot decide the cycle time independently because consecutive signals must have the same cycle time in adjusting offset as mentioned later. The green split decides the relative length of green time in one full cycle of a signal, and can be used for the control of both an isolated traffic signal and a traffic signal network. Taking larger green split for a particular direction can reduce the cost of traffic flow incoming from the direction.

In urban traffic signal networks, the offset is most important for the coordination of neighboring signals to reduce the stop-and-go costs of traffic flow. The desired offset pattern of a traffic signal network makes more traffic cars pass across consecutive signals without any stops, as shown in Fig. 1. Note that adjusting the offset requires the synchronization of the consecutive signals by which the signals have the same cycle time.

In order to reduce the stop-and-go cost in urban traffic networks, all the parameter. Cycle time, green split and offset, should be adjusted by signal control. The detail explanation for equation derivation of cycle time, split settings, and offset can be explored in [7].

**Simulation example**

Solving the traffic jam problem in big urban city requires hardware and software platforms. During the initial design stages, software evaluation is preferred because it allows easy comparison of different localization strategies for various environmental scenarios. The screenshot comparison between simulation using traffic signal control conventional and traffic signal control modification based on self-organizing methods to handle a complex real traffic light system in Indonesia showed in Fig 2.
Conclusions
We performed visualization of simulation using traffic signal control conventional and traffic signal control modification based on self-organizing methods to handle a complex real traffic light system in Indonesia. In next step we will analysis the performance off the system in different scenario. While the long term of our research is to simulate whole parts of cities in Indonesia where consisting of road and traffic signal.

Keywords
Nonlinear coupled oscillators, self-organizing method, traffic signal control.

References
Two approaches for diagnosing a Pap smear cell image: Based on image segmentation and classification methods and based on content-based image retrieval system

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Introduction

Cervix cancer is the cause of many women death throughout the world. According to the World Health Organization data [11], in the year of 2000, there are 471,000 cases and among them 288,000 died because of the cervix cancer. Pap smear test is the way to detect early cervix cancer. Pap smear means human cells that are subtracted using Papanicolaou method. The cells are observed by a pathologist through a microscope to decide whether they are healthy or not. Women who live in the remote areas of Indonesia are far from the facility for obtaining a Pap smear test. The substance of Pap smear cells could be mixed with coloring substance and recorded into a Pap smear cell images. A telemedicine system and a computer-based Pap smear image diagnostic system are needed.

This paper presents two approaches for diagnosing a Pap smear cell image. The first approach is based on image segmentation and classification processes, the similar way a doctor diagnoses a Pap smear cell image. Several segmentation methods and classification methods have been studied [1,7,9,10]. This paper has used the fuzzy c-means clustering that performed the best in the previous study [1]. Several classification methods and classification methods have also been studied [1,4,5,7]. This paper has compared the scaled conjugate gradient back propagation neural network, and the support vector machine for the classification methods [3,6,8].

This paper has also presented the second possible approach for diagnosing a Pap smear cell image by utilizing an accumulated knowledge stored in image database and a query by example using an image to be diagnosed. The former and the later approaches may also be used in a hybrid way for obtaining a verified decision. The later approach allows a young doctor to learn from his or her senior doctors or other doctor by retrieving similar diagnosed images and their related treatment record from a knowledge database. This paper is organized as follows: the methodology of the first and the second approaches, the experimental data, and the experimental results. At the end, this paper is closed by concluding remarks and future works.

Methodology

In the first approach for diagnosing Pap smear cell image based on segmentation and classification methods, the image processing methodology is as follows: (i) image filtering using the median filter; (ii) segmentation using the fuzzy c-means clustering [1,9]; and (iii) classification using the scaled conjugate gradient back propagation neural network [6] and Exponential Radial Basis kernel Function (ERBF) support vector machine [8]. In the preliminary study, the use of ERBF gave a better results compared to the use of Radial Basis Function (RBF) kernel function, with exponent value = 20. The study has also found that the use of Directed Acyclic Graph (DAG) for multiclass classifier gave better results compared to
the One-vs-All and One-vs-One methods [3]. In the experimental process, the overall error, false negative, and false positive are used as the performance measures. False negative (FN) rate describes the percentage of abnormal cells identified as normal cells. True positive (TP) rate describes the percentage of abnormal cells identified as abnormal cells. False positive (FP) rate describes the percentage of normal cells identified as abnormal cells. True negative (TN) rate describes the percentage of normal cells identified as normal cells. Overall error (OE) is computed using Eq. (1).

$$OE = \frac{(FN+FP) \times 100\%}{(TP+FN+TN+FP)} \tag{1}$$

where

$$FN = \frac{(FN \times 100\%)}{(TP + FN)}$$

$$FP = \frac{(FP \times 100\%)}{(TN + FP)}$$

In the second approach for diagnosing Pap smear cell image based on a content based image retrieval system (CBIRS), only a subset of the data have been used for experiments due to a limitation of time to enter the data. Seventy images (ten images for each class) are used for constructing a knowledge image database. The database record consists of the five scale-invariant shape features, the diagnose result, and the related image filename. For the query process, another seventy images (ten images for each class) are used for example images in the query process. The image processing methodology for constructing the knowledge image database is as follows: (i) image filtering using the median filter; (ii) image segmentation using the fuzzy c-means clustering; (iii) feature extraction of the five shape features (ratio between nucleus and cytoplasm area, nucleus elongation, nucleus roundness, cytoplasm elongation, and cytoplasm roundness) [3]; and (iv) database record construction. The query process consist of the following steps: (i) input the observed image to be diagnosed; (ii) image filtering using the median filter; (ii) image segmentation using the fuzzy c-means clustering; (iii) feature extraction of five shape features; (iv) image content matching using Euclidean distance measure; and (v) display the matched images including with their diagnosis information. The diagram is shown in Fig. 1 [2]. In the experimental process, the average classification error, the precision and recall accuracies are used for the performance measures. For each-class queries by example, the classification error are computed based on both 2-class and 7-class problem. Finally, the average classification error is computed based on both 2-class and 7-class problem. The precision accuracy describes the ratio between the number of relevant retrieved images and the number of retrieved images. The recall accuracy describes the ratio between the number of relevant retrieved images and the number of relevant images [2].

![Diagram](image.png)

**Experimental data**

The data for experiment are obtained from Jantzen et al. [4]. The data consists of 917 Pap smear cell images (Fig. 2.). The data consist of single Pap smear image, its segmented image supervised by a doctor and its diagnosed category of cell status.
Experimental results

The experimental results are shown in Fig. 3.

![Experimental results](image)

Figure 3: (a) Classification accuracy using several classifiers [1,2]; (b) Hasil content based image retrieval system [3].

Concluding remarks

A combination of fuzzy c-means clustering and support vector machine classifier using ERBF gave the best result with the overall error of 11.34%, followed by the scaled conjugate gradient back propagation neural network that gave an overall error of 15.42%. The preliminary study with a limited data has used five scale-invariant shape features. The CBIR approach shows quite promising results, with an average classification accuracy of 81% for 2-class problem and 40% for 7-class hard problem. Furthermore, the precision and recall analysis shows that the content-based image retrieval system is relatively quite effective in the sense that similar diagnosed images occupy the highest matching ranks (shown in Fig. 1).

Keywords

Classification, content based image retrieval system, segmentation.

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Variant of ranged global best in parallel modified niche PSO with flow of wind for multiple odor source localization problems in dynamic environments

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Introduction
Many issues have hindered odor source localization in the past. One of the common issues has been that most detection of chemicals with mobile robots has been based on experimental setups where the distance between the source and the sensor following an odor trail has been minimized to limit the influence of turbulent transport [1-2]. Another issue has been that of basing systems on the assumption of a strong, unidirectional air stream in the environment [3]. However, thus far not much attention has been paid to the issue of odor localization within a natural environment.

To combat natural environment issues [1-3], a new approach exploiting Particle Swarm Optimization (PSO) is presented in this paper. The PSO algorithm here is modified to include chemotaxic and anemotaxic theory along with the development of an Advection-Diffusion odor model. This Modified Particle Swarm Optimization (MPSO) is applied by multiple mobile robots which localize an odor source in natural environment where the odor distribution changes over time [4,5].

Modified particle swarm optimization
The main problem with standard PSO applications in dynamic optimization problems is that the PSO will eventually converge to an optimum; it thereby loses the diversity necessary for efficient exploration of the search space. Applying Coulomb’s law, a charged swarm robot is introduced in order to maintain diversity of the positional distribution of the robots and to prevent them from being trapped in a local maximum. This enhances adaptability to the changes of the environment. Suppose that robot \( i \) can observe the present position of the other robots \( \{ \mathbf{x}_p \neq \mathbf{x}_i \} \) and has a constant charge \( Q_i \) in order to keep a mutual distance away and maintain positional diversity. Two types of swarm robots are defined: neutral and charged robots. For all neutral robots \( Q_i = 0 \); hence, no repulsive force is applied to the neutral robots. For charged robots, the mutual repulsive force between robots \( i \) and \( p \) is defined according to the relative distance, \( |\mathbf{x}_i - \mathbf{x}_p| \), as follows;
where, \((i \neq p)\), \(r_{\text{core}}\) denotes the diameter inside which a constant, strong repulsion force is applied and \(r_{\text{perc}}\) denotes the recognition range of robot. Hence, if the mutual distance is beyond \(r_{\text{perc}}\), there exists no repulsion force between the robots. In the case of \(r_{\text{core}} \leq r \leq r_{\text{perc}}\), the repulsion force is dependent on the mutual distance. Then, taking the summation of the mutual repulsion force, robot \(i\) defines collective repulsion force by:

\[
\mathbf{a}_i(t) = \sum_{p \neq i}^{N} \mathbf{a}_{ip} \tag{2}
\]

\[
V_i(t) = c_1(V_i(t-1) + c_{1,\text{rand}}(\mathbf{p}_{i}(t-1) - \mathbf{x}_i(t-1))) + c_2 \text{Rand}((\mathbf{p}_{g}(t-1) - \mathbf{x}_i(t-1))) + \mathbf{a}_i(t) \tag{3}
\]

\[
\mathbf{x}_i(t) = \mathbf{x}_i(t-1) + V_i(t) \tag{4}
\]

Deal with multiple source

The limitation of PSO is premature convergence to a local solution or one solution. These situations is also finding in multiple odor source localization problem [6]. To escape from this situation, niche method with deflection procedure, is adopted [6,7]. The deflection approach operates in multiple odor density function, adapting it to remove or lose when the one source was found.

Implementation framework

The odor source localization problem in dynamic environments is related to several issues from biology, physical chemistry, engineering and robotics. This paper proposes a comprehensive approach to offer a sound technical basis for odor source localization in a dynamic environment.

Environment

We adopted an extended Advection-Diffusion odor model by Farrell et al. [8] because of its efficiency. It represents time-averaged results for measurement of the actual plume, including chemical diffusion and advective transportation. In addition, the Advection-Diffusion odor model has a key factor to approximate the meandering nature of the plume, in that the model is sinuous. (For further explanation on this model, see [8], section two and three.)

Robot behavior

The gas source localization algorithm used in this work can be divided into three subtasks: plume finding, plume traversal and source declaration. Random search is employed until one robot encounters the plume. After finding the plume, the second task of the plume traversal proceeds. Particle Swarm concept will be applied to following the cues determined from the sensed gas distribution.

Extension with ranged global best concept

MPSO groups could track the same odor source. And the second found odor sources that are not distributed properly among groups. If these groups have range from each other, they could be run more divergent and do not enter others’ area. This method, ranged groups, is also capable of distributing odor sources found by others’ properly because each group has region that cannot be interfered by others.

We make a region from their global best location and determine how far it should from global best of other groups. We call this method as ranged global best I as it is using global best position to make range of all groups.
Furthermore to increase the diversity from each group we extend the concept of the ranged global best I. Two type mechanisms to increasing the diversity will be introduced. First, the looser subgroup will spread goes far away from the winner subgroup where the center of spreading is from the looser subgroup. We call the method is a ranged global best II. Second the looser subgroup will spread goes far away from the winner subgroup where the center of spreading is from the winner subgroup as. We call the method is a ranged global best III.

Conclusions

The Niche Parallel MPSO was implemented for solving multiple odor source localization problems. These proposed approaches can solve such dynamic environment problems. Unfortunately, when using parallel niche, we found some problem where there is a possibility that more than one subgroup locates one odor sources. This is inefficient because other subgroups should locate other sources. To deal with this problem, we propose three variants method of preventing that problem there are global best ranged I, II and III.

Keywords

Dynamic environment, odor source localization, particle swarm optimization.

References

Vertex-antimagic total labeling of the union of suns

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Introduction
In this paper all graphs are finite, simple and undirected. Let \( G \) has vertex set \( V(G) \) and edge set \( E(G) \), and let \( n = |V(G)| \) and \( e = |E(G)| \).
A labeling \( \lambda \) of a graph \( G \) is a mapping that assigns elements of a graph to a set of numbers (usually positive integers). If the domain of the mapping is the set of vertices (respectively, the set of edges) then we call the labeling vertex labeling (respectively, edge labeling). If the domain is the set of vertices and edges, then we call the labeling total labeling. A general survey of graph labelings can be found in [2].
The vertex-weight \( w(x) \) of a vertex \( x \), under a labeling \( \lambda : V(G) \cup E(G) \to \{1, 2, \ldots, n+e\} \) (or \( w_{\lambda}(x) \)), is the sum of values \( \lambda(xy) \) assigned to all edges incident to given vertex \( x \) together with the value assigned to \( x \) itself.
A bijection \( \lambda : V(G) \cup E(G) \to \{1, 2, \ldots, n+e\} \) is called an \((a,d)\)-vertex antimagic total labeling (in short, \((a,d)\)-VAT labeling or \((a,d)\)-VATL) of \( G \) if the set of vertex-weights of all vertices in \( G \) is \( \{1, a+d, \ldots, a+(n-1)d\} \), where \( a > 0 \) and \( d \geq 0 \) are two fixed integers. If \( d = 0 \) then we call \( \lambda \) as a vertex-magic total labeling. The concept of the vertex-magic total labeling was introduced by MacDougall et al. [3].
Baća et al. [1] investigated basic properties of \((a,d)\)-VAT labelings. They also studied dual labeling and relationship between a SVMT labeling (or super \((a,0)\)-VAT labeling) and an \((a,d)\)-antimagic labeling. Rahim et al. [5] proved that the union of \( t \) suns has a VMT labeling (or \((a,0)\)-VAT labeling) with magic number \( k = 6\sum_{k=1}^{t} n_k + 1 \). Parestu et al. [4] proved that the union of \( t \) suns has an \((a,1)\)-VAT labeling with \( a = 4\sum_{k=1}^{t} n_k + 2 \)

Main result
A sun \( S_n \) is a cycle \( C_n \) with adding an edge connecting to each vertex \( v_i \) in a cycle with single vertex \( u_i \), for \( i = 1, 2, \ldots, n \). The sun \( S_n \) consists of vertex set \( V(S_n) = \{v_i : 1 \leq i \leq n\} \cup \{u_i : 1 \leq i \leq n\} \) and edge set \( E(S_n) = \{v_i v_{i+1} : 1 \leq i \leq n\} \cup \{u_i v_i : 1 \leq i \leq n\} \), where \( v_i \) are inner vertices and \( u_i \) are outer vertices of \( S_n \). Note that if \( i = n \) then \( i+1 = 1 \). The union of \( t \) suns, denoted by \( S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t} \), consists of vertex set \( V(S_{n_j}) = \{v_{i_j} : 1 \leq i \leq n_j, 1 \leq j \leq t\} \cup \{u_{i_j} : 1 \leq i \leq n_j, 1 \leq j \leq t\} \) and edge set...
$E(S_{n_j}) = \{v_i^j/v_{i1}^j : 1 \leq i \leq n\} \cup \{u_i^j/v_{i1}^j : 1 \leq i \leq n\}$. Thus $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has $2 \sum_{k=1}^t n_k$ vertices and $2 \sum_{k=1}^t n_k$ edges.

For any graph $G$ with the smallest degree $\delta$ and the largest degree $\Delta$ we have the restriction of $d$ as follows

$$d \leq \frac{(\Delta + 1)(2(|V| + |E|) - \Delta) - (\delta + 1)(\delta + 2)}{2(|V| - 1)}.$$ 

Since sun has $\delta = 1$ and $\Delta = 3$, then we have $d \leq 7$.

In following we give $(a,d)$-VATL of graphs, which consists of the union of $t$ suns for $d \in \{1,2,3,4,6\}$.

**Theorem 1**

For $n_j \geq 3$ and $t \geq 1$, the union of $t$ suns $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has a $(4 \sum_{k=1}^t n_k + 2,1)$-VATL.

**Theorem 2**

For $n_j \geq 3$ and $t \geq 1$, the union of $t$ suns $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has a $(4 \sum_{k=1}^t n_k + 3,2)$-VATL.

**Theorem 3**

For odd $n_j \geq 3$ and $t \geq 1$, the union of $t$ suns $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has a $(4 \sum_{k=1}^t n_k + 3,3)$-VATL.

**Theorem 4**

For $n_j \geq 3$ and $t \geq 1$, the union of $t$ suns $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has a $(2 \sum_{k=1}^t n_k + 3,4)$-VATL.

**Theorem 5**

For odd $n_j \geq 3$ and $t \geq 1$, the union of $t$ suns $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has an $(5,6)$-VATL.

**Conclusion**

We have studied an $(a,d)$-VAT labeling of the union of suns. We found that the graphs $S_{n_1} \cup S_{n_2} \cup \cdots \cup S_{n_t}$ has an $(a,d)$-VATL for $d \in \{1,2,3,4,6\}$. In the case when $d \in \{3,6\}$, for even $n \geq 3$; and $d \in \{5,7\}$, for $n \geq 3$, we do not have the complete answer.

We list here two problems for further investigation.

**Open Problem 1**

Find if there is an $(a,3)$-VAT labeling and $(a,6)$-VAT labeling for even $n \geq 3$.

**Open Problem 2**

Find if there is an $(a,5)$-VAT labeling and $(a,7)$-VAT labeling for all $n \geq 3$.

**Keywords**

Sun graph, vertex magic total labeling, vertex antimagic total labeling.

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Vertex-magic total labelings of union of generalized Petersen graphs and union of special circulant graphs

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Introduction
In this paper all graphs are finite, simple, and undirected. The graph G has vertex set \( V = V(G) \) and edge set \( E = E(G) \), and let \( n = |V(G)| \) and \( e = |E(G)| \). MacDougall et al. [4] introduced the notion of a vertex-magic total labeling. The vertex-magic total labeling of a graph G is a one-to-one mapping from \( EV \) onto the integers \( 1, 2, \ldots, n + e \) such that for every vertex \( v \in V \) there is a constant \( k \) so that for every vertex \( x \) ,

\[
w_v(x) = \lambda(x) + \sum_{y \in N(x)} \lambda(xy) = k,
\]

where \( N(x) \) is the set of all vertices \( y \) that adjacent to \( x \). The constant \( k \) is called the magic constant for \( \lambda \) and \( w_v(x) \) is called the weight of \( x \) under labeling \( \lambda \).

The generalized Petersen graph \( P(n,m) \), \( n \geq 3, 1 \leq m \leq \left\lfloor \frac{n-1}{2} \right\rfloor \), is a regular graph with an outer \( n \)-cycle \( u_1, u_2, \ldots, u_n \), a set of \( n \) spokes \( u_i v_i, 1 \leq i \leq n \), and \( n \) inner edges \( v_i v_{i+m} \) with indices taken modulo \( n \). Generalized Petersen graphs were first defined by Watkins [7]. Let \( 1 \leq a_1 \leq a_2 \leq \ldots \leq a_k \leq \lfloor n/2 \rfloor \), where \( n \) and \( a_i \) ( \( i = 1, \ldots, k \) ) are positive integers. A circulant graph \( C_n(a_1, a_2, \ldots, a_k) \) is a regular graph with \( V = \{v_0, v_1, \ldots, v_{n-1}\} \) and \( E = \{(v_i, v_{i+a_j}) (mod \ (n-1)) | i = 0, 1, \ldots, n-1, j = 1, 2, \ldots, k\} \).

If a regular graph \( G \) possesses a vertex-magic total labeling, we can create a new labeling \( \lambda' \) from \( \lambda \) by setting \( \lambda'(x) = n + e + 1 - \lambda(x) \)

for every vertex \( x \), and

\( \lambda'(xy) = n + e + 1 - \lambda(xy) \)

for every edge \( xy \). Ee call \( \lambda' \) as the dual of \( \lambda \). If \( r \) is the degree of each vertex of the regular graph \( G \), then

\[ k' = (r + 1)(n + e + 1) - k \]

is the new magic constant for \( \lambda' \).

Some results on vertex magic total labeling of particular classes of graphs. MacDougall et al.[4] proved that the cycle \( C_n \) for \( n = 3 \), path \( P_n \) for \( n = 2 \), complete graph \( K_n \) for odd \( n \), and complete bipartite graph \( K_{n,n} \) for \( n > 1 \), have vertex-magic total labeling. Baca, Miller,
and Slamin [1] proved that for \( n = 3, 1 \leq m \leq \left\lfloor \frac{n-1}{2} \right\rfloor \), every generalized Petersen graph 
\( P(n, m) \) has vertex-magic total labelings with the magic constant \( k = 9n + 2, k = 10n + 2, \) and \( k = 11n + 2 \). Balbuena et al. [2] proved that \( m \geq 5 \) and \( m \in 2, 3, \ldots, (n-1)/2 \), circulant graphs \( C_n(1, m) \) has a super vertex-magic total labeling with \( k = (17n + 5)/2 \). The complete survey of the known results on vertex-magic total labeling of graphs can be found in [3]. For the case of disconnected graph, Wallis [6] proved Theorem 1. Slamin et al. [5] proved that the 2 copies of generalized Petersen graphs \( 2P(n, m) \) has a vertex-magic total labeling with the magic constant \( k = 19n + 2 \) and \( k = 21n + 2 \).

Main result

Theorem 1 [6]
Suppose \( G \) is a regular graph of degree \( r \) which has a vertex-magic total labeling. (i) If \( r \) is even, then \( tG \) is vertex-magic whenever \( t \) is an odd positive integer. (ii) If \( r \) is odd, then \( tG \) is vertex-magic for every positive integer \( t \).

The union of \( t \) generalized Petersen graphs \( \bigcup_{j=1}^{t} P(n_j, m_j) \) has a vertex set
\[
V(\bigcup_{j=1}^{t} P(n_j, m_j)) = \{u_i' | 0 \leq i \leq n-1, 1 \leq j \leq t\} \cup \{v_i' | 0 \leq i \leq n-1, 1 \leq j \leq t\}
\]
and the edge set
\[
E(\bigcup_{j=1}^{t} P(n_j, m_j)) = \{u_i'u_{i+1}' | 0 \leq i \leq n-1, 1 \leq j \leq t\} \cup \{v_i'v_{i+m_j}' | 0 \leq i \leq n-1, 1 \leq j \leq t\}
\]

Theorem 2
For \( n_j \geq 3, 1 \leq m_j \leq \left\lfloor \frac{n_j-1}{2} \right\rfloor \), the union of \( t \) generalized Petersen graphs 
\( P(n_j, m_j), j = 1, 2, \ldots, t \), has a vertex-magic total labeling with the magic constant
\[
k = 10 \sum_{i=1}^{t} n_i + 2.
\]

From duality, we can show that the construction of vertex-magic total labeling for union of \( t \) generalized Petersen graph is not unique. However, both labels have the same magic number
\[
k = 10 \sum_{i=1}^{t} n_i + 2.
\]
The union of \( t \) special circulant graphs \( \bigcup_{j=1}^{t} C_n(1, m_j) \) has a vertex set
\[
V(\bigcup_{j=1}^{t} C_n(1, m_j)) = \{v_i' | 0 \leq i \leq n-1, 1 \leq j \leq t\}
\]
and the edge set
\[
E(\bigcup_{j=1}^{t} C_n(1, m_j)) = \{v_i'v_{i+m_j}' | 0 \leq i \leq n-1, 1 \leq j \leq t\}
\]

Special circulant graph \( C_n(1, m) \) is a regular graph with \( r = 4 \). Theorem 1 states that if \( G \) is a regular graph with \( r \) is even, then \( tG \) is vertex-magic whenever \( t \) is an odd positive integer. Moreover, we construct that the union of \( t \) special circulant graphs, \( \bigcup_{j=1}^{t} C_n(1, m_j) \), for not only odd \( t \), but also for even \( t \). For the case of even \( t \), our result is an example for \( G \) regular and even \( r \) that \( tG \) can have vertex magic labeling.

Theorem 3
For odd \( n \geq 5 \) and \( m_j \in \{2, 3, \ldots, (n-1)/2\} \), the disjoint union of \( t \) circulant graphs
\[
\bigcup_{j=1}^{t} C_n(1, m_j)
\]
has a vertex magic total labeling with \( k = 8tn + \frac{n-1}{2} + 3 \).
Corollary 1
For odd $n \geq 5$ and $m_j \in \{2, 3, \ldots, (n-1)/2\}$, the disjoint union of circulants $\bigcup_{j=1}^{t} C_n(1, m_j)$ has a vertex magic total labeling with $k = 7tn - \frac{n-1}{2} + 2$.

Conclusion
We conclude with an open problem for further research direction in this area.

Open Problem 1
Find if there is a vertex magic labeling for disjoint union of $t$ (non)-isomorphic regular graphs other than $\bigcup_{j=1}^{t} P(n_j, m_j)$ and $\bigcup_{j=1}^{t} C_n(1, m_j)$.

Keywords
Circulant graph, Petersen graph, regular graphs, vertex magic total labeling.

References
Visualization and statistical analysis of fuzzy-neuro LVQ in eigen domain for recognizing mixture odors

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Introduction
The olfaction system is essential and very vital sense in the animal world, especially for matting and survival of many species. Recently, technological advances have interest in the possibility of mimicking the human olfaction system electronically, and odor sensing system have showed an enormous number of potential application, such as in different product of foods [1-3], wine [4-5] and gasoline product [6]. One of the potential applications of an odor sensing system is to analyze and discriminate various perfumes odor [7, 8].

Odor discrimination system
The objective of an odor discrimination system is to automatically divide a set of unknown odor into numbers of homogenous odor clusters. The artificial odor recognition system consists of a sensory subsystem, a feature extraction subsystem and neural network as its pattern recognition subsystem. In the sensory and its feature extraction subsystem QCM sensor is used as it showed good correlation between a human threshold and its sensor response [17]. In this paper, we have used 20 MHz QCM sensors, each of which is covered by different thin membrane to build a sensor array with 16 QCM sensors of 20 MHz resonance frequency. Schematic diagram of the experimental system is not explained in this paper; it can be seen in another paper [10].

Fuzzy-neuro learning vector quantization
Fuzzy neural networks based back-propagation [9] learning algorithm have been developed and are widely used [14, 15]. Another fuzzy neural networks algorithm is developed based on Learning Vector Quantization (LVQ) [16], which is called Fuzzy-Neuro LVQ (FNLQV) [8] to distinguish with Fuzzy-Algorithms LVQ (FALVQ) [12]. These fuzzy neural networks used fuzziness number on its neuron and directly calculated the neuron activation using fuzzy similarity [11-13]. In FNLQV, neuron activation is expressed in terms of fuzzy numbers, i.e. a triangular fuzzy number.

Karhunen-Loeve transformation technique
K-L domain transformation or subspace decomposition [18,19], which means to orthogonalize, that is increasing the separability of the extracted feature, and to reduce its dimensionality. The standard analysis using principal components of aromatic data \( x(t) \in \mathbb{R}^n, \ n=0,1,\ldots,n \) is done by determining a set of hidden linear representation parameters \( y_i(t), \ldots, y_m(t) \), called factors or features. These features could then be used for linear least mean-squared-error reconstruction of the original data. If there is enough correlation between the observation variables \( x_i(t) \), then we can reconstruct the pattern with acceptable accuracy using a number of features \( m \) which is much smaller than the data.
dimension \( n \). We often call \( n \) is the superficial dimensionality of the pattern data while \( m \) the intrinsic dimensionality of the pattern data.

**Visualization**

In order to using FNLVQ algorithm, we had developed a GUI based simulation program that were written using Visual C++.

![Figure 1. Visualization of FNLVQ simulation program](image)

**Results**

Results of experiments on recognizing unlearned odors within 12 classes of two-mixture odors problem are depicted in Table 1. both FNLVQ in aroma domain and in its eigen domain show higher recognition rate, about 99%, compare with that of BPNN that just about 53% for 8 sensors and 81% for 16 sensors [3].

<table>
<thead>
<tr>
<th></th>
<th>Aroma Space</th>
<th>Eigen Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 sensor</td>
<td>16 sensor</td>
</tr>
<tr>
<td>CaAl-RoAl</td>
<td>99.9%</td>
<td>98.7%</td>
</tr>
<tr>
<td>RoAl-CIAI</td>
<td>99.6%</td>
<td>99.6%</td>
</tr>
<tr>
<td>CIAI-CaAl</td>
<td>98.8%</td>
<td>98.5%</td>
</tr>
<tr>
<td>Average</td>
<td>99.4%</td>
<td>98.8%</td>
</tr>
</tbody>
</table>

As for the three-mixture-odors problems, Table 2 show the experimental results of FNLVQ recognition rate for 6 classes for both in aroma domain and in its eigen domain, using 8 and 16 sensors.

<table>
<thead>
<tr>
<th></th>
<th>Aroma Space</th>
<th>Eigen Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 sensor</td>
<td>16 sensor</td>
</tr>
<tr>
<td>CaRoAl</td>
<td>85.1%</td>
<td>78.0%</td>
</tr>
<tr>
<td>RoCIAI</td>
<td>79.7%</td>
<td>87.8%</td>
</tr>
<tr>
<td>CIAI-CaAl</td>
<td>98.9%</td>
<td>98.0%</td>
</tr>
<tr>
<td>Average</td>
<td>87.8%</td>
<td>87.9%</td>
</tr>
</tbody>
</table>

As can be clearly seen in this table, the FNLVQ in eigen domain shows slightly higher of its recognition rate, about 90%, compare with that of in aroma domain for about 88%.

**Conclusions**
Experimental results on two-mixture-odors problem show that both FNLVQ in aroma domain and in its eigen domain have high recognition rate, and increasing the number of sensors has no effect on its recognition rate. As in the three-mixture-odors problem, when increasing the number of odor classes to be recognized, the FNLVQ in its eigen domain show its superiority.

**Keywords**
Fuzzy-Neuro learning vector quantization, Karhunen-Loeve transformation, odor discrimination system.

**References**
Antibacterial activity test of *Pangium edule* Reinw, fresh seed extract fractions

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**Introduction**

Fresh seed of *Pangium edule* Reiw (*picung*) has been used by for traditional fish preservation, the treatment extend the storage period for 2 weeks, however, preservation with addition of salt only able to preserve up to 6 days. The antibacterial in the fresh seed tannin, cyanide and fatty acid (Nuraida *et al.* 2000; Widyasari, 2005). Tannin was polyphenol group antimicrobial effect against bacteria, molds and yeast. Tannin isolated from *Rhizopora apiculata*, *Acasia mollissima* and *Quercus aucheri* have microbial activity to *Staphylococcus aureus*, *Micrococcus luteus*, and *Bacillus subtilis*, mold *Alternaria alternate* also yeast *Candida albicans* and *Candida krusei* (Scalbert, 1991, Digrak *et al.* 1999, Sakar *et al.* 2005; Lim *et al.* 2006). The objective of the research to examine antibacterial chromatograph fractions of aquadest and ethanol fresh seed against Gram positive and negative bacteria.

**Material**

Plant Material: Seed of *Pangium edule* collected from Pabuaran, Cileungsi, Bogor. Bacterial assay: Two Gram positive *Micrococcus luteus*, and *Staphylococcus aureus*, and six Gram negative: *Alcaligenes eutrophus*, *Enterobacter aerogenes*, *Flavobacterium gleum*, *Pseudomonas fluorescens*, *Salmonella typhimurium*, and *Serratia marcescens*. Antibiotic Chloramphenicol 10 mg/ml (as positive control). Media; Nutrient Agar (NA), Mueller Hinton agar (MHA).

**Methods**

**Extraction**: The fresh seed *picung* washed, and using followed freeze drying at -40°C and to become powder. Maceration was used for extraction, first step 200 g of fresh seed dissolved in 1000 ml aquadest, shake at 30 rpm for 3 days, with Whatman paper no 42, the filtrate further evaporated at 72 mbar, maceration residue 1000 ml ethanol, shake at 30 rpm for 3 days, the filtrates were evaporated at 175 mbar. The extract were freeze followed by freeze drying and kept in bottle for further analysis (Harbone, 1998: Andarwulan *et al.* 1999).

**Hromatography**: silica gel C-18 70 mesh, column 1,5x15 cm The amount 80 mg/ml extract fresh *picung* from aquadest and ethanol 50%, eluted using gradient methanol:water (5:1 and 7:1), ethanol-ethyl acetate (5:1 and 7:1) and methanol-n-hexane (5:1 and 7:1). Each volume of eluent in comparation of 5:1 500 ml 7:1 400 ml were examined similarity chromatogram pattern UVi spectrophotometer (100-600 nm). The identified fraction were collected and evaporated at 40°C (Harbone, 1998).

**Antimicrobial assays**: Agar diffusion methods was used for assay the antimicrobial activity of extract aquadest and ethanol 50%. Amount of 20 µL bacterial at optical dencity 0.5—I—0.6 inoculated at 15 mL MHA medium, and poured in the petridish. After solidify the sterriled disk paper diameter 6 mm dropped 20 µL consist of 1 mg/ml chromatography fraction.
Incubation was carried out at 37°C for 24 hours. Antibiotic chloramphenicol used as positive control and aquadest as negative control.

**Result and discussion**

Result fraction from chromatography column extract seed fresh *picung* from aquadest shown in Tabel 1. Eluent methanol: H₂O (7:1) give the antimicrobial for all bacteria assayed, the possibility that first fraction have a phenolic, flavonoid, alcaloid, saponin, and tannin component action synergistic inhibited the enzyme on biosynthesis peptidoglycan, lipopolysaccharide, damage the membrane cytoplasm and disturbance of membrane permeability (Gilbert, 1984; Cowan, 1999).

Tab1 1. Antibacterial fractions extract aquadest fresh *Pangium edule* Reiwn. against Gram negative and positive bacteria.

<table>
<thead>
<tr>
<th>Sample code</th>
<th>Eluent Average diameter zone inhibition (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bacterial assay</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>1</td>
<td>Meth:H₂O: 7:1 5.00 3.33 4.67 2.67 4.00 3.33 1.00 3.33</td>
</tr>
<tr>
<td>2</td>
<td>Meth:H₂O: 7:1 1 ND 1.00 2.00 ND ND 1.67 ND ND</td>
</tr>
<tr>
<td>D</td>
<td>Meth:H₂O: 7:1 1 ND 1.33 ND ND ND ND ND ND</td>
</tr>
<tr>
<td>3</td>
<td>Eth: Eth acetate (5:1) 3.67 4.00 3.67 4.00 4.00 1.33 3.67</td>
</tr>
<tr>
<td>25</td>
<td>Eth: Eth acetate (5:1) ND ND ND ND 1.33 ND ND ND</td>
</tr>
<tr>
<td>1</td>
<td>Eth: Eth acetate (7:1) ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>9</td>
<td>Met:n-hexane (5:1) ND ND ND ND 1.00 ND ND ND</td>
</tr>
<tr>
<td>11</td>
<td>Met:n-hexane (5:1) 5.00 3.00 4.00 3.00 4.67 4.33 2.33 4.00</td>
</tr>
<tr>
<td>10</td>
<td>Met:n-hexane (7:1) 4.33 4.33 3.33 3.67 6.00 5.00 2.33 3.00</td>
</tr>
<tr>
<td>12</td>
<td>Met:n-hexane (7:1) 4.67 ND ND ND 6.00 4.67 3.00 4.00</td>
</tr>
<tr>
<td>20</td>
<td>Met:n-hexane (7:1) ND ND ND ND 4.00 ND ND ND</td>
</tr>
<tr>
<td>21</td>
<td>Met:n-hexane (7:1) ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>K (+) chloramphenicol</td>
<td>13.83 11.67 13.00 11.67 14.00 13.56 13.33 8.33</td>
</tr>
</tbody>
</table>

Note: ND= Not Detected, 1=Staphylococcus aureus, 2= Micrococcus luteus, 3= Alcaligenes eutrophus,4= Enterobacter aerogenes, 5=Flavobacterium gleum,6= Pseudomonas fluorescens, 7= Serratia marcescens.
8=Salmonella typhimurium

Result fractions from chromatography column extract seed fresh *picung* from Ethanol 50 % extract shown in Tabe 2. ethanol: H₂O: 5:1 and methanol: H₂O: 7:1 inhibited the Gram positive and negative bacteriathe eluent used semipolar. The eluent have semipolar and polar component have antimicrobial activity. The extract isolated from *Nicolaia speciosa* have component terpenoid, alcaloid, flavonoid and glycoside, have synergistic action to Staphylococcus aureus, Salmonella typhimurium, Pseudomonas aeroginosa and Escherichia coli (Kanazawa et al. 1995).

Table2. Antibacterial fractions extract fresh *Pangium edule* Reiwn against Gram negative and positive bacteria.

<table>
<thead>
<tr>
<th>Sample code</th>
<th>Eluent Average diameter inhibition (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bacterial assay</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>A</td>
<td>Meth:H₂O: 5:1 5.00 5.00 6.00 5.67 3.00 6.00 4.67 5.67</td>
</tr>
<tr>
<td>B</td>
<td>Meth:H₂O: 5:1 4.00 2.33 5.00 2.00 4.00 5.67 5.67 5.00</td>
</tr>
<tr>
<td>C</td>
<td>Meth:H₂O: 5:1 5.67 1.67 5.67 5.00 5.00 5.00 2.00 4.00</td>
</tr>
<tr>
<td>5</td>
<td>Meth:H₂O: 7:1 4.00 4.67 3.00 2.67 4.00 4.00 1.00 3.67</td>
</tr>
<tr>
<td>6</td>
<td>Meth:H₂O: 7:1 5.67 4.33 4.67 5.00 4.67 4.67 2.00 4.00</td>
</tr>
<tr>
<td>7</td>
<td>Meth:H₂O: 7:1 ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>23</td>
<td>Eth: Eth acetate (5:1) 3.00 4.00 4.00 2.67 5.00 3.33 4.33 3.33</td>
</tr>
<tr>
<td>26</td>
<td>Eth: Eth acetate (5:1) ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>18</td>
<td>Eth: Eth acetate (5:1) ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>13</td>
<td>Met:n-hexane (7:1) 2.67 3.67 3.67 1.00 4.67 4.00 3.00 3.67</td>
</tr>
<tr>
<td>16</td>
<td>Met:n-hexane (5:1) ND ND ND ND ND ND ND ND</td>
</tr>
<tr>
<td>14</td>
<td>Met:n-hexane (7:1) 4.33 3.00 3.33 1.00 5.33 5.33 2.00 5.33</td>
</tr>
<tr>
<td>15</td>
<td>Met:n-hexane (7:1) 3.00 5.67 ND 2.67 6.00 4.33 2.33 4.67</td>
</tr>
<tr>
<td>K (+)</td>
<td>chloramphenicol 13.83 12.33 14.00 14.00 14.00 14.67 14.67 11.67</td>
</tr>
</tbody>
</table>

Note: ND= Not Detected, 1=Staphylococcus aureus, 2= Micrococcus luteus, 3= Alcaligenes eutrophus,4= Enterobacter aerogenes, 5=Flavobacterium gleum,6= Pseudomonas fluorescens, 7= Serratia marcescens.
8=Salmonella typhimurium
Conclusions

Antimicrobial assays of fractions obtained using column chromatography of aquadest extract of fresh seed of *Pangium edule* Reinw, which were eluted with methanol:H₂O (5:1) and ethanol-acetate (5:1); methanol: hexane (5:1 and 7:1) and fractions of 50% ethanol extract which were eluted with methanol: H₂O (5:1), ethanol: acetate (5:1) and methanol: hexane (7:1) showed that the fractions inhibited growth of Gram positive and negative bacteria tested.

Keywords

Antibacterial activity, bioactive compounds, Gram positive and negative bacteria, *Pangium edule* Reinw.

References


Biosorption of Cr(Vi) by *Psidium guajava*

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**Introduction**

Waste water containing heavy metals from industrial activities could contribute to environmental damage. Heavy metals, such as chromium, copper, lead, cadmium, etc, are dangerous environmental pollutants. Hexavalent chromium form is of particular because of its greater toxicity (Arslan, 2007). Cr(VI) is soluble in the water in form of divalent oxy-anion, chromate ion (CrO$_4^{2-}$) and dichromate ion (Cr$_2$O$_7^{2-}$). Solutions which contain chromium ion are used for electroplating industry, leather tanning, metals recovery, and neutralizing cadmium, magnesium, zinc, etc (Yakup, 2005).

Several methods have been utilized to remove chromium from industrial wastewaters such as direct precipitation (Kim, 2002) and reduction method (Lu, 2006). However, those methods have disadvantages such as limited in application, high energy needs, and high cost operation. Alternative methods have been conducted by some researchers to solve these advantages especially in its high-cost operation problem. One of these alternative methods is biosorption. Biosorption utilizes the ability of biological materials to accumulate heavy metals from waste streams by either metabolically mediated or purely physico-chemical pathways of uptake (Fourest, 1992). This research will employ leaves and fruits of *Psidium guajava* as biosorbent for chromium adsorption process in solution containing chromium ion.

**Materials and methods**

Experiments used colorimetric method to determine the concentration of dissolved hexavalent chromium, Cr(VI), in artificial wastewater from K$_2$Cr$_2$O$_7$ solution. This method can be used to analyze samples containing Cr (VI) from 0.5 to 50 mg per liter. It used visible light spectrophotometer to measure amount of chromium ion concentration filtrate. Filtrate absorbance was determined photo metrically at wave length of 540 nm. In this method, diphenylcarbazide solution, made from 250 mg 1,5-diphenylcarbazide and 50 mL acetone, was used to increase filtrate solution absorbance. The sorbents used were crushed guava leaves and fruits. All of these materials were obtained from local house yards; materials were crushed by blender, washed, and then dried in the sun for two days. After drying, the materials were kept in vacuum plastic ware. Filtrate concentration was determined from calibration curve. Visible spectrophotometer was calibrated using sample solutions having concentrations of 0; 2.5; 5; 7.5; and 10 mg/L. These samples were used for calibration curve based on measurement of visible spectrophotometer in 540 nm.

**Results and discussions**

Figure 1 shows that, as it is expected, the amount of Cr(VI) adsorbed increases with increasing contact time. Mechanism of Cr (VI) adsorption by leaves and fruits of guava have not been known before. Variation on pretreatment and preparation of biosorbent, method and metal behavior can be considered to explain whether adsorption mechanism is ion exchange,
surface adsorption, chemical adsorption, chemical complexation or complexation adsorption (Arslan, 2007). Electrostatic force, ion exchange and chemical complexation must be considered in analyzing the effect of pH on Cr(VI) adsorption. Thus, the adsorption pattern in acid condition is due to attract-electrostatic force between positive part of biosorbent surface and HCrO$_4^-$ anions of Cr(VI) from solution. On the other side, at pH 7 or 10, there will be a competition between anion Cr(VI) and OH$^-$ from the solution, where OH$^-$ was very dominant compare to anion Cr(VI).

Effect of temperature experiment to adsorption process is determined by varying temperature operation to 25, 35, 45, and 50 °C. Temperature operations change affects to thermodynamic parameters of adsorption process (Agarwal, 2006). Equilibrium constants for Cr(VI) decreased as temperature increases for guava leaves and guava fruits as shown in Figure 2. This phenomenon is due to the exothermic adsorption reactions of Cr(VI) ions with guava leaves and fruits and the weakening of sorptive forces between the guava leaves and guava fruits binding sites and the Cr(VI) ions, and between the adjacent molecules of the sorbed phase.

By assuming activity coefficient is uniform at low concentration (Henry Law), thermodynamic parameters can be determined using equation (Arslan, 2007):

$$K_c = \frac{C_{ae}}{C_{eq}}$$

$$\Delta G^0 = -RT \ln K_c$$

$$\log K_c = \frac{\Delta S^0}{2,303} - \frac{\Delta H}{2,303RT}$$

K$_c$ is equilibrium constant, C$_{eq}$ equilibrium concentration in solution (mg/L), and C$_{ae}$ solid phase concentration at equilibrium (mg/L). $\Delta G^0$, $\Delta H^o$, and $\Delta S^0$ represent change in free energy, enthalpy, and entropy. From equation (3), $\Delta H^o$ and $\Delta S^o$ were obtained by linear Van’t Hoff plot of log $K_c$ versus 1/T as shown in Figure 3. Correlations obtained by linear regression for guajava leaves (3) and fruits (4) are:

$$y = 1894,3X - 2,612$$

$$y = 1602,1X - 0,6299$$

To see the effect of initial concentration of chromium ions in solution, the experiments were varied into 10, 20, 40, 60, and 80 mg/L at 1 atm and 25 °C. These experiments only conducted at pH 2 and contact time of 90 minutes for guava leaves and 240 minutes for guava fruits. Percentage of Cr(VI) adsorbed by guava leaves relatively constant in the range of initial concentration observed, meanwhile, for guava fruits decrease with an increase in initial concentration of Cr(VI) in the solution as shown in Figure 4. The decrease due to active sites in biosorbent surface in solution has reached saturated condition so that biosorbent can not adsorb chromium ions from solution any further.

Conclusions

Experiments have been conducted to adsorb Cr(VI) ion from the solution using guava leaves and fruits as adsorbent. Experiment results showed that the adsorption process occur only at pH 2. The mechanism of Cr(VI) ion binding to guava leaves and fruits may include surface adsorption, physical adsorption, and chemical adsorptions. At pH 2, the experiment was reached equilibrium condition for guava leaves and fruits at the contact time of 90 minutes and 240 minutes, respectively, and percentage of chromium adsorbed reaching 99,7% for initial chromium concentration of 10 mg/L. Meanwhile, for commercial powdered activated carbon (PAC) at the same pH condition and operation conditions, the experiment has reached equilibrium condition in contact time of 15 minutes. The equilibrium constants for Cr(VI) adsorption and adsorptive capability of sorbents decreased with increasing temperature indicated that biosorption processes using guava leaves and fruits were exothermic processes. Cr(VI) biosorption on guava leaves and fruits were described only by the Freundlich isotherm model. From adsorption isotherm experiment, the sorption capacities ($K_f$) of guava leaves and
fruits were 4.2 and 2.9 mmol/gram, respectively. Meanwhile, the intensity values of adsorption processes (n) for both materials were 2.2 and 2.5, respectively. These intensity values showed that guava leaves and fruits are very valuable as chromium adsorbent, or at least are potential as biosorbent for chromium removal from wastewater.

**Keywords**
Biosorbent, biosorption.

![Figure 1](image1.png)
**Figure 1.** Variation of %CR(VI) absorbed with contact time.

![Figure 2](image2.png)
**Figure 2.** Variation of equilibrium constant, $K_c$, with temperature, $T$.

![Figure 3](image3.png)
**Figure 3.** Variation of Log ($K_c$) with $1/T$.

![Figure 4](image4.png)
**Figure 4.** Variation of %CR(VI) absorbed with initial concentration of Cr(VI) in the solution.

**References**


Characterization of activated carbon as adsorbent from Riau coal by physical activation method

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Introduction
Activated carbon consumption is continuously being increased because they are used in important areas such as waste, drinkable water treatments, atmospheric pollution control, poisonous gas separation, solvent recovery (Marsh, Harry et al. 2006 and B. Serrano-Talavera et al. 1997). In addition, as is well-known, any cheap carbonaceous material can be used as a raw material for the production of activated carbons such as wood, peat, fruit nuts, petroleum coke, bones, coconut shell, and coals. Anthracite and bituminous coals have been the major sources (B. Serrano-Talavera et al. 1997 and Yang, Ralph. T, 2003).

The modern manufacturing processes to produce activated carbon basically involve the following steps: raw material preparation, low-temperature carbonization, and activation. An adsorbent with a highly developed porosity and a correspondingly large surface area is obtained only by activating the carbonized material either by physical or chemical activation. In the present study, Riau coals were chosen as precursors of activated carbon by physical activation method and describes the influence of the activation duration on the development of the surface structure, this paper also describe the CO₂ adsorption on activated carbon.

Experimental section
Coal Characteristics
Riau coals were used as the starting material. The analyses of the raw coals are shown in Table 1. The as-received coals were crushed and sieved to a particle size of 5-10 mm before being treated.

<table>
<thead>
<tr>
<th>Unsere</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inherent Moisture</td>
<td>5.59</td>
</tr>
<tr>
<td>Ash Content</td>
<td>17.96</td>
</tr>
<tr>
<td>Volatile Matter</td>
<td>34.51</td>
</tr>
<tr>
<td>Fixed Carbon</td>
<td>41.94</td>
</tr>
<tr>
<td>Total Sulphur</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Production of Activated Carbon
The production of activated carbons by a physical activation technique was completed in an vertical autoclave activation reactor with a furnace. The processing steps used to produce the activated carbons were as follows: Carbonization; Pyrolysis of fresh coals were performed in a furnace under a stream of N₂ at ± 80 cm³/minute. The samples were heated at around 7.5 °C/min from room temperature to maximum heat treatment temperatures in 900 °C for 1
hour. Activation; Following the carbonization process, the char samples were gasified, also in the furnace, in a stream of CO2 at ± 80 cm³/minute. The samples were heated at around 7.5 °C/min from room temperature to maximum heat treatment temperatures in 950 °C for 60 (RU1), 90 (RU2), 120 (RU3), 150 (RU4), and 180 (RU5) minute. After activation process, the activated carbon were crushed to granule size 10x20 mesh. Activated carbons with various degrees of burn-off were prepared. Figure 1 presents a schematic of the process.

Result and discussion

Effect of activation time

In this work the result for five activation time were compared. Table 2 describe the effect of activation time on amount of carbon, longer activation time result in higher amount of carbon.

Table 2: Presentation of carbon on material (%)

<table>
<thead>
<tr>
<th>Material</th>
<th>Burn-off (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed carbon Riau Coal</td>
<td>41.94</td>
</tr>
<tr>
<td>Activated carbon; 60 minute activation process</td>
<td>75.22</td>
</tr>
<tr>
<td>Activated carbon; 180 minute activation process</td>
<td>88.19</td>
</tr>
</tbody>
</table>

Figure 2 describe the effect of activation time on burn-off and surface area. It can be seen from figure 2, in general longer activation time result in higher burn-off and surface area. This result was consistent with Marsh, Harry et al., 2006, that activation process influence of heat rate, mass flow rate of activating agent, activating agent, equipment and activation time.

Adsorption CO2 activated carbon

The method of volumetric adsorption isotherms of CO2 on activated carbon at 30 °C based on Belal, Dawoud et al. 2003 are shown in Figure 3. The adsorption isotherms of CO2 was higher on RU5 than RU3. This indicated that RU5 have surface area and total pore volume higher than RU. Adsorption capacity CO2 on RU5 is 48.3 mgr/gr activated carbon in 1 hour and adsorption capacity CO2 on RU3 is 44.1 mgr/gr activated carbon in 1 hour. This result was consistent with Yang, Ralph. T, 2003 that adsorption isotherm of adsorbate on adsorbent
influences of capacity of activated carbon. Adsorption capacity CO\textsubscript{2} commercial activated carbon is 68.9 mg/g in 1 hour, around 1.5 times from RU5 and RU3.

![Figure 3. CO\textsubscript{2} Adsorption on activated carbon at pressure equilibrium 1.5 bar (a); Schematic kinetic adsorption test rig (b)](image)

**Conclusion**

Riau coals were proven to be feasible materials for activated carbon preparation by a physical activation method at 950°C. Activation time influences of burn-off, surface area, structure of activated carbon and adsorption isothermal. Long activation time resulting better quality of activated carbon and in this study the optimum activation time was 180 minute.

**Acknowledgment**

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Certificate of Sampling and Analysis, 2007, PT. Superintending Company of Indonesia (Sucofindo).


**Characterization of killer toxin secreted by mycocinogenic yeasts originating from Cibodas Botanical Garden**

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**Introduction**
In accordance with the increasing of human population in the world, food and drink products have become the most important and dynamic industrial sectors. Microbial spoilage is a serious problem for the food industry as fungal contamination can occur during processing as well as handling of the end products. Since yeasts can generally resist extreme conditions better than bacteria, they are often found in products with low pH and in those containing preservatives (Deak, 2007; Moreira et al., 2001; Suriyarachchi, & Fleet 1981). To counterfeit spoilage, some manufacturers add benzoate or sorbate to food or drink products. However, under certain conditions some yeasts and molds may also be resistant to inhibition by sorbate (Piper et al., 2001, Stratford, 2007) These finding lead us to search an alternative preservative to prevent bacterial and fungal spoilage. Some yeasts strains produce and excrete extracellular toxins, mycocins, which are lethal to other sensitive yeasts and fungi (Golubev, 1998).

Various potential applications of killer yeasts and their toxins have been studied (Marquina et al., 2002; Guyard et al., 2002); . They can be used to eliminate undesirable contaminating yeasts during fermentations by conferring the killer character on starter strains and can be considered as bio-control agents in the preservation foods (Ciani & Faticimenti, 2004). The killer activity and protein profiles of 18 selected yeast strains isolated from leaves and fruits grown in Cibodas Botanical Garden were presented here.

**Material and methods**

*Killer activity test*

Killer sensitivity was assayed using seeded-agar-plate technique according to Buzzini & Martini (2000). Spoilage yeasts grown in YM slant medium was suspended in sterile water (~10⁶cells/mL) and plated as a lawn onto KM-MB agar. Killer toxins from potential mycocinogenic strains were prepared by growing yeasts in a pH 4.4 buffered liquid KM medium without methylene blue at 30⁰C, and harvested daily until 3 days. Yeast cells were isolated by centrifugation at 3000 x g for 10 min at 30⁰C and the supernatant filtered through sterile 0.45-µm polivinyliden fluoride membrane before precipitated with cold ethanol with final concentration of 70%. All the samples (supernatant, filtrate and precipitant) used in this study was kept at 4⁰C. The activity of killer toxins was tested using lysis zone assay by pipetting 0.1 mL of samples in wells (10 mm in diameter) cut into agar. The plates were incubated at 30⁰C and were observed daily for 3 days. If the killer reference strain was surrounded by a clear zone of growth inhibition, the lawn spoilage yeast was declared sensitive. The lawn strain was considered killer resistant if there was no clear zone of growth (Izgu & Altinbay, 2004; Vital et al., 2002) The confirmation of activity was obtained through triplicate-plating techniques.
**SDS-PAGE analysis**

Supernatant of the potential yeast cells were subjected to electrophoresis for a total of 1 h, following the method described by Laemmli (1970) under denaturing conditions, using a 12% acrylamide gel with coomassie brilliant blue staining. The molecular mass was determined by comparing the mobility of the purified protein with that of known marker proteins (pre-stained broad range, Bio-Rad).

**Results and discussion**

SDS-PAGE results showed that the toxin moved in five different running patterns of 12% of gel electrophoresis. No band was detected from UICC Y-324, Y-331, Y-343, Y-367, Y-385 and Y-391. Strains from *Rhodotorula* (Y-318, Y-325, Y-332, Y-381, Y-384 and Y-386) showed similar pattern detected at position around 35 kDa, 49 kDa and 100 kDa. Major bands were detected at position around 31 kDa; 39 kDa, 70 kDa and 80 kDa for *Candida rancensis* UICC Y-326. *Cryptococcus aethanolamini* UICC Y-322 showed similar pattern of bands to *C. rancensis* UICC Y-326, with little differences at lower bands position (Figure 1).

The killer activity test showed that among 18 tested strains used in this study, prominent clear zone of growth inhibition was observed in 2 strains of phylloplane yeast (*Cryptococcus aethanolamini* UICC-322 and *Candida rancensis* UICC Y-326), while *Cryptococcus aethanolamini* UICC-379 (Figure 2A) and UICC Y-319 (data not shown) showed weak activity. No inhibition zone was observed in other strains (*Rhodotorula* UICC Y-318, Y-325, Y-332, Y-381, Y-384 and Y-386; *Cr. laurentii* UICC Y-324, *Candida rancensis* UICC Y-331; *Deb. nepalensis* UICC Y-328 and Y-343; *Metschnikowia reukaufii* UICC Y-351; *Sporidiobolus pararoseus* UICC Y-367, and *Pseudozyma aphidis* UICC Y-391). The activity of killer strains was stable when kept at 40°C. However, the activity was destroyed by heating at 100°C (Figure 2B). This result is consistent with that reported by Izgu & Altinbay (2004). They showed that killer activity of K5 type toxin of *Pichia anomala* NCYC 344 was stable at temperatures 4 - 30°C, but decreased up to 60% when incubated at 50°C - 100°C for 1 h. The mycocinogenic activity demonstrated by *Cr. aethanolamini* UICC Y-322 (basidiomycetous) and *Candida rancensis* (ascomycetous) UICC Y-326, showed a wide spectrum for inhibition activity due to their ability to inhibit the spoilage yeasts of different taxonomical groups.

![Figure 1. SDS Polyacrylamide Gel Electrophoresis (12%) of 11 mycocinogenic potential strains of phylloplane yeast.](image)
Conclusion

The results presented here clearly demonstrated that phylloplane yeasts, especially *Craethanolamini* UICC Y-322 and *C.rancensis* UICC Y-326 can suppress the growth of spoilage yeast isolated from yogurt and could be promote as an alternate biopreservative in food industry. Futher studies are needed to reveal the molecular basis of killer phenomenon.

Keywords
Killer activity, mycocin, SDS-PAGE, yeast, yogurt.

Acknowledgement
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References
Combination of cellulase and celubiase for bioethanol production from bagasse and waste paper through Simultaneous Saccharification and Fermentation (SSF)

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Introduction
Ethanol productions are mostly derived from starch or sucrose [Gong et al., 1999]. Expansion of ethanol production for biofuel should not compete for food. Lignocellulose is abundant material available in forestry, domestic and agricultural residues. Sugarcane bagasse (Saccharum officinarum) is a potential renewable biomass resource, since it is readily available and considerably inexpensive. Our research aims to obtain novel process for the production of ethanol from bagasse and old paper. The propose process combines enzymatic hydrolysis, subsequent physical treatment with steam, biological treatments with selective lignin-degrading white rot fungi, and combination of both treatments process. Hydrolysis and fermentation were performed in the same reactor and simultaneously occurred. Thus, the presence of yeast together with the cellulolytic enzyme complex reduces the accumulation of sugars within the reactor, thereby increasing yield and saccharification rate with respect to separate saccharification and fermentation. Another advantage of this approach is that a single fermentor is used for the entire process, thereby curbing the investment costs.

Method
Bagasse was obtained from a sugar factory in Lampung and East Java. Sugarcane bagasse was milled, screened (30-60-mesh), air-dried to a final humidity 10% and stored under dry conditions. The same method was used for old newspaper and oldpaper. P. ostreatus ATCC 66376, C. subvermispora ATCC 90467, L. endodes IFO 6654 and Saccharomyces cerevisiae AM12 were precultured on PDA. Cellulase (Meicellase from Trichoderma viride, Meiji Seika Co. Ltd.) and celubiase (98%, Sigma-Aldrich, Slovakia) were used. Lignin, holocellulose, α-cellulose and hemicellulose contents were analyzed by Kason lignin and Wise methods, respectively. Ethanol concentration was determined by GC using SUPELCOWAX-10 (Supelco Inc., 0.53 mm i.d., 15 m, 0.5 mm) oven temperature at 50oC of a Shimadzu GC-14A GC.

Results and discussion
Ethanol production with enzymes
Combination of enzyme cellulase and celubiase increased ethanol production from bagasse by SSF using Saccharomyces cerevisiae AM12. The highest ethanol concentration was achieved after hydrolysis by enzyme cellulase-celubiase in SSF at pH=5 up to 6.94 g/L. This result indicated that although cellulase has a group of cellobiases (β-glucosidase), it can not optimally convert cellubiose (disaccharides) to glucose. Hydrolysis of cellulose to glucose is often followed by partial hydrolysis of cellulose to cellubiose. Thus, addition of celubiase enhances the conversion of cellulose to ethanol. The
Experiments were carried out at pH = 5. The ethanol production during incubation time of 0-48 h increased very significantly, whereas after 48 h incubation different result was occurred. These results indicated that incubation more than 48 h the enzyme and yeast were not so effective in converting bagasse to ethanol. Fermentation period or incubation time to achieve constant ethanol yield in this experiments was shorter compared to other studies. Ballesteros et al. (2004), reported that the maximum ethanol production from biomass using Kluyveromyces marxianus CECT 10875 and enzyme cellulase was done on fermentation period of 72-82 hr. Other study showed 72-82h incubation time to achieve final ethanol concentration using thermo-tolerant yeast and enzyme cellulase at 10% substrate by SSF of lignocellulosic waste (including bagasse) [Adrados et al., 2005]. The highest yield of ethanol production of bagasse was 13.87% based on original bagasse or 27.74% based on cellulose.

Conversion of bagasse to ethanol with combination of enzyme cellulase-cellubiose was 48.87% and the conversion of bagasse to ethanol with enzyme cellulase only was 42.03%. The increase was about 6.8% as cellulase-cellubiose was used. Conversion was calculated from the highest ethanol yield from experiment (13.87% based on original bagasse or 27.74% based on cellulose), compared with maximum yield from theoretical (28.43% based on original bagasse or 56.86% based on cellulose).

Effect of combination of these enzymes also have been examined on old newspaper and paper. The combination of enzymes increased ethanol production especially in newspaper.

**Effects of pre-treatment**

Combination of white rot fungi C. subvermispora and steam (180oC) increased ethanol production from bagasse. Ethanol production after incubation time 48h, 72 and 96h was about 12.73, 12.82 and 12.86 g/L, respectively (Fig. 1). The increasing of ethanol yield by combination of fungal treatments and steam treatments were ascribed to increase in accessibility of cellulolytic enzymes to cellulose by decomposing Lignin surrounding the polysaccharide and solubilised of lignin and hydrolytic degradation of hemicellulose in steam. C. subvermispora is known as a selective white-rot fungus that degrade lignin in wood cell walls without penetration of its extra cellular enzymes into the cell wall region [Watanabe et al., 2003].

![Figure 1. Ethanol production with enzyme cellulase-cellubiose using combination steam at 180oC for 60 minutes and white rot fungi treatment for 8 weeks](image)

White rot fungi like C. subvermispora, L. edodes are selective lignin degrading fungi that are able to decompose lignin in bagasse without intensive damage to cellulose [Samsuri et al., 2005]. Yuan-Zong Lai concluded that the reactivity and accessibility of cellulase and lignins depend on many factors such as crystalline and supramolecular structures [1996]. The other aspect water has an unusually high dielectric constant that enables ionic substances to dissociate. Water is able to dissolve all of the lignin and hemicellulose. Steam cleaves hemiacetal linkages in biomass, so that access of cellulase-cellubiose to polysaccharides is easier (Antal, 1996).
Calculations on ethanol yield (in %-tage) with combination of steam (180°C) and white rot fungi (C. subvermispora) treatments showed the highest ethanol yield was 25.72%, based on original bagasse; or 51.44%, based on cellulose. Theoretically, the maximum yield of ethanol production from bagasse was 28.43% (based on original bagasse) or 56.86% (based on cellulose). This result indicated that 90.02% of theoretical yield was achieved if bagasse converted to ethanol with enzyme cellulose-cellubiase and combination of steaming and white rot fungi treatment on SSF. Conversion was calculated from the highest ethanol yield from experiment (25.72% based on original bagasse or 51.44% based on cellulose), compared with maximum yield from theoretical (28.43% based on original bagasse or 56.86% based on cellulose).

Conclusions
Combination of cellulase and cellubiase increased ethanol production from bagasse by SSF using Saccharomycess cerevisiae. The highest ethanol concentration was 6.94 g/L, this was an increase of 16% if compared with ethanol concentration using enzyme cellulase only (5.98 g/L). The conversion of bagasse to ethanol was 48.87%, it was an increase of 6.84% compared with cellulase only (42.03%). This combination of cellulase and cellubiase also increased ethanol production from oldnewspaper and old paper raw materials.
Pre-treatment with combination white rot fungi (C. subvermispora) and steam treatments increased ethanol production very significantly. The highest ethanol production was 12.86g/L. The highest ethanol yield was 25.72%, based on original bagasse or 51.44%, based on cellulose. The conversion of bagasse to ethanol was 90.02%, which meant an increase of 51.11% compared to ethanol conversion with cellulase-cellubiase without pre-treatment (48.87%).

Acknowledgment
The Ministry of Research and Technology (MoRT) of the Republic of Indonesia are gratefully acknowledged for their financial supports to this research through INSENTIF scheme (No:126/MKp/XI/2006).

Keywords
bagasse, bioethanol, cellulase, cellubiase, fermentation, enzymes, saccharification.

References
Cryosurvival of goramy (*Osphronemus goramy*, Lacepede 1801) spermatozoa after subzero freezing

**Introduction**

Indonesia is one of the two megabiodiversity countries in the world, besides Brazil. About 44 out of 360 species of freshwater fish are endemic in Indonesia (World Conservation Monitoring Centre, 1992). Indonesian giant goramy (*Osphronemus goramy*, Lacepede 1801) is an indigenous species in Indonesian fresh water which also has very important economic value (Sunarma *et al.* 2007). Those of endemic (local) species are getting extinct if exploited in uncontrollable. There were two strategies in order to protect those of local (endemic) species, either by *in situ* (re-stocking) or by *ex situ* conservation (cryopreservation). Cryopreservation is a process to maintain genetic material in subzero freezing. The expectation result of the cryo-preserved materials were still performed in good physiological function. The successful of cryopreservation were influenced by cryoprotectant and extender. The methodologies, development and application of cryopreservation of fish spermatozoa were reported some for species: carp (Withler, 1982; Harvey, 1983; Horvath *et al.*, 2003), rainbow trout (Stoss & Donaldson, 1983) and other salmonids (Harvey *et al.*, 1982). This communication presents the preliminary results from the study of goramy spermatozoa cryosurvival at different extender (skim milk and sucrose).

**Material and methods**

**Collection of ejaculated semen**

Mature male goramies obtained from a private commercial hatchery were brought into laboratory. The ejaculates from a total of four male goramies were collected by hand stripping, 7—8 hours after injected intra-muscularly with Ovaprim at a dose of 0.7 ml/kg body weight according to modification method of Sunarma *et al.* (2007).

**Semen dilution**

The ejaculated semen were diluted with the solvent (15% skim milk-fish ringer + 10% methanol; 1 : 5) according to Harvey (1983) or (0.5% sucrose-Kurokura II + 10% methanol; 1 : 9) according to Horvath *et al.* (2003).

**Equilibration and freezing**

Samples were stored in 2 ml cryogenic tube, equilibrated at temperature 4 °C for 0 (for 0.5% sucrose) and 10 minutes (for 15% skim milk), respectively according to the modification method of He & Woods (2003). Samples were then stored in -34 °C (deep freezer) for 24 hours.

**Post-thaw parameters examined**

After thawing by immersing the cryogenic tubes in a waterbath at 40 °C for 13 sec., each sample was then evaluated for the following parameters using a light microscope with the aid of a digital eye-piece connected to the computer (image driving software; Scopephoto 2.0.4):
the percentage of spermatozoa motility, viability, abnormality, and the total spermatozoa per milliliter ejaculate.

**Results and discussion**

Fresh semen were whitish color, pH 8, and 100 µl of volume per ejaculate. The viable or motile sperm showed green color (transparent) on the sperm head, while the non-viable sperm showed pink or red color on the sperm head (Fig. 1). Most of the abnormal sperm has bigger head (Fig. 1). The percentage of sperm viability, motility, abnormality, and spermatozoa concentration of fresh semen were: 86%, 72.73%, 13%, and 22.75 x 10^7 cell/ml, respectively. While post-thawed sperm (diluted with 0.5% sucrose-Kurokura II + 10% methanol) showed: 36%, 12.12%, 30%, and 1.97 x 10^7 cell/ml, respectively. On the other hand, post-thawed sperm (diluted with 15% skim milk-fish ringer + 10% methanol) showed: 27%, 66.67%, 35%, and 4.88 x 10^7 cell/ml, respectively.

The highest post-thawed sperm viability (36%) was the combination of 0.5% sucrose-Kurokura II extender and 10% methanol, while the highest post-thawed sperm motility (66.67%) was the combination of 15% skim milk-Fish Ringer and 10% methanol. The lowest post-thawed sperm abnormality (30%) was the combination of 0.5% sucrose-Kurokura II extender and 10% methanol, while the highest post-thawed sperm concentration (4.88 x 10^7 cell/ml ejaculate) was the combination of 15% skim milk-fish ringer and 10% methanol. All of the percentage of sperm viability, motility, abnormality, and spermatozoa concentration were showed in Table 1.

![Figure 1. Spermatozoa profile (Eosin Y; 10 x 40)](image)

**Table 1. The pre-freezed and the post-thawed sperm profile**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Viability</th>
<th>Motility</th>
<th>Abnormality</th>
<th>Concentration (cell/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-freezed (fresh semen)</td>
<td>86%</td>
<td>72.73%</td>
<td>13%</td>
<td>22.75 x 10^7</td>
</tr>
<tr>
<td>10% Methanol + 0.5% Sucrose-Kurokura II</td>
<td>36%</td>
<td>12.12%</td>
<td>30%</td>
<td>1.97 x 10^7</td>
</tr>
<tr>
<td>10% Metanol + 15% Skim milk-Fish Ringer</td>
<td>27%</td>
<td>66.67%</td>
<td>35%</td>
<td>4.88 x 10^7</td>
</tr>
</tbody>
</table>

Although Kurokura II and Fish Ringer are the commonly used extender for freezing fish sperm, the process for preparing the extender involves complicated procedures including storage for one or more days prior to use in addition to microbiological problems. Moreover, there are considerable individual differences in the fertilizing capacity of cryopreserved fish spermatozoa frozen either in Kurokura II- or Fish Ringer-based extender. Thus, an improved system for cryopreservation of fish spermatozoa is required for successful breeding programs. Skim milk and sucrose are extract from biological products, however, both of them are commercially available as a reagent and widely used as a cryoprotective additive in carp (Harvey, 1983; Horvath *et al.*, 2003), mouse (Nakagata, 2000), goat (Dorado *et al.*, 2007), and canine spermatozoa (Abe *et al.* 2008). In addition, sufficient exposure time to the cryoprotectants may be a critical factor for the viability of frozen goramy spermatozoa. According to Bergeron *et al.* (2007), skim milk prevents the binding of seminal plasma protein to bull sperm and reduces sperm lipid loss while also maintaining sperm motility and viability during storage at 4°C.

**Conclusion**

The results presented here clearly demonstrate that an effective, simple extender composed of skim milk-fish ringer or sucrose-Kurokura II with methanol are available for the cryopreservation of goramy spermatozoa as an alternative to extender, and may be contribute to efficient exchange of genetic materials.
Aknowledgements
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Keywords
Cryosurvival, *Osphronemus goramy* spermatozoa, 0.5% sucrose, 15% skim milk, 10% methanol.

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Introduction
One of the most important messages in The World Summit on Sustainable Development in year 2002 is the prediction of energy supply in the next 50 years that will become more and more difficult. By that time, the energy demand will double what we need nowadays. Indonesia will also face challenges in increasing energy demand and in the same time decreasing fossil fuel production. Blessed for rich biological resources and available fertile lands, Indonesia is focusing on the development of the two most common types of biofuels, i.e. ethanol and biodiesel.

Bioethanol in Indonesia
Ethanol is normally and largely produced through fermentation of any pre- or untreated carbohydrate-containing biomass (starches, sugars, or cellulosics). This biological process name is then attached to the product, which is then commonly called “bioethanol”. National launch of bioethanol-blended gasoline in early 2005, symbolized the new era of biofuel in Indonesian transportation. However, the blended bioethanol-gasoline fuel, or popularly called “gasohol”, requires slightly different conduct.
Bioethanol can be produced by converting the starch content of biomass feed stocks (e.g. cassava, corn, potatoes, beets, sugarcane, and wheat) into alcohol. Several potential biomass resources in Indonesia are listed in Table 7. Potential Biomass Resources in Indonesia.

Table 7. Potential Biomass Resources in Indonesia

<table>
<thead>
<tr>
<th>Plant</th>
<th>Part of Plant</th>
<th>Ethanol Productivity (L/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava</td>
<td>Root</td>
<td>4,500</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>Root</td>
<td>7,800</td>
</tr>
<tr>
<td>Sugar Cane</td>
<td>Stalk</td>
<td>5,000 –6,000</td>
</tr>
<tr>
<td>Corn</td>
<td>Grain</td>
<td>5,000-6,000</td>
</tr>
<tr>
<td>Aren</td>
<td>Sap</td>
<td>40,000</td>
</tr>
<tr>
<td>Nipah (Mangrove)</td>
<td>Sap</td>
<td>5,000-15,000</td>
</tr>
<tr>
<td>Lontar</td>
<td>Sap</td>
<td>8,000 –10,000</td>
</tr>
<tr>
<td>Coconut</td>
<td>Sap</td>
<td>8,000 –10,000</td>
</tr>
<tr>
<td>Paddy</td>
<td>Stalk</td>
<td>1,000 –2,000</td>
</tr>
<tr>
<td>Forest plants</td>
<td>Wood waste</td>
<td>No data available</td>
</tr>
</tbody>
</table>

Sources: Panaka and Yudiharto, 2007

Table 8. Export of Ethanol from Indonesia

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (ton)</th>
<th>In US$ (x 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>30,197</td>
<td>9,857</td>
</tr>
<tr>
<td>2002</td>
<td>27,518</td>
<td>10,757</td>
</tr>
<tr>
<td>2004</td>
<td>22,198</td>
<td>9,180</td>
</tr>
</tbody>
</table>

Source: Kompas. April 19, 2006
In our Industrial Bioprocess research group at Universitas Indonesia (IB UI), experiments are underway since 2004 to produce ethanol from bagasse by simultaneous saccharification and fermentation (SSF). Combination of cellulase and cellubiase were used following hydrolisis. Fermentation by using Saccharomyces cerevisiae is done in the same reactor tubes. Combination of cellulase and cellubiase increased ethanol production.

**Biodiesel in Indonesia**

Diesel fuel is largely utilized in the transport, agriculture, commercial, domestic, and industrial sectors for the generation of power/mechanical energy. The substitution of even a small fraction of total consumption by alternative fuels will have a significant impact on the economy and the environment. The situation has led to the search for an alternative fuel, which should be technically acceptable, economically competitive, environmentally acceptable and easily available (Srivastava and Prasad, 2000). From the of these requirements, triglycerides and their derivatives may be considered as viable alternatives for diesel fuels. Vegetable oils are widely available from a variety of sources, and they are renewable.

Biodiesel production technology has referred to the reversible transesterification reaction, in which triglyceride molecule with methanol (methanalysis) is converted to alkyl methyl ester and glycerol. Although higher alcohols (ethanol) can be used in the transesterification, however, methanol is more advantageous since the two main products, fatty acid methyl ester (FAME) and glycerol, is hardly miscible and thus form separate phases – an upper ester phase and a lower glycerol phase. Moreover, the price of methanol is cheaper than ethanol which makes it preferable for commercial biodiesel production.

Palm oil was the preference of raw material for biodiesel production. However, there are pressures from domestics, activists and government to seek non feedstock raw materials. Since then, *Jatropha*, especially *J. curcas* has been on the field.

From the renewable energy policy, especially biofuels, it is stated that the target of biodiesel use in 2010 is 10% of the total diesel oil for transportation consumption. Error! Reference source not found. shows the potential biodiesel for the substitution of transportation sector. The figure of 10% equals to an amount of 1.337.000 million tones biodiesel per year. To meet this target, Indonesia should develop 15 to 40 units biodiesel plant at commercial scales with the plant size of 30,000 to 100,000 tones per year.

### Table 9. Projected Biodiesel Consumption for Industrial Sector up to 2010 with various Blending percentage (Thousand kL)

<table>
<thead>
<tr>
<th>Year</th>
<th>Diesel oil for industry</th>
<th>10 %</th>
<th>20 %</th>
<th>30 %</th>
<th>40 %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BD</td>
<td>F</td>
<td>BD</td>
<td>F</td>
<td>BD</td>
</tr>
<tr>
<td>2005</td>
<td>8,320</td>
<td>832</td>
<td>7,488</td>
<td>1,664</td>
<td>6,656</td>
</tr>
<tr>
<td>2006</td>
<td>8,570</td>
<td>857</td>
<td>7,713</td>
<td>1,714</td>
<td>6,856</td>
</tr>
<tr>
<td>2007</td>
<td>8,827</td>
<td>883</td>
<td>7,944</td>
<td>1,765</td>
<td>7,062</td>
</tr>
<tr>
<td>2008</td>
<td>9,091</td>
<td>909</td>
<td>8,182</td>
<td>1,818</td>
<td>7,273</td>
</tr>
<tr>
<td>2009</td>
<td>9,364</td>
<td>936</td>
<td>8,428</td>
<td>1,873</td>
<td>7,491</td>
</tr>
<tr>
<td>2010</td>
<td>9,645</td>
<td>965</td>
<td>8,681</td>
<td>1,929</td>
<td>7,716</td>
</tr>
</tbody>
</table>

**Road map of bioenergy in Indonesia**

Indonesian government shows has made various policies which are supporting the development of biodiesel energy. Presidential Regulation No. 5/2006 regarding the National Energy Policy (Perpres, 2006) and Presidential Instruction No. 1/2006 regarding the utilization of biofuel (Inpres, 2006) are released formally on 25 January 2006.

The National Energy Policy is intended to secure national energy supply and to support the sustainable national development, and becomes the guidance of the national energy management in efforts the fulfillment of national energy security. To achieve the targets, the National Energy Policy implementing the main and supporting energy policy as shown in Table 10.
Table 10. Indonesia National Energy Policy

<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Supply Side</th>
<th>Utilization Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main Policy</td>
<td>• Production exploration</td>
<td>• Energy Efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Energy Conservation</td>
<td>• Energy Diversification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Production Optimization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy price will gradually change to the economical price</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consider the environmental factor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Supporting Policy</td>
<td>Energy infrastructure development</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Subsidy policy for poor people</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Government and private sector partnership scheme</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Public empowerment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Research and development promotion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Coordination between related stakeholders</td>
<td></td>
</tr>
</tbody>
</table>

Source: Department of Energy and Mine Resources, 2006

Conclusions
By 2010 Indonesian plan to replace 10% of the country’s total oil-based fuel consumption which reached 70 million kiloliter last year according to the roadmap. Regarding to this, Government has issued policies & regulations on the supply & utilization of biofuels alternative fuel and providing incentive and tariff.

Government has to establish a commercialization scheme for bioethanol utilization in order to integrate with an existing fuel commercialization and also creating a simple testing system and standard procedure for bioethanol.

The stages of biodiesel development from research to be ready commercialized have been done and several important milestones have been achieved but more still have to be done. These include how to accelerate the construction of new biodiesel plants, plantation as a key driver in the continuity of raw material which is supported by the committed government policy and regulation. This implies all biodiesel stakeholders should work harder for the success of biodiesel program in Indonesia.

Keywords
Biodiesel, bioenergy, bioethanol, research implementation, roadmap.

Reference
Indonesian Kickxellales: Two species of Coemansia and Linderina

Introduction
The order Kickxellales R.K. Benj. (Kickxellomycotina) contains one family and nine genera (Kurihara and Degawa 2006). Within the Kickxellomycotina, Kickxellales is phylogenetically closest to the harpellalean genus Orphella L. Léger & M. Gauthier (White 2006; White et al. 2006), an inhabitant of stonefly nymph guts (Misra and Lichtwardt 2000). Most species of Kickxellales have been isolated from mammal excrement, soil, rhizosphere soil, other fungi, and cadavers and excrement of soil-dwelling arthropods (Linder 1943; Kwas’na et al. 1999; Benny et al. 2001, 2004; Ho and Hsu 2005; Kurihara and Degawa 2006). Most kickxellalean species are rarely found, except for several species of Coemansia (Benjamin 1958, 1979; Kwas’na et al. 1999; Benny et al. 2001).

Materials and methods
To isolate kickxellalean species in Indonesia, 77 soil samples were collected from Kupang, Cibinong, West Java and Kutai National Park, East Kalimantan. The soil samples were treated by the direct inoculation method (Kurihara et al. 2008). Pure cultures of kickxellalean to a Miura’s agar medium plate (Miura and Kudo 1970) with a fine needle. All the kickxellalean isolates were identified (Kurihara et al. 2001).

Preparation of slides and measurements of each morphological feature were conducted as described in Kurihara et al. (2000). Partial sequences of the nuclear large (LSU) and small subunits of ribosomal DNA (rDNA) of these isolates have been deposited at DDBJ/EMBL/GenBank (accession numbers: AB287996, AB295424–AB295429). In Indonesia, Boedijn (1958) reported two Coemansia species from mammal excrement: C. erecta from bat excrement and C. reversa from Isaria Fr. that was growing on rabbit excrement. In contrast, all the species discovered in this study were isolated from soil.

Results and discussion
Taxonomy
Coemansia asiatica Kurihara & Sukarno, sp. nov. Coloniae in agaro 1/2 ME-YE luteolae. Hyphae vegetatiae hyalinae, septatae. Sporangiophora erecta, septata, 7–19.5 μm lata, simplicia, furcata vel aliquantum trifurcata, asperula. Sporocladia primo divergentia, mox fere parallela ad sporangiophorum, cymbiformia, fere recta vel curvula, asperula, ex stipitibus brevivus 4–9 × 4–7 μm evolventia, 5–9-cellularia, praeter stipites 19–37 × 5–9.5 μm; cellula
Coemansia asiatica (BTCC-F31). Sporangiophore with sporocladium bearing mature sporangiосpores, sporangiophore with sporocladium after separation of sporangiосpores. Sporocladium with immature pseudophialides (above) and sporocladium with developing sporangiосpores formed on pseudophialides (below). Sporocladium after separation of sporangiосpores (above) and sporocladium with nearly mature sporangiосpores (below). Sporangiophores and pseudophialides after separation of sporangiосpores. Sporangiospores.

Linderina pennispora Raper & Fennell, Am. J. Bot. 38:83, 1962. Colonies on Miura’s medium pale yellow to yellow, nearly 5 mm high. Vegetative hyphae hyaline, septate. Sporangiophores erect, septate, 7.5–12.5 µm wide, branched, asperulate. Sporocladia subglobose to globose, sessile, slightly asperulate when immature, (7-)9–15 × 10–16.5(-19.5) µm, producing pseudophialides on the upper surface. Pseudophialides flask-shaped, 5.5–9(-9.5) × 2.5–3.5(-4) µm, producing a sporangiole apically. Sporangiophores elongate-obclavate to very narrow pyriform, 18–21.5 × 3.5–5 µm, easily detached at maturity, producing a spore mass. Sporangiосpores fusiform, ventricosus, slightly tapering to the apex, 7–13.5(-15) × 2.5–3.5 µm, surrounded by a sporangiole. Zygospores not observed.

Cultures of two L. macrospora isolates (BTCC-F30 and BTCC-F32) grew well on PDA, Miura’s medium, cornmeal agar medium (CMA; Nissui Pharmaceutical), and SGA, but sporulated poorly on these media. Sporulation of these two isolates has not been observed on CMA and SGA after incubation for 13 months. Poor sporulation of BTCC-F30 was observed on PDA and Miura’s medium after incubation for 5 months and 13 months, respectively. Similarly, BTCC-F32 sporulated poorly on Miura’s medium after incubation for 9 months. By way of contrast, BTCC-F30 and BTCC-F32 sporulated well on Miura’s medium after incubation for 2 months on Miura’s medium supplemented with aphids (BTCC-F30) or nereids (BTCC-F32). The substances that induced sporulation differed between the isolates.

Acknowledgments
This work was conducted under the Joint Research Project between the Department of Biotechnology, NITE, Japan, and LIPI. Mr. Tomoaki Kamijyo, Ms. Rieko Suzuki, and Ms. Kozue Anzai cultivated, preserved, and sequenced the isolates. Ms. Kimi Sakai and Dr. Yousuke Degawa provided an isolate (NBRC 102546). Dr. Katsumi Isono offered constructive criticism and editorial suggestions that improved previous drafts. Prof. Ken Katsumoto reviewed the Latin descriptions.
Keywords
Coemansia asiatica, Coemansia javaensis, Indonesia, Linderina macrospora, Linderina pennispora.

References
Inhibition of L-histidine decarboxylase produced by histamine forming bacteria using benzoic acid

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Introduction
Histamine is a non volatile compound which is produced during process of histidine decarboxylation (Lehane & Olley, 1999). The histamine production was influenced by the activity of enzyme L-Histidine Decarboxylase (HDC) (Bennour et al., 1991). The concentrations of histamine of fresh fish are around 10-15mg/100g (Ozogul et al., 2004). The activity of HDC enzyme is influenced by pH, temperature and low concentration of oxygen, and the optimum activity is at 37°C and pH 6.0 (Eitenmiller et al., 1982). Inhibition of HDC enzyme is consider as one method to control the production of histamine (Wendakoon & Sakaguchi, 1995). Benzoic acid at concentration of 0.05 – 0.1% is known potential to inhibit bacteria, yeast and mold in food (Medikasari, 2002). Characterization of HDC enzyme is needed in order to get information on the mechanism of inhibition of the histamine production (Coton et al., 1998). The objection of the research were to conduct the characterization of HDC enzyme produced from potential isolate, to study the inhibition of the HDC enzyme and to try the application on skipjack (Euthynnus affinis).

Material and methods
The bacteria used in this study was isolate A4 identified as Enterobacter sp., taken from the collection of Research Center for Marine and Fisheries Product Processing and Biotechnology. The fish used in the application trial was skipjack (Euthynnus affinis) of 25 – 30 cm long and 150 – 170 g/each weight which were bought at Palmerah market, Jakarta. Synthetic medium was adopted from Omura et al.1978), while production of HDC enzyme followed Atmadjaja (1994). The enzyme activity was measured using spectrophotometer (Hardy & Smith 1976). Characterization of HDC enzyme after addition of benzoic acids were conducted by variation of benzoic concentration, temperature, pH, and the availability of metal ions (Atmadjaja, 1994). Application of histamine inhibitor on skipjack (Euthynnus affinis) was conducted by assessing the histamine content (SNI ICS 67.120.30., 2006) and total histamine producer (Poerwadi & Indriati, 1984). The experiment was carried out in triplicate.

Result and discussion
Figure 1 showed that the addition of benzoic acid at concentration of 15 mM have the highest inhibition activity (0.17 Units). According to Clark & Pogrund (1961) the mechanism of inhibition of decarboxylase enzyme is a competitivite inhibition, the substrate inhibits the enzyme by competition of the active sites therefore the catalytic activity of the enzyme would decrease (Segel, 1975).
Figure 1. Activities of HDC enzyme produced from A4 isolate after addition of various concentrations of benzoic acid, measured at 30°C, pH 6.8.

Figure 2 showed that the optimum inhibition of enzyme added with 15 mM benzoic acids was at the temperature of 40°C. The enzyme is a thermo labile and will be denatured by heat. Increasing of the temperature may increase of the enzyme inactivation (Reed, 1975). Eitenmiller et al. (1982) reported that decreasing of the HDC activity was at temperature above 40°C.

Figure 2. Effect of temperature on the activity of HDC enzyme produced by A4 isolate after addition of 15 mM benzoic acid, measured at pH 6.8.

Figure 3 showed that pH 6 gave the highest inhibition of the enzyme after addition of 15 mM benzoic acid (0.27 Units). Similar results was reported by Eitenmiller (1982) that the HDC have the optimum activity at pH 6. By addition of inhibitor the correlation of substrate and enzyme was disturbed. pH affected the enzyme substrate configuration between inhibitor and enzyme (Whitaker, 1972). Variations changes of pH influence the H⁺ ion concentration, so it modify the conformation of active sites and the catalytic activity of the enzyme (Segel, 1975).

Figure 3. Effect of pH on the activity of HDC enzyme produced by A4 isolate after addition of 15 mM benzoic acid, measured at 40°C.

Figure 4 showed the effect of 10 mM divalent ions on the HDC after addition of 15 mM benzoic acid. The highest inhibition was achieved by addition of ion Fe²⁺ with the activity of 0.27 Units. The divalent ion was important as a cofactor at the enzymatic reaction (Segel, 1975). According to Whitaker (1972), the complex substance which change the essential cation from the apoenzyme will act as a inhibitor of the enzyme and the ion inhibition was also correlated with the pH of the enzyme.

Figure 4. Effect of divalent metal ions on the activity of HDC enzyme produced by A4 isolate after addition of 15 mM benzoic acid, measured at 40°C, pH 6.8.

Figure 5 showed the results of the treatment by dipping skipjack in 0.1% benzoic acids to see the effect on the histamine produced and the growth of the histamine producing bacteria. The highest growth of histamine producing bacteria was found in control treatment (dipping in aquaest) which was 13.5 x 10⁵ cfu/g. For the benzoic acid treatments, the growth of histamine producer bacteria were less than 10⁵ cfu/g. Those inhibition might be due to the low pH of the benzoic acid (pH 3.66) (Medikasari, 2002). Similar result was revealed on the production of histamine (Fig. 5).
Figure 5. Growth of histamine forming bacteria and the production of histamine on skipjack (Euthynnus affinis).
A: untreated fresh fish, direct assessment without storage
B: dipped in aquadest for 30 min, assessed after 8 hrs storage at room temperature
C: dipped in 0.1% benzoic acid for 30 min, assessed after 8 hrs storage at room temperature

Conclusions
The optimum inhibition of benzoic acid on the HDC activity was at 15mM. The characterization of inhibition of the enzyme HDC produced by isolate A4 which was identified as Enterobacter sp. was at temperature of 40°C, and pH 6.0 using buffer phosphate and divalent ion Fe²⁺. Application test by dipping fish in 0.1% benzoic acid for 30 minutes, inhibited the growth of histamine producing bacteria and the histamine production.

Keywords
Benzoic acid, Euthynnus affinis, histamine forming bacteria, L-histidine-decarboxylase.

References
Isolation, purification, and characterization of kojic acid from fermentation culture of *Aspergillus flavus*

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**Introduction**

Kojic acid is a secondary metabolite commonly produced through fermentation process by many species of *Aspergillus* and *Penicillium*. Kojic acid is mostly used in cosmetics, as whitening agent and protector against UV radiation. Beside that it also has few potential activities such as insectiside, antibiotics, antiinflammation, analgetics, antifungi, anticancer, and antioxidant which increase the stability of oil and fatty acids (1,2,3,4). Kojic acid is produced from carbohydrate in aerobig fermentation process by few species of *Aspergillus*, such as *A. oryzae, A. flavus* dan *A. tamari* (5). Usually, large scale production was carried out after optimum productivity obtained. Some efforts to improve the productivity of *A. flavus* strain has also been performed (6,7).

There are few methods of kojic acid isolation from fermentation culture, such as by precipitation technique, extraction with suitable solvent, evaporation and crystalization, and absorption with carbon active followed by elution with organic solvent. Rough crystal of kojic acid from crystalization step was then purified by column chromatography. In this study, isolation of kojic acid was carried out by liofilization, and followed by extraction with suitable organic solvent. Purification of crystal obtained was done by column chromatography (1,8,9).

The objectives of this study were to obtain pure isolate of kojic acid from fermentation culture of *Aspergillus flavus* mutant and to find its chemical characteristics compared to kojic acid standard.

![Figure 1. Molecular structure of kojic acid.](image)

**Materials and methods**

Isolate *Aspergillus flavus* M3B7F7E8 from our previous study was used as biocatalyst. Potato Dextrose Agar (PDA) [Difco] and YES (yeast extract [Difco]) dan sucrose [Merck]) medium were used for maintaining and preculturing *A. flavus* colonies, respectively. Fermentations were carried out in YES medium contain (per-liter) : 100 g sucrose, 0,5 g MgSO₄[Merck], 1 g KH₂PO₄[Merck], supplemented with 15 g red rice beans [Cianjur]. All mediums were dissolved by boiling and sterilized by autoclaving at 121°C for 15 minutes. Other chemicals used were : standard kojic acid [Nicco Chemical Co], methanol [Malincrodt], toluen [Malincrodt], ethyl acetate [Merck], formic acid [Merck], acetone
Variation of yeast extract concentration was carried out to find optimum concentration of nitrogen source, those are 1 g/L (Medium I ), 2 g/L(Medium II), and 4 g/L (Medium III), respectively. Incubation was done by shaking at room temperature, 180 rpm for 12 days. Biomass as dry cell weight was determined by gravimetry and kojic acid was analyzed by TLC densitometry and spectrophotometry. Fermentation with selected medium was carried out in 1000 ml Erlenmeyer contain 400 ml medium and 10% (v/v) inoculum. Isolation of kojic acid from fermentation liquid was carried out by lyophilization, and the residu was extracted by acetone. Pool of extract was dried by nitrogen flowing, dissolved in mix solvent of toluen-ethyl acetate- formic acid (3:6:1), and used for purification with column chromatography. Recrystalization was done by acetone, and melting point of crystals were determined and compared to standard. Both morphology of kojic acid isolate and standard were observed under microscope, and their infra red spectrums were also compared.

Results and discussions

Maintenance and preculture of A. flavus mutant M3B7F7E8

After maintaining and subculturing in PDA for 14 days, darkgreen-yellowish colonies of A. flavus mutant was observed growing in slant and disc of PDA medium.( Fig. 2.a). This mutant strain of A. flavus M3B7F7E8 was selected for its higher productivity of kojic acid although it showed slower growth.

When the mutant was grown in preculture medium with shaking for 24 h, it grew higher than those in PDA plate. Biomass in preculture suspension showed a pellet form with white-yellowish colour. (Fig. 2.b). and readily used as inoculum for fermentation medium.

Optimization of nitrogen source concentration

Biomass suspension from preculture step, in amount of 10 ml was pipetted into 100 ml medium of different kinds of yeast extract concentration. The growth was measured during the fermentation periods every three days. The pattern of biomass growth and its relationship to kojic acid was observed and showed in Fig. 3.

The results showed that biomass increased maximum between day 0 to day 3, and reached stationer at day 3 for medium II but at day 6 for medium I and III. This observation showed that earlier biomass growth to reach the stationary phase will earlier induced secondary metabolite production (Fig.3). Kojic acid concentrations were calculated by using calibration curved of kojic acid standard, y = -22,497 + 18,479x, with linear regression, r = 0,99926.
Purification and characterization of kojic acid isolate

Crude crystals of kojic acid isolate was confirmed by its similarities to UV and Visible spectrum of kojic acid standard 25,6 ppm. Both UV spectrum showed high similarities, with maximum absorption at 269 nm. The crystals were purified again by column chromatography and positive fraction were collected, dried by nitrogen flowing, and recrystallized by acetone. The pure isolate was then identified by infra red Spectrometry, and compared to standard spectrum. Both IR spectrum were identics which showed similar peaks at 1660 cm⁻¹, 1700 cm⁻¹, 1230 cm⁻¹, 1140 cm⁻¹, and 3230 cm⁻¹. (Fig.4).

![Image](image.png)

Figure 4. IR Spectrum of standard kojat acid (lower) and isolate (upper). A. O—H, 3180 cm⁻¹; B. C=O, 1700 cm⁻¹; C. C—O alkohol, 1230 cm⁻¹; D. C—O eter, 1150 cm⁻¹

Conclusion

Isolation of kojic acid from fermentation culture can be performed by liophilization, followed by extraction with acetone and purified by column chromatography to produce relative pure kojic acid which showed characteristics with high similarities to standard.

Keywords

Aspergillus flavus, characterization, isolation, kojic acid, tlc-densitometry.

References


Screening for glucosyltransferase gene (gtf) from exopolysaccharide producing lactic acid bacteria

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Introduction
Glucosyltransferase (GTF) is an enzyme involved in exopolysaccharide (EPS) polymer synthesis in microbes. One example of EPS that has been used in pharmaceutical and medical application is dextran. Dextran has been used in conjugated-drug delivery system as matrix. As a group of microbes producing EPS, lactic acid bacteria (LAB) have been well reported carrying sucrase genes glucosyltransferase (gtf), as well as fructosyltransferases (ftf). In an attempt to search for novel gtf genes as the aim of this study, LAB collection isolated from local sources yielded from previous study were screened performing PCR using degenerate primers DegFor and DegRev.

Materials and methods
LAB collection, isolated from local sources yielded from previous study, were screened performing PCR using degenerate primers DegFor and DegRev. Genomic DNAs were extracted performing Murray and Thompson methods using CTAB as described previously. Agarose gel electrophoresis was employed to observe the PCR product (amplicon).

Results and discussion
An approximately 660 base pairs (bp) amplicons were obtained by using genomic DNAs of those LAB isolates as templates with conserved region of gtf genes catalytic domain as target. Two out of 20 LAB strains were yielded no amplicon as observed on agarose gel, while one strain exhibited non-specific amplicon DNA bands with sizes other than 660 bp. The two negative ones were isolated from soil obtained from dairy product waste field and from waste of soy sauce from previous study, while the latter was isolated from waste of soy sauce.

Keywords
Degenerate primers, exopolysaccharide, glucosyltransferase, gtf, lactic acid bacteria.

References
**Auxiliary Substrates for Elimination of Trichloroethene, Monochlorobenzene, and Benzene in a Sequential Anaerobic–Aerobic GAC Biobarrier**

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**Introduction**

Trichloroethene (TCE), monochlorobenzene (MCB), and benzene (BZ) represent the most common contaminant cocktails found in contaminated subsurface water in various places. Reductive dechlorination of TCE has been reported to occur in anaerobic groundwater systems (DiStefano et al. 2001, Bradley 2003). During the reductive dechlorination process, TCE receives electron from hydrogen. Further dechlorination follows similar reaction to vinyl chloride and then to ethene. Molecular H2 was demonstrated in the labs as well is in natural systems, including contaminated aquifers, to be the direct and initial electron donor for reductive dechlorination that was observed under sulfidogenic, methanogenic, or fermentative conditions (Middeldorp et al.1999). This paper examines the influence of controlled variables, i.e. auxiliary substrates and electron acceptors, on biological degradation of TCE, MCB, and BZ on sequential anaerobic–aerobic GAC barrier system.

**Method**

All the granular activated carbon used in the experiments were from Chemviron Carbon, Neu-Isenburg, Germany (FILTRASORB TL 8-30). Inoculums were obtained by means of membrane filtration (Polyethersulfonfilter, 0,45 µm) of contaminated groundwater area from Bitterfeld, Leipzig-Germany. The cake was put into three 500 ml Erlenmeyer flasks containing chloride-free medium. A laboratory scale column set, with 2 vertical 0.164L columns (diameter 3.5cm and height 17cm) was filled with Filtrasorb GAC TL 830 (Chemviron Carbon, Belgium). Analysis of hydrocarbons was performed by GC from Hewlett Packard (GC Series II 5890) equipped with a head-space sampler, flame ionization detector (FID), and electron capture detector (ECD). Separation was accomplished in a 50-m capillary column (PONA id 0.21 mm, methyl silicon film 0.5µm thickness, Hewlett Packard). Sulphate and chloride ionic concentrations were determined with IC 2010I Dionex.

**Results and discussion**

**Auxiliary substrates**

To examine the effect of auxiliary substrate (AUXS) on reductive dechlorination, the concentrations of ethanol and sucrose were gradually modified. In the beginning of the experiments, high supply of AUXSs was introduced to the anaerobic column, i.e. 50 mg/L DOC.

Theoretical H2 production was 0.065 mg/ mg sucrose and 0.174 mg/mg ethanol. These number correspond to approximately 0.15 mg/ mg DOCSucr. and 0.06 mg/mg DOCEtOH. Thus, it is clear that the actual AUXS supply (50–5 mg/L) surpassed the theoretical AUXS demand (3.3 mg/L). Further reduction of AUXS from 5 to 1 mg DOC/L was
stoichiometrically resulting in insufficient electron donor for a complete dechlorination or conversion of TCE.

The activity of methanogenic started after throughflow 250 L when the AUXS availability was high. Reductive dechlorination of TCE to ethene is more favorable thermodynamically compared to sulfate reduction and methanogenesis. Therefore, supply of H2 in the form of AUXS should be maintained at low or stoichiometric demand of reductive dechlorination. Our mass balance clarified that the shares in AUXS through sulfate reduction or methanogenesis were considerably low. Most part of the AUXS was available for halorespiration. Halorespiration (TCE reduction through cis-DCE and VC to ETH) gains greater energy than through sulfate reduction or methanogenesis. Libelo et al. (1998) confirmed that supplying H2 at low AUXS concentration will further degrade TCE to ETH.

The low redox condition existed around 40 days of operation. Reduction of AUX allowed the halorespiration microorganisms to survive. As the reaction zone was dominated by the reductive dechlorination afterward, the redox potential was relatively stable at approximately -100 mV. Table 4. 1 Theoretical demand and the actual supply of H2 for dechlorination of TCE to cis-DCE, VC and ETH.

In our experiments, the autochthonous micro flora of the Bitterfeld site proved to be capable of degrading VC oxidatively regardless of the auxiliary substrate provided. In all samples taken after 48 d, VC was completely degraded. Degradation of VC without the addition of auxiliary substrates (flask no. 10) indicated the use of VC as sole carbon and energy source (Davis and Carpenter, 1990; Hartmans and DeBont, 1992; Verce et al., 2000). However, in our batch tests the presence of organic material added with the inoculum and serving as auxiliary substrates could not be excluded. In contrast to VC dechlorination, significant differences in cis-DCE dechlorination were observed. Addition of ethene resulted in a complete dechlorination within 48 d, thus confirming the positive results reported previously (Koziolle et al., 1999; Freedman et al., 2001). In the presence of other auxiliary substrates, cis-DCE was still detectable after 138 day. The auxiliary substrates monochlorobenzene, benze, and toluene stimulated cis-DCE dechlorination significantly and were completely degraded. Addition of formate, sucrose, and ethanol also improved cis-DCE dechlorination. Sucrose and ethanol have the potential to stimulate further dechlorination of cis-DCE in the presence of oxygen. The oxidation of methane or ammonium was not observed. Corresponding to the low metabolic activity in the methane and ammonium amended flasks, oxidative dechlorination of cis-DCE was low. However, the lowest chloride formation was observed without addition of an auxiliary substrate. Interestingly, the end product of reductive dechlorination, i.e. ethene, as well as the aromatic compounds i.e. monochlorobenzene, benzene and toluene, are suitable auxiliary substrates for oxidative dechlorination. This suggests the benefit natural attenuation in pollutant cocktails containing aromat.

**Electron acceptors**

The aerobic phase clearly showed the role of oxygen as electron acceptor (H2O2). All of molecular oxygen was used to oxidise model contaminants and a part of auxiliary substrates. As oxygen was depleted, then part of the auxiliary substrate used nitrate as electron acceptors. This fact showed electron acceptor preferential. Figure 10 shows that monochlorobenzene predominate the utilisation of electron acceptor (oxygen). Biodegradation of MCB and BZ with nitrate as terminal electron acceptor could not be observed. The high DOC in the influent at the initial phase was oxidised with nitrate. AUXS was supplied to favour reductive dechlorination purpose and used by various microorganisms in the anaerobic column. However, there was remaining AUXS entering the subsequent aerobic phase. The remaining AUXS can be measured by DOC method, which did not quantify volatile chlorinated carbons. Therefore, this DOC value indicated only DOC from the remaining AUXS. As a source of molecular oxygen, hydrogen peroxide (H2O2) is more manageable for groundwater application compared to air injection. The liquid form of H2O2 is easier to handle than the gaseous form of oxygen.
Conclusions
In the sequential anaerobic-aerobic systems for elimination of TCE, MCB and BZ one should maintain the supply of auxiliary substrates low but stoichiometrically adequate for supporting reductive dechlorination stoichiometrically. Supplying higher amount of auxiliary substrates provoked competitive reactions in anaerobic conditions, such as sulfate reduction and methanogenesis. If the auxiliary substrates do not utilised completely in the anaerobic phase, the remaining flow into the aerobic phase. This lead to unwanted conditions, ie. oxidation of auxiliary substrates instead of pollutant elimination. One should supply electron acceptor in the aerobic phase to oxidise pollutant contaminants and metabolites from previous anaerobic phase. In our experiments molecular oxygen was still the preferred electron acceptor for the model contaminants used in this research. Molecular oxygen can be supplied with hydrogen peroxide. One should avoid supplying hydrogen peroxide in high amount to avoid the toxic effect of hydrogen peroxide to microorganisms. A maximum level of 30 mg/L did not show inhibition to denitrifying bacteria while supported the oxidation of model contaminants. More distributed electron acceptor supply along the column could be beneficial for the application in biobarrier.

Acknowledgement
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Keywords
Benzene, biobarrier, granular activated carbon, monochlorobenzene, trichloroethene.

References
Bioavailability of monochlorobenzene and benzene on aerobic granular activated carbon column

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Introduction

The use of granular activated carbon (GAC) in water treatment is standard due to activated carbon ability to transfer effectively broad range of organic compounds, from the liquid phase to solid phase. A number of works reported bioregeneration of AC using continuous or, mostly batch reactor (Nakano et al, 2000; Klimenko et al, 2003) Most of the bioregeneration proceeded in separate chamber or in different treatment system than the sorption process, except for the experiments by Kim et al. (1997) and Koshikawa et al. (2003) who performed simultaneous adsorption and biodegradation in small Erlenmeyer reactors. Using wide variety of contaminants, those authors observed that the adsorbed contaminants were bioavailable, although the bioregeneration level differed from 0 to 99% of adsorbed contaminants. The principal objective of this effort is to examine the concept of simultaneous adsorption-biodegradation in aerobic GAC column system in eliminating model contaminants of contaminated groundwater. Possible implementation of this technology is in remediation of any appropriate contaminated groundwater plume, which is contaminated with pollutant cocktails. Initially, respirometer batch experiments using benzene as model pollutant examined the bioavailability and toxicity reduction effect of various amount of GAC. Then MCB, together with Benzene (BZ) as model pollutants in aerobic GAC column, assessed further sorption behaviour and bioregeneration of model pollutants in the presence of high GAC amount.

Materials and method

All the granular activated carbon used in these experiments was from Chemviron Carbon (FILTRASORB TL 8-30). Different volume of monochlorobenzene (sole carbon source) was injected into 1-litre vials containing 750 ml chloride-free medium. To examine the effect of GAC presence on bioavailability and toxicity of MCB, the oxygen utilisation was measured by a respirometer with various MCB concentration and GAC loading (2 to 3 replicates, each). After injection, 4 days of shaking was allowed for MCB adsorption onto GAC, prior to inoculation. A laboratory scale experiment consisting of aerobic operation unit was built to study adsorption and biodegradation of the model contaminants. A set of vertical 0.164 L column (diameter 3.5 cm and height 17 cm) was filled with Filtrasorb GAC TL 830. The GAC was washed in demineralised water to remove fines, followed by drying at 105°C. A reference set was operated under sterile conditions. After the pre-loading period, bacterial mixed cultures capable of utilising BZ, and MCB were injected (active column), while in the sterile column NaN3 was added continuously to hinder the growth of microorganisms. During the loading
period, the flowrate to GAC columns varied from 50 to 90 L/d. Two similar set, but packed with pumice stone (PS), were build to examine the non adsorptive operation. For the bioregeneration experiment, the flowrate (medium and substrate) to each column was adjusted to approximately 4 L per day. The pore volumes of the GAC columns were ± 57%.

Analysis of hydrocarbons was performed by gas chromatograph (HP 5890) equipped with a head-space sampler, flame ionisation detector (FID) and electron capture detector (ECD). Separation was accomplished in a 50-m capillary column (PONA id 0.21 mm, methyl silicon film 0.5 µm thickness, HP). Sulphate and chloride ionic concentrations were determined with ion chromatograph with suppression system and conductivity detector. Measurement of redox potential and pH was done regularly with a multimeter (pH 91 WTW). Determination of O2 was carried out with a dissolved O2 meter (Oxi 330-WTW). H2O2 level was monitored with peroxide test strip (Merck).

Results and discussion

Effect of GAC on MCB short term bioavailability

Respirometer tests showed no significant effect of adsorption on the bioavailability of monochlorobenzene in the presence of low GAC concentrations (0.3 g GAC/L medium). At higher amounts of 1.3 to 13 g/L GAC significantly lower respiration rates were observed. The model contaminants are bioavailable in the presence of high amount of GAC. Bioavailability is affected to some extent by the quantity of activated carbon, or the amount of MCB-loading. At higher activated carbon amount, i.e. lower MCB-loading, the equilibrium concentration of MCB in the liquid phase is reduced. Thus, it reduced the availability of MCB to microbial attack and slowed down the aerobic respiration activity. By lower GAC amount, or in other words, higher contaminant loading, the availability of MCB was only slightly affected, because the available MCB in the solution is evidently higher.

Column experiments

Prior to inoculation with culture of bacteria, two GAC columns were loaded with MCB and BZ. The loading in both columns was achieved in 17 days. Loading operations of both columns produced comparable breakthrough curves (data not shown), thus confirming the reproducibility of the operations. Benzene broke through earlier than monochlorobenzene as it was predicted based on lower KF (adsorption constant) of BZ than that of MCB. At through flow ca. 280 L or ± 3.000 exchange pore volumes (EPV), 50% of initial BZ concentration had broken through. The 50% breakthrough of MCB followed after approximately 650 L of through flow (± 7.000 EPV). Adsorption of BZ and MCB reached their equilibrium between solid and liquid phase at through flow 1100L (± 12.000 EPV) as no more adsorption occur in the column.

Results show that most of the MCB elimination took place in this lower part of the column. This indicates the availability of the organic compounds, i.e. MCB, for the growth of microorganisms. The total biological elimination until 2424 L or 424 day of operation was approx. 98% of the MCB flux. The adsorption took place strongly on the lower part of the column (80%) rather than on the upper part of the column (20%).

There were no distinctive metabolites that could be analysed to proof the biodegradation of benzene in the aerobic column. Thus, to make a mass balance on benzene, only influent and effluent concentration of BZ could be taken into account. After the initial phase of adsorption (from 33rd day on) reduction of model contaminant concentration in influent created new equilibrium condition between the concentration in solid and liquid phase at through flow 1100L (± 12.000 EPV) as no more adsorption occur in the column.

Due to temporary fall in influent concentration rate (between through flow 750 to 1000 L) the amount of BZ on the surface of GAC was decreasing. However, from through flow ca. 1200 L ahead, the sterile column reached its equilibrium condition and stayed at around 15 mmol until the end of operation. No more BZ was detected in the effluent of active column at the end of the experiments. The gradient of B1 elimination is positive and equal to influent rate from the time when temporary fall occurred until end of aerobic operation. Therefore, the
remaining BZ concentration on the surface of active GAC column might have lower value than that in sterile column (15 mmol).

**Conclusion**
Abiotic oxidation of GAC during experiments did not show significant hindrance to the bioregeneration of GAC in terms of time scale and amount of oxygen required for the overall project. The need for abiotic oxidation of GAC is ca. 2.5 - 3 mg O2/g GAC. The contaminants are competitively adsorbed in the adsorptive materials (GAC) with order according to their hydrophobicity. Biodegradation processes in the GAC column also affected the contaminant distribution in the reactor. This might lead to zonation of contaminants along the biobarrier. Model contaminants are still bioavailable in the presence of high amount of GAC although bioavailability is affected by the quantity of activated carbon. At high activated carbon presence in the system the equilibrium concentration of contaminant in the liquid phase is reduced. Thus, it reduced the availability of contaminant to microbial attack and slowed down the respiration activity. Oppositely, by lower GAC amount, or in other words higher contaminant loading, the availability of contaminant was only slightly affected, because the available contaminant in the solution is higher.

**Keywords**
Aerob, benzene, bioavailability monochlorobenze, granular activated carbon.

**Acknowledgement**
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**References**
Electrochemical detection of free chlorine at gold-modified boron-doped diamond electrodes

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Introduction

Chlorine is a strong oxidizing agent. Since one mole HCl or ClO⁻ is generated from each mole chlorine gas dissolved in water, HCl and ClO⁻ were also known as “Free chlorine” (Kodera et. al. 2005). The ability of chlorine to disinfect depends on its concentration. If the concentration is too small, the disinfectant effect is ineffective; however, too much chlorine is wasteful and creates other dangerous side products such as trihalomethanes. Therefore, the exact determination and continuous on-line monitoring of residual water disinfectant is a necessary requirement. Electrochemical oxidation of free chlorine, in the form of HCl/ClO, with conventional electrodes has been reported (Simper 1997). However, this technique can only detect free chlorine in ppm level, whereas a lower detection limit is required. The fact that oxygen evolution of conventional electrodes occurs very near to the potential oxidation of free chlorine oxidation should also be considered. Moreover, deterioration of electrodes attributable to hypochlorite oxidation has been reported, resulting in fouling of the electrode.

On the other hand, the use of boron-doped diamond (BDD) electrodes for electroanalysis are established due to their superior properties, including wide potential window, low and stable background current, low sensitivity to dissolved oxygen and stability of the responses (Kodera et. al. 2005). In the present study, we focused on the electrochemical quantitative determination and the possibility of continuous on-line monitoring of free chlorine oxidation using BDD electrodes. A simple, fast, and stable detection with excellent detection sensitivity could be performed at as-deposited BDD electrodes. In order to study the mechanism, a comparison was made between different terminations of BDD electrodes. Cyclic voltammetry and flow injection analysis were used.

Experimental section

A standard free-chlorine solution was prepared by diluting a sodium hypochlorite aqueous solution. BDD electrodes were deposited on Si(111) wafers in a microwave plasma-assisted chemical vapour deposition (MPCVD) system (ASTeX) Corp. Details of the preparation procedure are described elsewhere (Fujishima et. al. 2004, Ivandini et. al. 2002). A mixture of acetone and methanol in the ratio of 9:1 (v/v) was used as the carbon source. B₂O₃, used as the boron source, was dissolved at a B/C atomic ratio of 1:100. Oxidized BDD electrodes were prepared by oxidation of as-deposited BDD at a constant potential of 2.3 V (vs. Ag/AgCl) in a phosphate buffer solution (PBS) pH 7 for 30 min. The surface termination was characterized by using X-ray photoelectron spectroscopy. Electrochemical measurements were carried out with a single-compartment cell. An Ag/AgCl (saturated KCl) electrode was used as the reference electrode and a Pt wire was used as the counter electrode. The planar working electrode was mounted on the bottom of the glass cell by the use of a silicone-O-ring.
with estimated geometric area of 0.77 cm². The supporting electrode was 0.1 M sodium perchlorate. All measurements were made at room temperature.

**Result and discussion**

A well-defined irreversible oxidation peak was observed at a potential of ~2.4 V (vs. Ag/AgCl) at ad-BDD electrodes. The inset shows a plot of the oxidation peak current vs. the free chlorine concentration. A linear calibration curve obtained at the concentration range of 20-100 mg Cl L⁻¹, indicating that determination of free chlorine can be. A slope of 0.744 µA cm⁻² mg⁻¹ L shows the sensitivity, which is 3-4 times higher in comparison with those at the conventional electrodes [Kodera et. al. 2004, 2005]. The background current of 3 µA cm⁻² was obtained very small in comparison with that of Pt electrode in the same condition (115 µA cm⁻²). Furthermore, excellent stability is shown in Fig. 1b with a relative standard deviation of 2.56% for 10 repetitive measurements.

**Figure 1.** Cyclic voltammograms of a 0.1 M NaClO₄ solution (a) in the presence of various concentrations of free chlorine and (b) for 10 repetitive scans of 50 mg Cl L⁻¹ using as-deposited BDD electrode. The scan rate was 100 mV s⁻¹. Linear calibration plots are shown in the insert.

In order to confirm the interference of chloride ion, some experiments with chloride oxidation was conducted. Cyclic voltammetry (CV) of 100 mg Cl L⁻¹ NaCl in 0.1 M NaClO₄ solution shows no oxidation peak obtained in the potential range of 0-1.5 V (vs. Ag/AgCl). However a well-defined peak was observed when 100 mg Cl L⁻¹ NaClO was added in the solution (Fig. 2a), indicating that the oxidation peak is represent to the oxidation of HClO/ClO⁻ and not the oxidation of Cl⁻. Further investigations were conducted for a various concentration of NaClO in 0.1 M NaClO₄ in the presence of 100 mg Cl L⁻¹ NaCl. Similar CVs as well as slopes of linear calibration of free chlorine oxidation in the absence and the presence of NaCl (Fig. 1a) indicated that no significant influent of NaCl. Although an increasing of current densities (~1 mA cm⁻²) is shown with the presence of chloride ions, no concentration dependence was observed. Moreover, no shifting of the oxidation peak potential was detected. These result have confirmed the previous work about hypochlorite decomposition in water that chloride ion contributes nothing but the ionic strength.

Effect of electrolyte was also studied on the chlorine oxidation using different electrolyte solutions. CVs of 100 mg Cl L⁻¹ in 0.1 M NaCl shows shifted peak from ~1.4 V (vs. Ag/AgCl) in 0.1 M NaClO₄ (Fig. 1a) to ~1.2 V (vs. Ag/AgCl) in NaCl solution (Fig. 2). On the contrary, the peak shifted to the more positive potential (~1.5 V) in 0.1 M PBS. The result indicated that exceeded chloride ion concentration leads to accelerate the electron transfer on hypochlorite oxidation, whereas reserve effect was found in PBS. It seems that different chemical reactions between ClO⁻ and Cl⁻ (in NaCl electrolyte) and between ClO⁻ and ClO₄⁻ (in NaClO₄ electrolyte) occurred before electrochemical oxidation of the electrodes, suggesting a CE mechanism in the presence of other species Cl (Cl⁻ or ClO₄⁻).
Further comparison with anodically oxidized (ao-) BDD was conducted. CVs of 500 mg Cl L$^{-1}$ at ao-BDD electrodes shows that the oxidation peak shifted to a more positive potential in comparison with that at ad-BDD. It is well-known that the ad-BDD surface is mainly hydrogen-terminated since BDD electrodes were deposited in a hydrogen plasma of the CVD machine. Ad-BDD has relatively more positive charge than ao-BDD, which has oxygen termination. An oxidation treatment can convert the BDD surface to be partially oxygen terminated [Notsu et al. 2000]. The strong repulsion at ao-BDD suggests that the active oxidized molecule has negatively charged, confirming that the active molecule is ClO$^{-}$.

Figure 2. Cyclic voltammograms of 0.1 M NaClO$_4$ at as-deposited BDD electrodes. He scan rate was 100 mV s$^{-1}$. The inset shows a cyclic voltammogram at an anodically oxidized BDD electrodes.

Conclusion

A novel electrode to the determination of the free chlorine concentration in water has been developed using highly boron-doped diamond electrodes. Cyclic voltammograms exhibited well-defined peaks of ClO$^{-}$ at both hydrogen- and oxygen-terminated BDD electrodes. However, the superiority of hydrogen over oxygen termination was demonstrated in terms of the more negative oxidation potential and lower background current. High sensitivity and good stability were also shown without any pre-treatment required. Interference of small concentration of chloride ion was not observed, whereas exceeded chloride concentration was found to accelerate the electron transfer on hypochlorite oxidation. A detection limit of 8.3 µg L$^{-1}$ was achieved using flow injection analysis, suggesting that this method can be applied for free chlorine monitoring in drinking water.

Keywords
diamond electrodes, differentiation method, gold, stripping voltammetry, total inorganic arsenic.

References
Fe-Al intermetallic coating on steel by means of high energy milling of Fe-Al particle mixture

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Introduction

Fe-Al intermetallic compounds are well known to have a structural superiority in high temperature condition because of their resistant to oxidation, sulphidation and corrosion (Mc Kamey et al.,1996; Hashii and Hosoi, 1998; Singhu and Ishihara, 1995). However, the disadvantages of this compound are brittle in room temperature and loose their strength at the temperature above 600ºC. An approach to increase the ductility of the intermetallic compounds is by making the materials to nanostructure (Grosdidier, et al., 2001). Steel coating with nanostructure Fe-Al had been reported by thermal spray method at 2350ºC and by the combination of ball mill and pack cementation at 400-600ºC (Grosdidier, et al., 2001, Zhan et al., 2006). Intermetallic Fe2Al5 was formed after processing for 15-120 minutes by using ball mill and pack cementation.

The present research aims to investigate the Fe-Al intermetallic coating on structural steel by using high energy ball mill at room temperature. In addition, this research is also investigating the formation of nanostructure powder and coating phenomena of Fe-Al powder on the steel surface.

Experimental method

Al with the purity above 90% and Fe with the purity more than 99% with size of 10 µm obtained from Merck Co. Ltd were used in the research. Composition of powder were set at Fe-30 atomic % Al (Fe-30 at.% Al) and Fe-60 atomic % Al (Fe-60at.% Al). Milling and coating process were conducted simultaneously by using high energy milling HEM-E3D for 32 hours in inert atmosphere by using argon gas with the speed of 263 rpm. The vials with the volume of 100 mL made from stainless steel were utilized during milling process. Ball mill which are made from chrome steel with size of 10 mm and 2 mm were employed in the milling. The ratio between big and small ball is 1:5 and the ball to powder ration (BPR) is 8:1. The milling temperature was kept at 25-50ºC, with the interval time was set for 5 minutes. The milling products were characterized using SEM (Leo 430) and XRD with anode tube Cu Kα (Philips Instruments).

Results and discussion

Figure 1 shows the XRD patterns of the powder mixture of Fe-30at.% Al in the initial state and after different milling times. From the figure, one can perceive that phase transformation
occurs in the powder samples during milling. It also can be observed that at the early stage of mechanical alloying process (0–4 h), the intensity of the fcc Al diffraction peaks decrease and then disappear after 16 h. This indicates that bcc Fe(Al) solid solution is formed since Al atoms dissolves into Fe lattice (Shi et al., 2008). After milling for 16 h, the Fe3Al phase was formed. The XRD patterns of the mechanically alloyed powders for 32 h are similar with the pattern obtained after 16 h of milling. 

The changes of crystal size was calculated from X-ray diffraction patterns of Fe-30at.%Al and Fe-60at.%Al powder mixtures at 0, 4, 16, 32 h. As shown in Figure 2, during the early stage of milling the crystallite size decreases rapidly with a final value of about 35 nm. It is observed that Fe-30at.%Al in the early milling have relatively larger crystallite size than that of Fe-60at.%Al. However, by increasing time of milling, the crystallite size of Fe-30at.%Al become smaller than that of Fe-60at.%Al. It also indicated in XRD pattern that Fe-30at%Al powder mixture tend to form brittle intermetallic Fe3Al after milling for more than 16 hours. On the other hand, similar phenomenon is not found in the Fe-60at.%Al powder mixtures after milling for 32 hours. In addition, by extending the milling time, the formation of intermetallic phase in Fe-60at.%Al powder mixtures is predicted to be occurred.
Figure 3. Cross section of steel with Fe-30at.%Al coating.

Figure 3 shows the cross section of base metal of steel (left-hand side) with Fe-30at. %Al coating (right-hand side). In the early stage of milling, the coating on the steel is thin, less than 10 µm. On further milling (16 h) the coating is relatively thick, about 10 µm. It is also observed that the structure of coating layer is rough and coarse. After milling time 32 h the coating layer became thicker (about 20 µm). The coating layer structure is finer than that of 16 h milling time. Mechanical interlocking mechanism is observed according to the Fig. 3 after 32 hours of milling time. The phenomenon of cold welding in the coating process also occurs.

Conclusion
1. Fe₃Al intermetallic is formed after mechanical alloying of Fe-30at%Al powders at this condition.
2. Nanostructure materials have been formed after 32 hours of milling time. This can be predicted by decreasing crystallite size until 35 nm obtained from the calculation.
3. Mechanical interlocking mechanism seems to be occurred in the coating process as observed in the coating layer structure.

Keywords
Ball mill, iron-aluminide, mechano-chemical, metallic powder, nano particles.

References
Knowledge-based material cost control for building construction project using expert system approach

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Introduction
Poor project monitoring and control process has been identified as one of the main reasons for construction projects not achieving project cost objectives. Other factors contribute to this condition include: lack of documentation on project lessons learned, not optimum in adopting information technology, and a long process in making decisions. Documentation of lessons learned corrective actions can help project team in identifying various project risks. It is an important feedback in the effort to achieve better project performances, to prevent occurrences of specific risks or to prepare responses to such risks. This paper discusses the development of knowledge-based corrective actions related to controlling project material cost, which includes identifying the impacts, the causes and corrective actions. A survey on various high rise building projects was selected as the research method, and structured interviews with experts on such projects was used as data collecting method. Probability matrix, statistic and simulation were used to analyse the data, and expert system was used to develop decision support system based on cost control theory and practices.

Research results
Knowledgebase for project cost control process are based on relationships between cost overrun indicators with events and causes. In the initial stage of the research, these relationships were grouped into related project cost components. Table 1 shows the number of knowledgebase indicators as well as their related events and causes.

<table>
<thead>
<tr>
<th>Project cost component</th>
<th>Cost overrun indicators</th>
<th># Event</th>
<th># Causes</th>
</tr>
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<tbody>
<tr>
<td>Equipment</td>
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<td>67</td>
<td>52</td>
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<td>Materials</td>
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<td>58</td>
<td>57</td>
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<tr>
<td>Manpower</td>
<td>4</td>
<td>48</td>
<td>70</td>
</tr>
<tr>
<td>Subcontractor</td>
<td>4</td>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td>Overhead</td>
<td>4</td>
<td>52</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>256</td>
<td>270</td>
</tr>
</tbody>
</table>

Further assessment using qualitative risk analysis has provided information on the complexity of the relationship between cost overrun indicators and events, as well as between events and their causes.

The sources of risks that cause the most events on material cost overrun are purchasing and material usage. Eight events that have the most influence on material cost overrun, which are related to purchasing are:
- Project delay which is caused mostly by schedule variance and materials are purchased not in accordance to specifications & requirements,
Increased material costs which is caused mostly by delay in purchasing and poor strategy in selecting sellers

Change orders and excess materials which are mostly due to materials that are purchased not in accordance to specifications & requirements

Delay in material procurement which is caused mostly by shortage in the market, change in materials sources that are related to project location, delay in payment, and delay in purchasing

Delay in project works execution which is mostly due to shortage of materials in the market, change in materials sources that are related to project location, delay in payment, and delay in purchasing

Increased procurement cost which is caused mostly by shortage of supply in the market

Delay in delivery of materials to project site which is mostly due to poor strategy in selecting sellers

Seven events that have the most influence on material cost overrun which are related to material usage are:

• Delay in project completion which is mostly due to repairs or reworks
• Shortage of materials during construction which is caused mostly by excess materials onsite, reworks and inefficient works
• Reworks which are mostly caused by mistakes in material use
• Excess materials that are mostly caused by inefficient usage and materials movements of materials on site, poor understanding of site characteristics, insufficient equipment for mobilisation, and mistakes in materials usage.
• Delay in works execution which is due mostly to poor understanding of site characteristics and insufficient equipment for mobilisation
• Increase in procurement cost which is caused mostly by inefficient usage and materials movements of materials on site, reworks, mistakes in materials usage, poor understanding of site characteristics, insufficient equipment for mobilisation, and mistakes in materials usage.
• Increase in defective/damage materials which are caused by inefficient materials movements of materials on site, poor understanding of site characteristics, insufficient equipment for mobilisation, and mistakes in materials usage.

Figure 1 shows the integration of the relationships between indicator-event, event-causes and causes-corrective actions. The first level, which is the highest level of the network, is the four cost overrun indicators: purchasing cost, transportation cost, storage cost, and excess (waste) material cost. The second level is the events, the third level is the causes, and the fourth, which is the lowest level of the network, is the corrective actions.

Figure 1. Relationship pattern indicators-event-causes-corrective action in Project Material cost control

The use of decision support system (DSS) in selecting corrective actions can improve the effectiveness and efficiency in getting recommended corrective actions that lead to better project cost performances. The program starts with an introduction that explains what the program is all about and instructions to use the program. The second sub-model defines the project information, such as project type, contract type and contract value. The third sub-
model consists of two modes of process, i.e. lessons learned mode and DSS mode. The fourth sub-model provides report of the process results. C++ has been used in developing the program. The validation of the program was done by conducting several trials to construction experts. These experts were asked to assess the program and the results it provides. The assessment used in the validation include: completeness of knowledgebase system, speed, user friendliness, accuracy of the results, and level of application. Most of the experts involved in the validation gave good assessments for the program. They also suggested that an improvement in design can make the program more attractive.

**Conclusions**

Relationships between cost overruns-events and events-causes are complex. The combinations of these relationships require effective and efficient corrective actions that can lead to improve project cost performances. It is very significant to document those relationships as part of project cost control system. Those relationships make up a basis for a good knowledgebase to select corrective actions The use of DSS program can support the selection of effective and efficient corrective actions.

**Keywords**

Cost control, knowledge base, lessons learned.

**References**


Modification and grain refinement in AC4B alloy produced by Low Pressure Die Casting

Introduction

AC4B alloy (Al-8Si-2.4Cu) is one of the most desirable cast aluminium to be processed through low pressure die casting (LPDC). However, there are many problems particularly shrinkage and porosity that need to be resolved. Methods to solve this problem are by adding modifier and grain refiner, such as Al-Sr and Al-Ti. Strontium is added to transform the morphology of the silicon phase from acicular flakes to a fibrous rodlike form, thereby improving mechanical properties, especially fracture toughness and elongation [Dinnis et al., 2004]. At the same time Sr addition changes the mode of eutectic nucleation from that occurring near the $\alpha$-Al dendrites, to that taking place within the eutectic liquid itself. It then will control the distribution of the remaining liquid in the last stages of solidification and will define the connectivity of the feeding channels, and thus determine the resultant porosity profile in the solidified casting. Titanium addition produces TiB$_2$ and TiAl$_3$ particles as nucleant, on which $\alpha$-Al dendrites will nucleate and thus producing a smaller grain size [Asenio-Lozano, 2006; Nafisi, 2006]. This research is aimed to understand the effects of Sr and Ti addition on AC4B alloys produced by Low Pressure Die Casting (LPDC) and to investigate the fading mechanism of each alloying addition.

Experimental method

The melting of AC4B was conducted in reverberatory furnace with the capacity of 500 kg at 810 ± 5 °C. Then aluminum was poured in to the preheated ladle and trapped hydrogen was eliminated by using Gas Bubble Floatation (GBF) for 8 minutes. Strontium was added as Al-10Sr (wt. %) rod with the amount of 0.002, 0.012, and 0.015 wt. % Sr in the holding furnace. At the beginning of GBF process, flux Al-Ti grain refiner was added with the amount of 0.019, 0.029, 0.0505 and 0.072 wt. % Ti. Molten metal was then injected through LPDC machine at 700 – 710 °C. Fading was observed through the changes of hardness, tensile strength and microstructure for a period of 0 – 2 hour. Samples were taken from thick and thin area of the component to see effect of heat transfer on grain refinement and fading.

Results and discussion

Effects of Sr Addition
Fluidity is an important factor in casting processes to reduce misrun. Results in Fig. 1 show that at all injection temperatures, addition of Sr increased fluidity of molten AC4B alloys. This is in correlation with previous studies that the role of Sr in solidification process is to decrease the eutectic temperature so that shorten the solidification range and resulting in higher fluidity. The presence of Sr also alters the morphology of porosity from irregular in Sr-free AC4B alloys into rounded and partly irregular ones as seen in Fig. 2.

![Fluidity vs. Injection Temperature](image1)

**Figure 1.** Effect of Sr addition and injection temperature on fluidity of AC4B alloys.

![Morphology of Porosity](image2)

**Figure 2.** Morphology of porosity in (a) Sr-free, and (b) 0.015 wt. % Sr-containing AC4B alloys. Microstructures were taken from fluidity samples.

**Effects of Ti Addition**

Effect of Ti flux addition on hardness and tensile strength of AC4B alloys is presented in Fig. 3. It is clear that the addition of Ti increased the hardness, and is linear with the increase in tensile strength.

![Hardness and Tensile Strength vs. Ti Addition](image3)

**Figure 3.** The change of (a) hardness and (b) tensile strength of AC4B alloy with addition of Ti

Fig. 4 shows detailed microstructure of Ti-containing alloys, and results of microanalysis are provided in Table 1. Second phase of silicon crystal is found in the alloys, as well as Al15(Fe,Mn)3Si2, and Al2Cu. They are spreading in between the dendritic structures. No difference in types of second phase was detected by addition of titanium. It is interesting to note that titanium was not revealed by SEM in both alloys. Therefore, it is thought that titanium grain refiner in the form of flux may have different mechanism in refining the structures, in which the titanium contributes to the growth limitation of dendrite.

Fig. 5 shows the change of hardness of 0.072 wt. % Ti-containing alloy for 4 hours. Samples from thin area reveals continuous decrease in hardness throughout the period, while samples from thick area exhibits sudden decrease in hardness in 1 hour, before increases up to 3 hours. In general, thin area possesses higher hardness than the thick area, due to faster heat transfer.
Fig. 4. SEM micrograph of AC4B alloys with addition of 0.072 wt. % Ti. Points of EDX microanalysis are labeled, and the results are available in Table 1.

Table 1. EDX microanalysis of AC4B alloy with 0.072 wt. % addition of Ti, at points shown in Fig. 4.

<table>
<thead>
<tr>
<th>No</th>
<th>Si</th>
<th>Cu</th>
<th>Fe</th>
<th>Mn</th>
<th>Ti</th>
<th>Al</th>
<th>Colour</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.96</td>
<td>-</td>
<td>24.73</td>
<td>5.46</td>
<td>0</td>
<td>rem</td>
<td>Light grey</td>
<td>Al_{15}(Fe,Mn)<em>{3}Si</em>{2}</td>
</tr>
<tr>
<td>2</td>
<td>96.43</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>rem</td>
<td>Dark grey</td>
<td>AlSi crystal</td>
</tr>
<tr>
<td>3</td>
<td>0.51</td>
<td>66.51</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>rem</td>
<td>White</td>
<td>Al_{2}Cu</td>
</tr>
<tr>
<td>4</td>
<td>1.52</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>rem</td>
<td>Grey</td>
<td>-Al</td>
</tr>
</tbody>
</table>

Figure 5. Change of hardness of AC4B alloys with 0.072 wt. % addition of Ti flux for 4 hour-period.

Conclusions

1. Addition of Sr up to 0.012 wt. % into AC4B alloys increases tensile strength, hardness and fluidity, as well as spreading porosity and change its morphology from irregular into rounded and partly irregular porosity. Further addition of Sr leads to decrease in mechanical properties due to extensive porosity formation.

2. Addition of Sr modifies microstructures of AC4B alloys up to class E (well modified) and decreases the secondary dendrite arm spacing (DAS). Modification of microstructures is apparent by the transformation of Si eutectic from acicular into fine fibrous, α-Al(Fe,Mn)Si from *chinese script* into accicular β-Al(Fe,Mn)Si, and Al_{2}Cu from pocket into massive blocks. Higher solification rate leads to finer SDAS and lower modification level.

3. Addition of Ti up to 0.072 wt. % increases the hardness and tensile strength of AC4B alloy by refining the DAS. The effect of Ti addition is more dominant in thin area.

4. The longer the holding time, the lower hardness and the tensile strength of AC4B alloy. On the other hand, the longer the holding time, the higher the SDAS.

5. The titanium was not detected in the microstructure indicating its growth limiting effect to refine the α−dendrites.

Keywords

AC4B, Al-Ti flux, fading, Grain refiner, modification,LPDC, Sr.

References

Asenio-Lozano, J; B. Suarez-Pena (2006), Scripta Mat., 54, 943-947.
Nanocrystallinity enhancement of the sol–gel derived TiO₂ thin films by conventional annealing and post-hydrothermal treatments

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Introduction
Titanium oxide or titania (TiO₂) is one of the transitional metal oxides which has been a subject of research and industrial interests due to its large range of interesting properties and technological importance. For example, the photocatalytic characteristic and super-hydrophilicity of TiO₂ thin films have led to important industrial applications such as antibacterial ceramic tiles, anti-fogging coatings, and self-cleaning glass (Negishi, 1995). In certain architecture application, the self-cleaning effect of TiO₂ coated on the glass panels is essential to maintain the transparency and cleanliness of the glass window, leading to a reduced maintenance cost for the building. Among other techniques to prepare TiO₂ thin films, sol–gel process has been widely practiced due to its versatility, i.e.: (i) a lowered processing temperature and thus lowered energy consumption; (ii) high purity; and (iii) feasibility of employing various post-forming processes (McKenzie, 1984). However, the sol–gel process has a major limitation, which is the largely amorphous state in the resulting TiO₂ phase, as a consequence of the relatively low processing temperatures. Therefore, the present study is aimed first at understanding the mechanisms responsible for the low crystallinity of the sol–gel derived TiO₂ film and furthermore finding an appropriate technique to enhance the crystallinity of the film at relatively low temperature.

Experimental details
In the present study, TiO₂ thin film was fabricated by using transparent TiO₂ sol solution obtained through a careful hydrolysis of the precursor titanium isopropoxide (Ti-iP, 98%, Acros) with ethanol (Et-OH, 95%, Merck) and de-ionized water. The Ti-iP concentration in the solution was controlled at 0.4 M with an understoechiometric ratio of water to Ti-iP (rw) of 0.82 and pH value of 1.3 for obtaining a stable clear solution. Furthermore, the sol solution were spin coated the onto the glass substrates at 3000 rpm for 20 seconds. The nanocrystallinity of the TiO₂ thin film was varied by applying two different treatments, i.e. conventional annealing and post-hydrothermal treatments. In the first treatment, the samples were dried at 60 °C for 5 minutes followed by annealing in a dry atmosphere at 150 °C for 3 hours. In the second treatment, after drying at 60 °C for 5 minutes and annealing at 110 °C for 15 minutes, the samples were exposed to water vapor using Teflon-lined stainless steel autoclave at 150 °C for 24 hours. The crystallinity of the resulting TiO₂ thin films was investigated by means of X-ray diffraction (XRD) measurements performed on Bruker AXS diffractometer using Cu K- radiation (1.5406 Å) operated at 40 kV, 40 mA and with a step-size of 0.02° and time/step of 20 seconds. The corresponding infrared spectra of the samples were recorded at room temperature in the range of 4000-400 cm⁻¹ using Bio-Rad FTIR model QS-300 spectrometer, which has a resolution of 8 cm⁻¹. The nanostructure of the films was...
examined further by using a high-resolution transmission electron microscope (HRTEM) operating at 200 keV and with a resolution of 0.14 nm (JEOL -3010).

Results and discussion
Figures 1a shows the XRD traces of the conventionally annealed and post-hydrothermally treated TiO₂ samples. It is clearly seen that the conventionally annealed thin film (trace “a”) shows broadened diffraction peaks in the 2θ range of 25–36, 38.5, 48.25, 54.85 dan 63.38°, corresponding to the (101), (112), (200), (211) dan (204) crystal planes of anatase TiO₂. The broadening of diffraction peaks strongly indicates a low crystallinity of TiO₂ phase. By contrast, the intensities of all the peaks were found to increase significantly in the post-hydrothermally treated TiO₂ thin film (trace “b”).

Figure 1b shows the existence of broad absorption bands located at ~3400–3500 cm⁻¹, which is assigned to hydroxyl groups of Ti–OH (Lee and Chen, 2001). In addition, there exists also an absorption band in the range of ~400–900 cm⁻¹, is accounted for by stretching vibrations of Ti–O–Ti groups (Wang, et.al., 1999). It is apparently demonstrated that the conventionally annealed sample (spectrum “i’”) provides a high intensity Ti–OH absorption band, but with a weak intensity Ti–O–Ti absorption band. By contrast, a reverse phenomenon is resulted by the post-hydrothermally treated sample (spectrum “ii’”) where the intensity of Ti–OH absorption band is decreased significantly, accompanied with an increase in the intensity of Ti–O–Ti absorption band. It is obvious that the nanocrystallinity enhancement of TiO₂ phase on the film is represented with an increase in intensity of Ti–O–Ti absorption band and a decrease in intensity of Ti–OH absorption band. The stretching vibration of Ti–O–Ti absorption band is regarded as the characteristic peak for TiO₂ nanocrystalline (Wang, et.al., 1999). The difference in nanocrystallinity between these two samples is further confirmed by HRTEM studies as shown in Figure 2. The conventionally annealed thin film provides amorphous TiO₂ clusters appearing as nearly spherical nanoparticles with no clear lattice fringes (image “a”). By contrast, TiO₂ nanoparticles in the post-hydrothermally treated film shows well-established lattice fringe (image “(b)”). The average crystallite size and standard deviation are 3.98±0.97 and 9.09±1.51 nm for conventionally annealed and post-hydrothermally treated thin films, respectively.Concerning the lack of nanocrystallinity for the sol–gel derived TiO₂ phase, Brinker and Hurd (1994) and Langlet et al. (2001) have suggested that the largely amorphous nature is related to the high functionality of titanium alkoxide precursor favoring the fast development of stiff Ti–OH networks via condensation. In this connection, further studies by Matsuda et al. (2000) and Kotani et al. (2001) suggested that some structural changes in the TiO₂ thin films derived from sol–gel process could be induced by a treatment in a high humidity environment at temperatures above 100 °C. Further investigations by Imai et al. (1997) and Imai and Hirashima (1999) confirmed that the exposure of sol–gel-derived TiO₂ films to water vapor triggered rearrangement of the Ti–O–Ti bonds leading to the formation of anatase phase at relatively low temperature (180
Therefore, the XRD and FTIR results in this study confirm two important points. First, the largely amorphous nature of the sol–gel derived TiO\textsubscript{2} thin films is due to formation of the stiff Ti–OH networks during fast condensation stage in the sol–gel process. Second, based on the model proposed by Imai et al. (1997) and Imai and Hirashima (1999), the nanocrystallinity enhancement upon post-hydrothermal treatment is obtained through the cleavage or cutting mechanism on the stiff Ti–OH networks by highly-pressurized water molecules to generate the flexible Ti–O–Ti bonds which can rearrange and thus densify to form nanocrystalline TiO\textsubscript{2} phase.

**Conclusion**

Based on XRD and FTIR studies, the mechanism responsible for the largely amorphous state of TiO\textsubscript{2} phase has been made understood, i.e. this is due to the formation of stiff Ti–OH networks during condensation stage which retarded further densification to obtain TiO\textsubscript{2} nanocrystalline. Nanocrystallinity enhancement on TiO\textsubscript{2} thin films was successfully achieved through a modified process combining a pre-annealing and a post-hydrothermal treatment carried out at relatively low temperature (150 °C). Highly pressurized water molecules upon post-hydrothermal treatment provide a cleavage mechanism on the stiff Ti–OH networks and thus generate much more flexible Ti–O–Ti bonds which can further densify to form TiO\textsubscript{2} nanocrystallites.

**Keywords**

Amorphous, enhanced nanocrystallinity, thin films, TiO\textsubscript{2}.

**Acknowledgement**

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Optimizing study on dissolved oxygen removal from water through hollow fiber membrane contactor via sweep gas method

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Introduction
In the power plant industry, removal of dissolved oxygen in boiler feed water is an important step for protecting the boiler from corrosion, poor heat transfer and efficiency reduction. Hollow fiber membrane contactors have high efficiency, energy, space and cost savings, and some other advantages. Hollow fiber membrane contactors for oxygen removal from water have been widely used in the process for ultrapure water in microelectronic, pharmaceutical and other industrials. Recently, hollow fiber membrane contactors have been utilized to remove the dissolved gases in boiler feed water (Miller, 2005).

Several earlier research on dissolved oxygen removal from water through hollow fiber membrane contactor via sweep gas method have been conducted at the Department of Chemical Engineering Universitas Indonesia (Kartohardjono, 2008). The result of the study is the correlation of the mass transfer coefficient represented by Sherwood number. The aims of this study is to obtain optimum conditions in the membrane contactors at a given water flow rates and fiber diameters. The optimum condition is achieved at the lowest operating, pumping and membrane costs.

Theoretical optimum conditions
There are three choices to define the best module as follows: the best module that gives the most mass transferred per cost; the best module that gives the most mass transferred per module volume; and the best module that gives the most mass transferred per power required to move the fluid. The first definition will be that most commonly used commercially (Wickramasinghe, 1993). When the total cost is dominated by the capital cost of the membrane, the best module is the one with the greatest mass transfer coefficient. The second definition is commonly quoted for blood oxygenators (Wickramasinghe, 2002, Matsuda, 2000, and Catapano, 2001), or might also be used for separations where space is important or very expensive, as on off shore oil platforms. The third definition, the module with most mass transferred per power required to move the fluid, would be achieved at low flows. At low flows, the power required to move the fluid is proportional to the square of the velocity across the fibre bed, while at higher flows, it varies with the velocity cubed.

The mass transfer correlation obtained from the previous study is (Kartohardjono, 2008),

\[
Sh = 0.11 \phi^{1.42} Re^{0.99} \tag{1}
\]

This equation is obtained from mass transfer study on dissolved oxygen removal from water through hollow fiber membrane contactor via sweep gas method. Furthermore, the number of fibers in the contactor can be obtained by solving Eq. (2).
\[
\left(0.011 \left(\frac{d_f}{d_p}\right)^{1.2}\right) = \frac{\frac{Q L}{n \pi d_F}}{\frac{\ln \left(1 - \frac{C^*}{C_i}\right)}{\mu \rho}} - \frac{\frac{Q L}{n \pi d_F}}{\frac{\ln \left(\frac{d_p}{d_i}\right)}{\mu \rho}} = 0
\]

(2)

**Results and discussions**

Eq. (2) is solved by numerical method using bisection method. Variables used in the equation are: DO\textsubscript{inlet} = 6 ppm; DO\textsubscript{outlet} = 4 ppm; C\textsubscript{*} = 0 ppm; Q\textsubscript{L} = 100, 200 and 300 L/h; \(d_p = 7\) – 25 cm; \(d_i = 0.03\) – 0.2 cm; and \(l_f = 40\) cm. Fig. 1 shows the effect of shell diameter on the number of fibers in the contactor. The number of fibres \(n_f\) increases with increasing module shell diameter \(d_p\). As the module diameter \(d_p\) is increased, the equivalent diameter of the module \(d_e\) increases, and based on the Equation (1) the mass transfer coefficient decreases and lead to an increase in membrane area.

Fig. 2 shows the results of membrane, pumping and total costs versus module shell diameter \(d_p\) at fibre length \(l\) of 40 cm, and cost of membrane per area per year \(a_f\) of $20, 30 and 40/m\(^2\)-y. Fig. 2 also shows that pumping cost is independent of membrane cost. The membrane cost increases and pumping cost decreases with increasing module shell diameter \(d_p\). Meanwhile, at the same module shell diameter, membrane cost increases with increasing the cost of membrane per area per year. Fig. 2 is consistent with Fig. 1 where an increase in module shell diameter \(d_p\) will increase the number of fibers and lead to an increase in the membrane area \(A_m\).

Total cost of pumping and membrane is shown in Fig. 3. Total cost decreases as contactor shell diameter increases at the region where pumping cost is dominant, and then increases at the region where the membrane cost is dominant. The same phenomenon also occur for the optimum module shell diameter as shown in Fig. 4. Fig. 4 reveals that as the membrane cost is increased, the optimum module shell diameter \(d_p^o\) decreases. Increasing the cost of membrane per area per year \(a_f\) increases the membrane cost at the same module shell diameter as shown in Fig. 3. Therefore, one needs lower module shell diameters \(d_p\) before the pumping cost starts to dominate, hence pushing the optimum module shell diameter \(d_p^o\) to lower values. The value of \(\eta\) at the optimum module shell diameter \(d_p^o\) increases because it costs more to membrane and to pump a liquid further. All the curves tend to the same straight line at lower module shell diameters where the pumping costs dominate.

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**Figure 1.** Variation of fiber number in the contactor, \(n\), with contactor diameter, \(d_p\).

**Figure 2.** Variation of pumping and membrane costs, with with contactor diameter, \(d_p\).
Figure 3. Variation of total cost/year, with contactor diameter, $d_P$.

Figure 4. Variation of performance index, $\eta$, with contactor diameter, $d_P$.

Conclusions

The study has been conducted to evaluate optimum contactor shell diameter at dissolved oxygen removal process through hollow fiber membrane contactor via sweep gas method. The optimum condition is obtained in two stages, first to find the fiber number in the contactor and then to obtain optimum contactor shell diameter at the lowest performance index. The optimum contactor shell diameter decreases at the region where the pumping cost is dominant, and increases at the region where the membrane cost is dominant.

Keywords

Contactor, sweep gas, and performance index.

References


Separation of dissolved oxygen from water through hollow fiber membrane contactor via sweep gas method

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Separation of dissolved oxygen from water through hollow fiber membrane contactor via sweep gas method. Proceeding on Seminar Nasional Fundamental dan Aplikasi Teknik Kimia, Surabaya

Introduction
Water is one of main utilities and has an important role in industries. This water still contain very small amount of dissolved oxygen, however, have great effect on several industries such as corrosive and oxidative effects. As for instance, in semiconductor and power plant industries, dissolved oxygen in water can cause corrosion to production equipment and products such as corrosion at steam turbine and defect chip products. The need to remove dissolved oxygen from water is different from one to another depend on purity requirement and its tolerance. In power plant industry, as for example, dissolved oxygen concentration in boiler feed water must be reduced until below 0.5 ppm (mg/L) to protect the boiler from corrosion, poor heat transfer and efficiency reduction (Shao, 2008), and below 10 ppb (mg/m³) to prevent oxide layer formation in waver-immersion system (Ito, 1998).

Hollow fiber membrane contactors for oxygen removal from water have been widely used in the process for ultrapure water in microelectronic, pharmaceutical and other industrials because of its high efficiency, energy, space and cost savings, and some other advantages. Recently, membrane contactors have been utilized to remove the dissolved gases in boiler feed water. However, their use in boiler feed water are still not commonly used compared with currently widely used technologies, such as chemical agents, forced draft degasifiers and steam deareators (Miller, 2005). In the gas-liquid contact process through the hollow fiber membrane contactor, usually used hydrophobic microporous membrane to prevent water filled the membrane pores and allow oxygen go through the membrane pores. In general there are three methods to remove dissolved oxygen from water through membrane contactor; vacuum degassing method, sweep gas method and combination of these two methods. This research will employ polypropylene fibers in the contactors to remove dissolved oxygen from water via sweep gas method. The aim of this study is to evaluate the effectiveness of hollow fiber membrane contactor for dissolved oxygen removal from water via sweep gas method through mass transfer and hydrodynamics studies.

Materials and methods
The fiber membrane was provided by MEMCOR Australia. The membrane is made of hydrophobic polypropylene and the fibers are 2 mm in outer diameter. The total numbers of fiber membrane in the hollow fiber membrane module are 30, 40 and 50, respectively.
The schematic diagram of deoxygenation experiment is shown in Fig. 1. Water from the reservoir was pumped by a centrifugal pump to the hollow fiber membrane module at the shell side. Meanwhile, nitrogen sweep gas flow on the lumen side of the membrane contactor to sweep oxygen out from the membrane. Dissolved oxygen concentration and pressure drop
Results and discussions

Mass transfer coefficients and oxygen fluxes through the membrane contactors are shown in Fig. 2 and 3. Mass transfer coefficients and fluxes, as it is expected, increase with an increase of water flow rate in the contactors. On the other hand, mass transfer coefficients and fluxes decrease with an increase of membrane packing fraction in the contactors. Transversal flow and surface renewal effects are main factors affecting the increase of mass transfer coefficients and fluxes at the lower membrane packing fraction (Kartohardjono, 2005). Similar phenomena also occur in heat transfer where Nusselt number increases as the tubing packing fraction in heat exchanger decreases (Lipnizki, 2001).

To study the dependency of oxygen transfer coefficients through the membrane contactor, correlation is usually expressed in dimensionless Sherwood number, Sh, Reynolds number, Re, and Schmidt number, Sc. Sherwood number, Reynolds number and Schmidt number are representing mass transfer coefficients, flow properties and its viscosity, respectively. General equation to correlate these parameters is expressed in Eq. (1), and for oxygen-water system in this study the water viscosity is not varied and the b value of 0.33 can be used (Gabelman, 1999).

\[ Sh = f(\varphi)Re^a Sc^{0.33} \]  

Figure 4 shows experimental data of Sherwood number plotted against Reynolds number at various contactors packing density. Similar to mass transfer coefficients and fluxes, Sherwood number increase with an increase of water flow rate and a decrease in packing density. Moreover, the correlation from Fig. 4 is best fitted by equation,

\[ Sh = 0.0015\varphi^{-1.42} Re^{0.99} Sc^{0.33} \]  

The high dependency of Sherwood number on Reynolds number exponent \(a=0.99\) indicated that mass transfer is took place in turbulent region (Costello, 1993).

Hydrodynamics study is concluded by plotting water pressure drop versus Reynolds number as shown in Fig. 5. Pressure drop increase with increasing membrane pacing density in the contactor at the same Reynolds number due to an increase friction between water and fibers in the contactor. In addition, an increase in fiber number will decrease equivalent diameter of the contactor, and at the same time increase the water velocity at the same flow rate which lead to an increase in water pressure drop.
Conclusions
Experiments have been conducted to remove dissolved oxygen from water through hollow fiber membrane contactor using nitrogen as a sweep gas. The mass transfer coefficients and oxygen fluxes through the membrane contactor increase as water flow rate increase and membrane packing density decrease in the contactors. Meanwhile, water pressure drop increases either with increasing water flow rate or membrane packing density. Mass transfer correlation in the contactor is best fitted by equation of: $Sh = 0.011 \phi^{-1.42} Re^{0.99}$ showing the dependency of contactor geometry ($\phi$) and water flow rate in the contactors (Re).

Keywords
Mass transfer coefficient, Reynolds number and pressure drop, Sherwood number.

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Introduction
The coating of steel or iron with zinc using various processes is called "galvanizing". Metallic zinc is used for corrosion protection of cast irons, mild steels and low alloy steels. The zinc or zinc alloy cathodically protects the steel surface. Manufacturers of many items such as truck bodies, buses, and automobiles are increasingly concerned with the effects of corrosion particularly when chemicals or salts are used on roads for ice control. Galvanized metal is also used in many appliances such as household washing machines and driers and in many industrial products such as air conditioning housings, processing tanks, etc. Other uses for galvanized products are for high tension electrical transmission towers, highway sign standards, and protective items.[1]

There are two basic methods of galvanizing steel.[1] One is by coating sheet metal and the other is by hot dipping the individual item. The coated sheet metal is produced by the continuous hot dip process, but traffic control devices, high-tension transmission tower parts, etc., are made by dipping each item. Galvanized steels can be joined by the same methods as uncoated steel. The tensile, bend and impact properties of sound welds made with covered electrode, gas shielded metal arc or submerged arc processes in zinc coated steel are equivalent to the properties of sound welds in uncoated steel, but galvanized coatings on steel may require: i) different data for calculation of welding parameter; and ii) different methods of fabrication.[2,3]

There is often uncertainty about these differences and how problems connected with them can be solved. This leads to reluctance to specify welding of galvanized structures and welders are also often unwilling to weld them. This objections are often based on the erroneous opinion that welds in zinc coated steel have inferior mechanical properties such as increased porosity, inter-crystalline cracking, and zinc becoming incorporated in weld metal when compared to welds in uncoated steel.

These problems tried to be dealt with applying the plasma arc welding technique on zinc coated steel sheets. Since the plasma welding has many advantages such as a good penetration, narrower weld beads, a minimized heat affected zone (HAZ) and minimal distortions.[4,5]

The paper describes the weldability of zinc coated steel sheets produced by plasma arc welding and also to investigate the influence of zinc dilution on the mechanical properties of weldments as a function of various process parameters.

Experimental procedures
Welding equipment and accessories: The plasma welding equipment and the mechanized tracking machine (BUG-O System) was used in this investigation to maintain the welding travel speed.
Material & Specification: The low carbon steel sheet was used with the dimension was 0.7 mm and 1.0 mm in thickness respectively and the plate area of 450mm x 100mm. Those materials were hot-dip galvanizing types with a variety of zinc thickness. The thickness of zinc layer is 20 µm for 0.7 mm-thickness sheet and 10 µm for 1mm-thickness sheets.

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Welding Program and Design: The welding experiments were carried out by several parameters, those are:

a. Plate thickness: 0.7 and 1.0 mm
b. Welding current in the range of 20 to 40 A
c. Welding gas flow rate: 0.8 and 1.2 Lt/min
d. Welding travel speed: 300 to 650 mm/min

Results and discussion
An optimum combination of parameters was sought which would give the full-penetration of weld with the highest travel speed and no visual defects on every steel-sheets thickness as a basis characterizing the process in the most interest and useful industrial applications.

Effect of Main Parameters: The arc current, travel speed, orifice gas flow rate were the prime variables in this investigation. All of these variables are interrelated in their effect on penetration to produce the sound of welds. The relationship between current, travel speed and plasma gas flow rate which is called the operating envelopes. [6]

Evaluation of Mechanical Properties: The mechanical properties of the butt welds were determined by transverse tensile tests, bend test and micro hardness test. The highest hardness is in the weld metal area, this is due to the high cooling rate in weld metal producing the hard structure. [3] The tensile results showed that the dilution of zinc in weld-metal had no significant effect on the tensile properties of the butt-welded sheet. It is found that there is no crack in all welds as can be seen in Figure 1.

![Figure 1](image1.png)

(a) The macrostructure of weldments for 0.7 mm in thickness before and (b) after bending test.

Evaluation of zinc dilution in the weld pool: For further investigation, the SEM by EDAX was carried out to determine the dilution of zinc in the weld pool. The photograph in Figure 2 shows that the zinc layers are still exist in the surface of weld metal, but there are very thin layer. Analyzing the weld metal area using EDAX show that the amount of zinc diluted in the weld pool varies from the top to the bottom of weld bead in all welds as can be seen in Figure 2. The dilution of zinc tends to decrease from the top weld bead to the bottom weld bead. There are some elements dilute on the weld metal especially aluminium which is one of the most important and common of the metallic elements. [7,8] However, the presence of zinc that picks up in the weld metal is no influence on the tensile and bending properties.

![Figure 2](image2.png)

(a) The thickness of zinc coating for 0.7 mm in thickness after welded by PAW & (b) The percentage of zinc dilution from top to bottom of weldments
Conclusion
The following conclusion can be drawn as follows:
1. Zinc coated steel sheets with 0.7 mm and 1 mm in thickness can be welded satisfactorily by plasma arc welding.
2. Arc current, travel speed & gas flow rate are the main parameters in PAW interrelating in their effect on weld penetration to produce the sound weld.
3. No significant defects in all welds produced by PAW and the highest travel welding speed can be achieved up to 650 mm/min for both plate thicknesses.
4. The tensile and bend properties of zinc coated steel welds were unaffected by the dilution of zinc in weld metal.
5. There is a slight difference in chemical composition because of zinc pick-up varying from the top layer to the bottom of zinc coated steel sheets weldments.

Keywords
Mechanical properties and weldability, plasma arc welding, zinc coated steel sheet.

References
A study on Kampung Pekojan area as urban living heritage

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Introduction
This study investigated issues on urban living heritage and local community participation on conservation of urban heritage. The case study is urban settlement of Pekojan, a Muslim Arab community in Kotatua, Jakarta. The investigation focused on object as well as subject of conservation i.e. the physical urban characteristic and the socio-cultural aspect of Pekojan. Academically the purpose of this study is to enrich understanding and contribute development of theory of problem solving on urban living heritage, especially for the metropolitan city such as Jakarta. Practically this study aims to formulate a conservation strategy of urban living heritage within the context of urban development system.

The urban characteristic of Pekojan had been investigated through data compilation and field surveys. We explored the historical background of Pekojan through key informant interviews as well investigation of historical resources. Using the purposive sampling, detail observations on the existing dwelling units had been conducted to understand the architectural qualities of the remaining old buildings. An open ended interview had questioned to old building’s owners on their vision on conservation.

The results and discussion
Pekojan is derived from Koja, a Moorish or Muslim Indian migrant from Bengali. Few records mentioned Moorish settlers living there, but the survival of Al Anshor mosque dates back from 1648 remarks their existence. The opening of Suez encouraged migration from Hadramaud or South Yemen and since then the Muslim Arab population gradually increased and replaced the Moorish settlers. By the end of the 19th century Pekojan become entirely an Arab Muslim settlement.
At the micro-morphological scale of family household, the common housing type in Pekojan was the tube-like terrace row house often called rumah petak. By purchasing only one plot, one could build a house which only 4 meters width, but could be as long as needed according to conditions. The longest house could be 40 meter length.

The house of Pekojan is characterized by the intermediary transition spaces between the entrances and the courtyards, preventing direct contact with the public to protect the privacy of life taking place in the courtyards. On the other hand the life on terraces is more public and open to communicate with the neighbourhood. The physical constraints of terrace and courtyard met the social and cultural practices of Muslim Arabs in Pekojan. The pattern of the houses in Pekojan created enclosed spaces, yet enhanced the sense of togetherness among the Arab Muslims. Social practices are clearly expressed through the separation of the public sphere. Men move freely in the streets and the terrace in the absence of women, while women space is reserved for their convenience and privacy in the back-lane areas.
By the middle of 20th century, migration from rural areas took place in large scale in Jakarta, and Pekojan soon become more and more built up. While Pekojan is gradually transformed into a high density residential area, the disappearing process of Arab Muslim population tends to increase. From a total of 30,794 people in Pekojan, less than half of the population are Muslims, of which not more than 1,000 inhabitants are Muslim Arab. The rest are non-Muslim dominated by Chinese. It is very clear that Arab Muslims are gradually disappearing and are being replaced by the Chinese inhabitants.

Transformation is clearly visible in the new pattern of the Arab houses which are transferred to Chinese. However, the Chinese intrusion does not necessarily transform building activities, since many new dwellers maintain the building function for residential purposes. In the area along the main streets, more change of use from residential to commercial or other more economic uses are expected, such as combining housing with storage. The latter relates to the fact that Pekojan is located adjacent to the commercial and retail center of Glodok. The transformation strikes the naked eye with intensity. High levels of congestion are observed – as result of high residential densities, multiple means of transport and the use of street for
commercial and circulation purposes. The previously peaceful residential quarter is makeshift, transformed into mixed areas that imply congestion and degradation. The main characteristic of morphological change in Pekojan is the intensification use of building lots. Existing small series of purchased lot parcel or smaller units of houses force the new owners to rebuild upward. Meanwhile, there is scarcely any transformation in the case of rental houses so that most of them are in an unreasonable state of disrepair. The low rental rate is the main reason why the landlord will not have anything to do with repairs. On the other side, tenants will not invest in expensive repair since there is no any guarantee of long-term security. Such tenants are really caught in a dilemma, sticking on because of the cheap housing as well as the convenience being located in the inner city.

Conclusion
Although local government had designate Kampung Pekojan as Arab Muslim cultural heritage district (Regulation Governor of DKI No. 34/2006), the study revealed that Pekojan had been transformed into heterogenic settlement. The continuous process of building transformation of old houses in Pekojan is undergoing and triggering the physical degradation through continuous demolition of abundant old buildings. As a result, neither characteristic of dweller nor the pattern of settlement implies the continuance of Arab Muslim cultural tradition. Without any protection program, Muslim Arabs in Pekojan have been gradually disappeared, while in return the Chinese communities have emerged. The declining process of the Arab Muslim population might be difficult to resist, as long as the property inheritance consistently follows Islamic law. But religious buildings and activities would never shrink, as the rest of Muslim Arabs keep on try to maintain the subsistence of all religious features and activities in Pekojan. This has been underway for a long time and until recent times remains significant to preserve old kampung Pekojan as the historical Arab Muslim settlement. For that reason, synergy of religious buildings and activities would bear a considerable role to maintain Pekojan as the Islamic center for already spreading Arab Muslims, alongside an emerging Chinese community inside Pekojan.

Keywords
Arab muslim, socio-cultural aspect, urban characteristic, urban living heritage.

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Factor affecting on sustainability of water supply (Case study on Buaran water treatment plant in the city of Jakarta)

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Introduction

In Indonesia like other countries in Southeast Asia, the major problems are increasing population density, rapid urbanization and industrial growth, inadequate food, resources depletion and pollution in the new era. To meet the increasing demands, people deliberately modify the natural environment with a purpose to improve the quality of live. Water is used not only for daily life such as drink, food, bath but also for other purposes such as agriculture, industry and many other purposes. According to Cunningham and Saigo (2001) almost 60% of human body is consisting water, and people can survive for couple of week without enough food but without water can only survive for a couple of day. To support the quality of life, water is very important in human life. To meet the needs of water for the communities, the government has to provide the good water supply system.

In the past, municipal water supply systems generally comprise collection works, purification works, transmission works and distribution works which are concerning with engineering aspect. Population growth, industrialization, economic growth and the development of quality of life are some example in increasing demand of water supply. To fulfil the need for water supply, not only depend on engineering aspect but also another aspect should be taken into account. Integrated water supply system approach which will consider natural environment, engineering aspect, and socio-economic and community participation aspect should be applied.

Method

The study was observing Buaran and Pulo Gadung Water Treatment Plant and their operation as well as raw water characteristics in water intake. Study on consumer perception on water supply usage is using ex post facto research with stratified random sampling for water supply consumer. Primer data has collected by field observation and questioner form are distributed to representative sample. Secondary data has collected from representative offices and other relevant sources. Study on raw water characteristics at Water Treatment Plant at Buaran and observation on social aspect along West Tarum Canal. Jatiluhur Dam is one of raw water sources for water supply for City of Jakarta. From Jatiluhur Dam to the nearest Water Treatment Plant in Buaran which around 70 km long, transmitted by using open channel so call West Tarum Channel since 1966. Instead of as raw water for Buaran Water Treatment Plant, West Tarum Channel its also supplied for two other Water Treatment Plant, Pulo Gadung Water Treatment Plant and Pejompongan Water. Water analysis from raw water
conducted for 34 water quality parameters. 34 parameters were used under time based approach of various time period (hours to monthly based).

**Result and discussion**

The result was indicated that some parameters are exceeding water quality standard based on National as well as Local Government Water Quality Standard and the method of analysis is based on AWWA (1999) and Hefni (2003). Observation on water quality parameter source of Water Intake Buaran from year 2003 until year 2006 shows that there are 8 parameter are exceeding water quality standard, turbidity, BOD, Iron, COD, Ammonia, Manganese, Suspended Solid and Total Coliform.

**Figure 1. Concept on sustainability of water supply**

Characteristics of raw water, water treatment technology alternative, water production cost, willingness to pay, implementing and law enforcement on current regulation are other aspect to be considered in sustainability of water supply system. Nowadays, river is the main alternative of source of water among other sources of raw water. However, characteristic of the surface water has been setting worst basically caused by people activities as well as the effect on climate change. Adaptive technology should also an option to accommodate the change of characteristics of the raw water in produce safe water. In general water treatment plant in Indonesia was constructed for 15 and 40 years ago. The development on water treatment plant technology to produce drinking water that meet drinking water standards will affect to the water production cost as a result will also affect to willingness to pay of the water supply consumer. Many regulation concerning with water supply have already been set up and produced which is not only protecting the water resources and the environment from pollution, but also managing the community as well as government obligation.

Concept of integrating among natural resources, man made environment and social environment should be implemented in all kind of live. Sustainability of water supply in general depend on natural condition and man behaviour. Environmental condition also depend on natural resources and global climate changes that will affect to the characteristics of water resources. Human behaviour also affects the characterisic of water resources. Education, regulation and proper environment are some examples to change man behaviour to protect environment. Technology alternative in improving water treatment plant should also pro environment and not to burden the water supply consumer. Addition technology to treat raw water should also to consider capacity of human resources available.

**Conclusion**

People participation on protection water resource management should be improved by education, training as well as socialization on the important of health. Production cost as addition of technology should be explained and also transparency to consumer. Willingness
to pay consumer to water tariff is one of the performance indicator of level in water supply services. The other important thing is coordination among institution or parties involving in water supply. The coordination should be made among, central Government, Department of Internal Affair, Department of Public Work, Forestry Department, Local Government, Private Company, Police Department and the community participation.

Keywords
Adaptive technology, characteristics of raw water, integrated water supply system, production cost, willingness to pay.

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Geochemical association of heavy metals and environmental pollution at Jakarta Bay

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Introduction
The environmental degradation due to the increasing of heavy metals concentration in water and sediments will cause many health disturbance to organism (biota) such as fish, bivalvia, etc. that live in the water and also human.

Studies of the trace metal contamination of sediments to monitor industrial pollution often rely on the analysis of total metal content, but information on total concentration is not sufficient for an understanding of the environmental behaviour of trace metals as only fraction of the total metal is available for biological or diagenetic processes (Groot et.al., 1982; Martin et.al., 1987: Tack and Verloo, 1995).

The objective of this study is to know the distribution of heavy metal Pb (Lead) in five river mouths that flow into Jakarta Bay and to know the geochemical partitioning of Pb in the sediments that are bound to “Exchangeable Fraction”, “Reducible Fraction”, “Fe-Mn Oxide Fraction”, “Oxideable Fraction” and “Residual Fraction”.

In this study, a total of 18 sediment samples were collected from the coastal area of Jakarta Bay. The samples were taken from the 5 river mouths namely Muara Angke, Muara Ciliwung (Ancol), Muara Sunter, Muara Cakung, and Muara Bekasi. From each river mouth, there were 3 sub samples taken from left side, right side and the middle part of river mouth. One comparison sample was also collected from Penjaliran Island (100 km up North of Jakarta Bay) to see background value and compared it with values that observed in Jakarta Bay.

Methods
During sample collection the depth, salinity, dissolved oxygen, biological oxygen demand and suspended solids of the overlying water were recorded. Water samples were collected with a 2-L Van Dorn water sampler. Biological oxygen demand is based on a five-day incubation period. Suspended solids were determined by filtering 2 liters of water through a pre-weighed glass fiber filter. Filters was dried at 60º C and reweighed after equilibration in a desiccator. Sediment samples were collected using a 3.5 L Ekman grab sampler. The top 2–3cm of sediment was collected using a plastic spatula. After that, sediments was placed in acid washed plastic bags and stored at 4º C for transport. Within 24h of collection, samples are hand picked for benthic organisms and large organic matter, dried at 105º C and stored in acid washed sample bottles. Bulk sediment samples should be disaggregated with an agate mortar and pestle in preparation for geochemical analysis.

The geochemical fractionation of Pb is determined on a 1g aliquot of bulk sediment using a series of three sequential leaches, a residual digestion and a separate oxidizing leach (Buckley and Winters, 1992). The first sequential leach, denoted F1, is with weak (25%) acetic acid
adjusted to pH 2 for 16 hours at room temperature as described in Chester and Hughes (1967). This weak acid leach extracts metals predominantly from carbonates, hydrated sulfides, and weakly bound metals adsorbed on mineral surfaces. The second leach, denoted F2, is using 1M hydroxylamine hydrochloride (NH$_2$OH.HCl) at room temperature for 16h at pH 5–6. This leach extracts potentially reducible metals (Chester and Hughes, 1967). The third leach, denoted F3, is performed with 0.04M NH$_2$OH.HCl at pH 2 heated to 80º C. This leach extracts predominantly strongly adsorbed metals from mineral surfaces (Tessier et al., 1979). The sum of metal extracted by these three leaches is defined as labile metal. A 0.5g aliquot of the residue from the first three leaches will be analyzed for total metal content by a four acid digestion (HClO$_4$/HNO$_3$/HCl/HF) at 200ºC. This residual digestion, denoted F5, extracts metals bound within lithogenic material and complexed with organic matter. To account for metals bound to organic matter, the F5 fraction is presented as the total metal content of the residual fraction minus the metal content of the organic fraction. The organic fraction leach, denoted F4, will be performed on a separate 1g aliquot of sediment treated with an oxidizing leach of 10% hydrogen peroxide and 25% acetic acid at pH 2 for 24h. This leach will extract metals associated with organic matter and oxidizable sulfides. The acetic acid retarded hydrolysis of metals as they were extracted. Because this leach also extracted metal from the weak acid soluble forms, it is necessary to correct for this component by subtracting the results from the first sequential leach.

Leachates from the labile and organic fractions were analyzed by ICP-AES. Residue total destruction analysis was analyzed using ICP-MS. The accuracy and precision of results is determined by analyzing five sediment samples in duplicate and the standard reference material MESS-1 in triplicate.

**Results and discussions**

The result of this research showed that Lead (Pb) reach the highest concentration of 272 ppm at Muara Sunter. Other river mouths like Muara Angke, Muara Cakung, and Muara Ciliwung have average concentration as much as 167, 146, 78 ppm, respectively. These values exceed the Canadian Standard for Contaminated Sediments which for Pb is 25 ppm. Lead (Pb) is used for industrial processes such as in textile, paint, ceramics, metal foundries, agrochemical, pharmaceutical, electronics, plastics, vehicles, pulp, and electroplating factories. Meanwhile, the lowest concentration of Pb was found at Muara Bekasi. There are not many industries, yet, in this area. Based on percentage of fraction, most of Lead (Pb) was bound to lithogenic fraction (F5) as much as 15-90 %, therefore there are not bioavailable for biota right now, but it is possible to be released in the future.

**Conclusion**

Lead (Pb) content in four river-mouths (Muara Angke, Muara Sunter, Muara Cakung, and Muara Ciliwung) exceeds the Canadian Standard for Contaminated Sediments which for Pb is 25 ppm.

**Keywords**

Geochemical association, heavy metal, sediment, pollution, Jakarta bay.

**Acknowledgement**

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Heavy metals content in the sediments of Angke River and its estuary, Jakarta

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Introduction

River is one of important water resources that give many benefits for human society. Characteristics of river reflect the environmental condition of the surrounding landscape. Healthy river ecosystems are balanced systems where input, output and chemical transformation maintain nutrient concentrations within ranges appropriate for organisms living in the river. Sewage and industrial effluent from urban areas and fertilizers from agriculture field and residential landscape becomes major input pathway, raising nutrient concentration to many times their natural concentration. In response to the high nutrient levels and the associated high concentration of organic matter, autotrophic and heterotrophic microbial communities bloom and natural species composition are severely disrupted. The consequences of these effects to water quality may be severe that human health is directly threatened, especially the presence of toxin such as heavy metals in these effluents (Naiman et al., 1998).

Kali Angke is one of complex river ecosystem in Jakarta. This river provides benefit for the surrounded people such transportation, diffusion of wastes, and fishing, but on the other hand impact of those activities have degraded river condition. Monitoring of water quality and management of Kali Angke are needed to maintain the river water condition.

Sediment plays a crucial role in water quality due to its role as a sink for pollutants and the potential later release of these contaminants to the water column with changes in physiochemical conditions (Salomons and Forstner, 1984).

Methods

Surface sediment sampling was performed in the middle of the rivers. Surface sediments were collected using an Ekman grab sampler. The samples were carefully scraped only the top 2 cm, then transferred to plastic bags (acid washed). At places where the water depth is low, plastic spatula is used to take the sediments from each site. Sediments were air-dried at room temperature. To know the concentration of heavy metals in the environment, strong acid digestion using HF, HNO₃ and HCIO₄ on fraction < 63 um of sediments was used. This method not only gives total concentration of metals but also attack silicate minerals. The procedures are as follows: pre-weighed (± 0.25 g) dry sediment samples were put into teflon beaker and were digested in a gradually warmed (± 100 °C) mixture of nitric, perchloric and hydrofluoric acids in teflon ‘bombs’. This method will destroy the silicates and most constituents of sediments. Samples were evaporated overnight and after several steps of dilution (with deonized water) and filtration (using mesh 42 of ash-less paper), the samples were ready for analyses by Perkin Elmer 3110 Atomic Absorption Spectrophotometry.
(AAS) (Sola, 1991). The detection limit for Pb and Cd were 0.01 ppm; while for Hg and As were 0.0001 ppm.
To calculate heavy metals content in benthic animals, 0.5 – 3.0 g of benthic animal samples were preweighed to obtain a dry weight. Samples were ground using an agate mortar and pestle. Ground samples were stored in plastic vials until sub samples were taken for digestion. Approximately 0.3 g of benthic animal samples are mixed with 5 mL of concentrated nitric acid and heated to 60 degree Celcius for 2 hours. The temperature is raised to 110 degree Celcius and the samples are digested for further 4 hours. An additional 3 mL concentrated nitric acid was added and temperature be reduced to 60 degree Celcius. The samples were covered and allowed to reflux overnight, until the volume reduced to approximately 1 mL. Samples were diluted to final volume of 50 mL with demineralized water. The samples are ready for analysis. Here, Zeeman Background Corrected Graphite Furnace/ Autosampler Condition Hitachi Model Z-2000 Series Spectrophotometer was used.

Results and discussions

Based on heavy metal analysis using Atomic Absorption Spectrophotometer, it is showed that lead (Pb) content in Angke River sediment range from 13.73 in Pantai Indah Kapuk and 56.10 µg/g dry wt (ppm) in Right side of Rivermouth. Some of these values were above the Canadian Standard which for Pb is 25 ppm. Sources of lead (Pb) is from leaded gasoline, smelting, painting, and galvanizing, also electroplating factories.
Cadmium (Cd) content in Angke river ranges from 8.92 µg/g dry wt (ppm) in Pesing Poglar and 124.33 µg/g dry wt (ppm) in river mouth. These values exceed the Canadian Standard for contaminated sediment which for Cd is 0.006 ppm. Cadmium is used extensively in electroplating factory, paints, batteries, and phosphate fertilizers.
The concentration of Arsenic (As) in sediments of Angke river and its estuary ranges from 3.55 – 34.28 µg/g dry wt. Probable Effect Level (PEL) is the concentration above which adverse effects are expected to occur frequently. The PEL for arsenic is 17 micrograms per gram (µg/g) dry weight, for bulk (un-sieved) sediments. Arsenic occurs naturally in soil and minerals and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Beside that, arsenic is used in various agricultural activities, insecticides, and poisons.
Mercury (Hg) content in sediments of Angke river and its estuary varied between <0.2 - 28.11µg/g dry wt (ppm). Some of these values are below the detection limit. Only at River mouth is high. This is probably due to water discharge directly from river that is carried by the currents. Canadian Standard for Contaminated Sediment for Mercury in sediments is 0.5 ppm.

Conclusion

Most of heavy metals content in several areas of Angke River and its estuary already exceeds the Canadian Standard for Contaminated Sediments.

Keywords
Angke river, benthic animal, estuary, heavy metal, sediment.

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References
Low impact development approach of meandering river to conserve equilibrium river system

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Introduction

Indonesia has approximately 127 river basins managed by central government, provincial government and district government. Most of the river has a meander area especially located at the lower reach. The word ‘meander’ originates from the Meander River of South-West Turkey, which clearly shows the winding course characteristic of a meandering river. In general, rivers originate from volcanic mountains and have a distinctive bed slopes which are steep at the upper reach, moderate at middle reach and nearly flat at lower reach. When the bed slope change from moderate into flat, the pattern of river channel also altered from straight into braided or meander due to varying velocity and geometry of the channel.

Meander migration

Meander migration usually occurs as a response to natural or man-made disturbances of the fluvial system. In most cases, it causes the occurrence of imbalance river morphology. In order to predict changes in channel morphology, location, and behavior, it is important to understand the relative stability of a channel, which is revealed by its patterns. The conditions of the flow and the properties of the soil are major factors affecting meander migration, thus, soil properties, meander geometry, channel relocation and human activities on the floodplain.
of river are considered to be the most important factors affecting meander. For instance, its related processes of the meander migration cause problems such as landslide or slope failure, outside bend erosion (Figure 2), siltation on the inside meander area, flood, scour of infrastructure foundations and ecological problem.

A number of researchers showed the relation of meander migration with several properties of the river such as free surface slope of the river, catchments area, channel width and channel geometry.

Most of meander pattern in Indonesia located at the urban area which is has some a serious problem as well as many human activities along the floodplain of the river. This is of great economics importance such as in connection with cost of flood control scheme, its critically dependent on the estimated maximum flood level, sustainability of infrastructure i.e. irrigation system, water treatment plan, highway, bridge pier that is seriously affected by the scour and subsequent downstream deposit of sediment.

Subsequent modification if conditions remain stable such as canal shortcut or river correction, are deep weathering and the deposition of sediment on the flood plain. Oxbow lakes, meander scars, and natural levees are common which is has to maintain for long term purpose and need some of maintenance budget to prevent meander migration.

**Low impact development approach (LID)**

The concept of LID is an innovative, ecosystem-based approach to land development and stormwater management (Figure 3). Basic LID principles are conserve natural areas as meander pattern, minimize development impact, maintain site runoff rate through implement Integrated Management Practice such as pollution prevention, proper maintenance and public education programs.

The morphological behavior in Meander Rivers is governed by several factors: channel width, discharge, water depth, slope, bed material and vegetation. The role of vegetation on the floodplain should be addressed as once of Low Impact Development approach to conserve the meandering channel pattern. Bank vegetation influences the channel pattern and controls bank strength also increase bank strength, reduction flow velocity and effective shear stress as well as channel width (Ikeda and Izumi, 1990).
Conclusions

There are many examples of streambank stabilization and rehabilitation measures that failed because they were placed on actively migrating streams and rivers without evaluating the characteristics of channel migration at those locations. In many places, efforts are being made to acquire, maintain, and increase remaining riparian vegetation system for ecological and biological purposes also for conserve meander river migration (Figure 4). Since sheet erosion can also cause banks slope failure, slope surface protection should be considered as important as other structural reinforcements but its importance is often over looked. Protecting the slope surface with vegetative cover is an effective, economical, and essential preventive measure. The vegetative cover provided by grass seeding, hydro-seeding or hydro-mulching normally is quite effective against sheet erosion and small rill erosion, and deep-rooted plants such as trees and shrubs can provide some structural reinforcement for the ground. According to this condition, a river which has an active meander migration is generally necessary to maintain a healthy riparian community with vegetation system, a meanderbelt that is sufficiently wide to allow active channel migration should be maintained.

References

Small hydraulic structure to maintain reliable water municipal supply

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Introduction

Indonesia has encountered no problem in the water issue as supply is sufficient. The problem results from the way of managing water properly. In recent years, certain problems associates with in many river basins have become apparent, for instance, extensive soil erosion and siltation problems in the river basin are severe due to the destruction of ecological environment. One of the most important problem occurred at West Tarum Canal (WTC) is to convey raw water to feed Buaran Water Treatment Plant (WTP). It produces more than 400,000 m³ of drinking water per-day for community in the East Jakarta and becomes one of the biggest plants in Jakarta. The raw water is taken from the West Tarum Canal (WTC), which is part of the Citarum and Bekasi river system (Figure 1).

In the last few years, turbidity level in the WTC has been a major problem to Buaran WTP. Quite often Bekasi River supplies not only the required additional discharge but also large amount of suspended solids. Thereby, the WTP is suffering supply of water characterises not only by high turbidity level but also by frequent spike that may rise from 16 NTU to as high as 10,000 NTU. (source: Buaran WTP Intake data - March 2002). It is observed that several spikes of turbidity level shows disturbed productivity of drinking water supplied to costumers in DKI Jakarta. This condition identified that turbidity level principally analogous with suspended solids amount, indicates that the sediment mostly dominated by suspended solid. To reduce -and, if it is possible, to stabilize- turbidity level before the water enters the plant, therefore come the idea to propose the Small Hydraulic Structure located at in front of Buaran Intake.
Problem identification

Several problem can be identified from the River Basin especially is the control of water quality. Since the standard of turbidity level for clean water must be less than 10 NTU (Nephelometric Turbidity Unit) and standard for drinking water must be less than 5 NTU, therefore, some of countermeasures to reduce and to stabilized turbidity level before the water enter the plant are strongly needed. The data recorded and previous studies at Buaran Water Treatment Plant gives figures of several spikes of turbidity level, shown as wide discrepancies between the average and the maximum value.

Table 1 and Figure 2 show the difference of around 7000 NTU. From the observation along the canal, it also identifies that turbidity level principally analogous with suspended solids amount as shown in the Figure 4, indicates that the sediment mostly dominated by suspended solids (e.g. silt). It is assumed that the dominant sediment is in the form of silt. This assumption will be clarified by testing the sediment samples in the laboratory at the following section.

Table 1. Recorded Turbidity Level (NTU scale)

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
<th>Difference (Max-Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.20</td>
<td>1490.03</td>
<td>8456.17</td>
<td>6966.14</td>
</tr>
</tbody>
</table>

Source: WTC monitoring research by Uol, 2001

Result and discussion

Preliminary identification

The 7 km channel between Bekasi Weir to Buaran treatment plant that convey flow rate (Q) of 15 m³/sec has an average depth of only 2 m with 20 m width. An assessment based on settling velocity (Vs) of coarse silt indicates that the current depth of the channel is inadequate to prevent re-suspension. Even though, there is no significant disturbance from area near the channel.

Design of small hydraulic structure

Regarding to laboratory analysis and the relation of turbidity and suspended solid, thus, the objective of the research is to develop a scale model of small hydraulic structure as a treatment unit which capable to overcome the spike and looking at the possibility of using turbidity sensor and other technology to support the unit. Small Hydraulic Structure reduces suspended solid concentration which might be installed near the existing intake unit at Buaran WTP. The structure is a sedimentation unit, supplying the clearer water to further treatment with settler plate system consisted of intake bay equipped with ‘V’-notch flow measurement which will be used to control the flow of raw water that enters the unit. Settling chamber has rectangular shape and riser with the type and number of intake pipe (riser) inside the basin, should be able to attain discharge as design without causing any turbulence in the system.
Conclusions

There are several ways to control the suspended solid transport along the canal which is conveying raw water to feed Water Treatment Plant. For instance, the construction of weir or sediment trap can be built before the water enters the plant. However, there are some constraint in order to built the either weir or sediment trap. This problem is the decreasing of water supply during the construction time and must be a consideration, since the water supply for community in Urban Area on the supply from the canal.

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R Perianez, 2004, Modelling the Transport of Suspended Particulate Matter by the Rhone River plume (France) Implications for Pollutant Dispersion, paper published on www.elsevier.com.
Introduction

Studies of the trace metal contamination of sediments often rely on the analysis of total metal content; however, information on total concentration is not sufficient for an understanding of the environmental behaviour of trace metals as only a fraction of the total metal is available for biological or diagenetic processes (Groot et al., 1982; Martin et al., 1987; Tack and Verloo, 1995). Assessment of heavy metal contamination of the coastal environment based solely on total metal content also poses the difficult problem to regulators of how to distinguish between background lithogenic trace metal that is relatively unavailable to marine biota and labile trace metal. This study is aimed to examine the distribution of metals Copper (Cu), Chromium (Cr), Lead (Pb) and Zinc (Zn) and to know the geochemical partitioning of those heavy metals in marine sediments from the coast of Jakarta Bay, Indonesia that are bound to “Exchangeable Fraction”, “Reducible Fraction”, “Fe-Mn Oxide Fraction”, “Oxidizable Fraction” and “Residual Fraction”.

In this study, a total of 12 sediment samples were collected from the coastal area of Jakarta Bay. The samples were taken from the 3 river mouths namely Muara Kamal, Cengkareng Drain, and Muara Dadap. From each river mouth, there were 3 sub samples taken from left side, right side and the middle part of river mouth. One comparison sample was also collected from upstream of Ciliwung River to see the anthropogenic effects to the estuaries and one from Penjaliran Island (100 km up North of Jakarta Bay).

Methods

The geochemical fractionation of Cr, Cu, Pb, and Zn is determined on a 1g aliquot of bulk sediment using a series of three sequential leaches, a residual digestion and a separate oxidizing leach (Buckley and Winters, 1992). The first sequential leach, denoted F1, is with weak (25%) acetic acid adjusted to pH 2 for 16h at room temperature as described in Chester and Hughes (1967). This weak acid leach extracts metals predominantly from carbonates, hydrated sulfides, and weakly bound metals adsorbed on mineral surfaces. The second leach, denoted F2, is using 1M hydroxylamine hydrochloride (NH2OH HCl) at room temperature for 16h at pH 5–6. This leach extracts potentially reducible metals (Chester and Hughes, 1967). The third leach, denoted F3, is performed with 0.04M NH2- OH HCl at pH 2 heated to 80º_C. This leach extracts predominantly strongly adsorbed metals from mineral surfaces (Tessier et al., 1979). The sum of metal extracted by these three leaches is defined as labile metal. A 0.5g aliquot of the residue from the first three leaches was analyzed for total metal content by a four acid digestion (HClO4/HNO3/H Cl/HF) at 200°C. This residual digestion, denoted F5, extracts metals bound within lithogenic material and complexed with organic
matter. To account for metals bound to organic matter, the F5 fraction is presented as the total metal content of the residual fraction minus the metal content of the organic fraction. The organic fraction leach, denoted F4, was performed on a separate 1g aliquot of sediment treated with an oxidizing leach of 10% hydrogen peroxide and 25% acetic acid at pH 2 for 24h. This leach extract metals associated with organic matter and oxidizable sulfides.

Results and discussions
Copper (Cu) reach the highest concentration 157 ppm in Muara Dadap, followed by Muara Kamal and Cengkareng Drain, which were 138 and 100 ppm, respectively. The lowest concentration (5 ppm) is in Penjalaran Island (uncontaminated area). This suggests that the sediments of those 3 areas already contaminated with Cu. Meanwhile, the percentage of fraction of Cu is dominated by Residual Fraction (F5) which range from 50 – 70 %. It means that Cu does not have high potency to be released to the environment, because it is still be bound to lithogenic fraction. Usually, copper is used in oil refinery, electroplating, pesticide, etc. According to Canadian Standard for Contaminated Soils and Sediments, 2001, ambient value for Copper (Cu) is 30 ppm. Most of Cu values in this research exceed the standard. Total metal content of Zn in sediments of Cengkareng Drain, Muara Dadap, and Muara Kamal river-mouths fell within the range of 100 ppm in Penjalaran to 465 ppm in Muara Kamal. These values suggest that sediments in parts of Jakarta Bay already contaminated with Zinc (Zn). Based on the percentage of fraction of Zn in sediments, Zn is dominated by labile fraction (F1-F3) and F4 (organic fraction), ranges from 68 – 80 %. Here, Zn has higher opportunity to be released to the environment and will be available for organisms. Zn is usually used in galvanizing, automotive, and pharmaceutical industries. Although Zn is an essential micronutrients in low concentration, but in high concentration of it can be very toxic. According to Canadian Standard for Contaminated Sediments, the ambient value for Zn is 60 ppm.
The highest Pb content was found in Cengkareng Drain which is 58 ppm, followed by Muara Dadap and Muara Kamal, which are 45 and 28 ppm, respectively. All the values exceed the Canadian Standard for Contaminated Sediments which for Pb is 25 ppm. Based on geochemical fractionation, the percentage of metals (Pb) in three locations are bound to Exchangeable fraction (F1), Reducible fraction (F2), and Oxidisable fraction (F3) and F4, ranges from 35–76 %.
Meanwhile, the highest Cr content was found in Muara Kamal, 72 ppm and the lowest is in Muara Dadap, 24 ppm. All these values exceed the Canadian Standard for Contaminated Sediments which for Cr is 22 ppm. While, for its geochemical fractionation, the percentage of Cr is dominated by F1-F4, ranges from 39-66 %. Both Pb and Cr have higher possibility compare to Cu to be released to the environment and will be available for biota (organisms).

Conclusion
Most of heavy metals found in the research areas (Cengkareng Drain, Muara Kamal, and Muara Dadap) were exceed the Canadian Standard for Contaminated Sediments.

Keywords
Heavy metal, Jakarta bay Pollution, sediment, sequential extraction.

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The changes of surface water characteristic as raw water source for water supply treatment plant in Jakarta

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Introduction

One of the objective in water supply management is providing the safety and healthy clean water and sufficient at anytime needed to the community. Nowadays, demand on water supply increases while the capacity of water treatment plant are remains constant as the consequences surface water and ground water become important alternatives. The main problem in water demand in urban environment is the poor of quality raw water, insufficient water quantity and non contiguous of clean water distribution which puts many low income communities at risk to water diseases. Treatment Plant in Indonesia have been constructed for 20 and 40 years ago, with the criteria design implemented is conventional treatment plan. The design of the treatment plant is based on raw water characteristic condition in 20 or 40 years ago so that need some modification in the design. Raw water source mainly comes from surface water, which is being worst in quality as well as quantity. Jakarta is the capital city of Indonesia, is facing water supply problem like other cities in Indonesia. Based on Municipal Water Supply Jakarta (PAM Jaya), water demand in DKI is around 27806 litre/second and total production of water is around 12235 litre/second or 48% of total demand of water supply. Production of water mostly comes from surface water which is treated in water treatment plant. Although very small amount distributed from spring water, the rest of the community used ground water to support their need of water supply.

Due to the fact that Water Supply in DKI Jakarta could not supply all population, ground water source will be an important alternative to accommodate the need of water supply in Jakarta. The exploration on ground water source is used by continuous pumping which various from small until large scale of capacity of pump which will cause many impact to the environment. This exploration not only for domestic water supply needed but also for industrial as well as other commercial purposes.

In fact, the water treatment plan effectiveness is decreasing and needs some adjustment in line with current quality standard. The treatment is designed to treat raw water with has parameter of water quality on the certain level, and most cases the parameter are exceeding the limit standard, as the result the water produced to consumer is not meet with the consumer expected as well as national or international standard. The regulations to protect water resources has been established and socialization on water pollution control to the community has done regularly.

The main output of this study is to propose alternative solution to improve water supply services to the community in maintaining and rehabilitation the quality of water production from water supply treatment plant of surface water as raw water source.
Method
The research is using ex post facto research with secondary and primary data on raw water characteristic from year 2003 until year 2006. 42 water parameter are measured with frequency of 6 hour, 24 hour, 1 week, 1 month and 3 month analyzed by Standard Methods from American Water Work Association.

Result and discussion
Observation on water quality parameter source of Water Intake Buaran from year 2003 until year 2006 shows that there are 8 parameter are exceeding water quality standard, turbidity, BOD, Iron, COD, Ammonia, Manganese, Suspended Solid and Total Coliform. Among 8 parameters, turbidity is the highest number of concentration exceed the criteria standard which had set up before construction and in the past, turbidity was used as the primary parameter in design water treatment plant.

Figure 1. Turbidity in WTP Buaran (2003-2006)

The concentration on turbidity can be seen on Figure 1 below during 2003 – 2006, whereas criteria design for water treatment plant is 100 mg/l. In the current situation, water quality is changed, which need effort to redesign or to improve effectiveness of water treatment plant. Technology alternative in improving water treatment plant should also pro environment and not to burden the water supply consumer. Addition technology to treat raw water should also to consider capacity of human resources availability. Human behaviour also affects the characteristic of water resources. Education, regulation and proper environment are some examples to change man behaviour to protect environment. Sustainability of water supply in general depend on natural condition and man behaviour. Environmental condition also depend on natural resources and global climate changes that will affect to the characteristics of water resources. Community participation should be involved regularly in maintaining and rehabilitation water facilities and law enforcement should also be implemented to eliminated water pollution.

Conclusion
Technology alternative in improving water treatment plant should also pro environment and not to burden the water supply consumer. Addition technology to treat raw water should also to consider capacity of human resources availability. Human behaviour also affects the characteristic of water resources. Education, regulation and proper environment are some examples to change man behaviour to protect environment. Sustainability of water supply in general depend on natural condition and man behaviour. Environmental condition also depend on natural resources and global climate changes that will affect to the characteristics of water resources. Community participation should be involved regularly in maintaining and rehabilitation water facilities and law enforcement should also be implemented to eliminated water pollution. Several option to solve this problem is concerning with maintenance and rehabilitation not only the sediment along the river, but also alternative technology to reduce. More overt the other important thing is coordination among institution or parties involving in water supply. Based on engineering consideration, additional treatment plant to improve
efficiency of the treatment plant or another alternative by improving transmission line from Jatiluhur Dam to Buaran Water Intake separate with other purposes.

**Keywords**
Alternative technology, characteristic of raw water, quality standard, turbidity, water treatment plant.

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The physical environmental quality of primary school grounds and their potentials as learning resources for environmental education

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Introduction
There is a need for environmental education for every child as the future steward of the earth. It becomes important to integrate environmental values into all aspects of learning (UNESCO, 2007). The successful delivery of messages in environmental education is much related to the availability of physical environments to support the learning processes. The physical environments experienced by children in their everyday life, including natural environment, play an important role in the development of children’s knowledge and attitudes towards environment (Malone & Tranter, 2003; Titman, 1994). Unfortunately, there seems to be a tendency of decreasing quality of physical environments especially for urban children. School environments in urban areas tend to offer limited environmental experiences for children. In particular, there is a need to pay attention to the physical condition of open spaces or school ground and their potentials to support environmental learning.

Every kind of environments may offer potentials to support human activities; nevertheless only a small proportion of those potentials are effectively utilized (Gans, 1986; Kytta, 2004). In the context of this study, the physical environment of school ground may offer various potentials for environmental learning activities. However the utilization may not be optimum. This research explores the quality of the physical environments of open spaces in primary schools and their potential as learning resources for environmental education. The objectives of the research are: a) to illustrate the availability of physical elements and the variety in the physical quality of school grounds as learning resources for environmental education; b) to identify the extent to which the potentials of school ground as learning resources are utilized by teachers and children and c) to identify the accessibility of physical environment of school ground for children.

Methods
The research was conducted in fifteen primary school grounds in Jakarta. The school grounds chosen as the location of study represented a variety in school ground areas. The data for this study was collected through observation and the distribution of questionnaires among teachers and pupils. The observation of the physical quality of school ground was conducted to identify the extent to which school ground offer potentials as leaning resources for environmental education. The observation included the mapping of school ground areas and the identification of physical elements that are available in school ground: variety of ground surface materials, plant and animal habitat, elements related to trash, elements related to water and other elements. The questionnaires were completed by a total number of 83 teachers and 493 pupils. The objective of the questionnaire distribution was to identify the teachers’ and pupils’ general perception of the physical quality of school ground, the utilization of school...
ground and their elements for learning activities and the pupils’ accessibility to the physical elements of school ground.

Findings
The study found that there was a variety of school ground in terms of the area and the availability of physical elements in the school ground observed in this study. School ground generally possess some basic physical elements that are necessary as learning resources of environmental education, such as plant habitat, a variety of ground surfaces – both the water absorbing and non-water absorbing surfaces, and trash bins or trash cans. In addition the high percentage of water absorbing surface in many school grounds compared to non water absorbing surface provides a good example of ecological environment. However, school grounds are still lack of certain physical elements, such as water plants, animal habitat, sand and gravels, water pool, trash sorting facilities, composting box and water absorbing facilities. These elements are necessary in order to provide children with opportunities to learning more from the environment. The study also suggests that the large space area of school ground does not necessarily relate to the sufficient physical elements, school grounds with limited ground area could also be equipped with variety of elements for environmental learning resources. This study explored the extent to which school ground has been utilized as learning resources. The majority of the teachers in this study had conducted learning activities that utilize school ground. Some of the learning activities really utilized the physical elements that exist in the school ground, however, the other activities only use the school ground as location of activities, without any relationship with the physical elements of school ground. The learning activities include observation of natural elements, other observation activities such as measuring distance and drawing objects, science experiments, growing and caring for plants and other activities, such as sport, traditional games. Most pupils had been involved in observing types of plants or animals and their characteristics as well as growing and caring for plants. Meanwhile, not too many pupils had been involved in the activities of caring for animals, observing the characteristics and condition of soil, sand and gravels, observing types of trash, observing the trash cycle, sorting and recycling trash and observing the absorption of water on the ground surface.

The study also found the limitation of access for pupils towards certain physical elements of school ground, as indicated by various activities that were not allowed and various elements that pupils were not allow to interact with. According to pupils, they were not allowed step on grass, climb the tree, sit on the soil or grass, be around trash collection area, be around water and play with water. According to teachers, pupils were not allowed to step on grass, climb the tree, sit on the soil or grass, be around trash collection area, be around water and play with water. In addition to those restricted activities, pupils in this study also mentioned that they were not allowed to get close to the part of school ground with plants, touch the soil, sand and gravels. Both pupils and children mentioned certain elements that pupils could not touch. The reasons behind such restriction include aesthetical, health and safety reasons. The pupils tend to mention health reasons, while teachers tend to mention aesthetical reasons.

Conclusion and recommendation
The findings of this study suggest a variety in the physical environmental quality in the school grounds observed in this study. The variety exist in terms of the areas of school ground that are available for the school as well as the availability of physical elements in the school ground, including the ground surface, plant and animal habitat, elements related to trash, elements related to water, and other elements. The findings also indicate the utilization of school ground and its physical elements as learning resources, although still limited to the observation of natural elements and scientific experiments. There are still other possible utilizations of the physical elements of school ground that have not been fully utilized for environmental learning activities. However, other findings of this study suggests limited access for pupils to interact with the physical elements of school ground, as indicated by various activities that they are not allowed to do and various
elements that they are not allowed to touch or get close with. It becomes necessary to pay attention to such limited accessibility, since it may decrease the pupils’ opportunities for interaction with various elements that are important for environmental learning.

Based on the findings of this study, there are some recommendations and implications for practice, both for architectural design practice and educational practice:

- There is a need for guidelines for the design of school ground environment that offers a lot of potentials as learning resources for environmental education and offers opportunities for pupils to interact with various environmental elements. In particular the design of school ground environment should incorporate plant and animal habitat as well as various elements related to trash and water.

- The planning and design of school ground environment should guarantee the health and safety of the pupils, in order to minimize the needs to limit pupils’ accessibility to interact with the physical elements of school ground and use them as learning resources.

- There is a need for an understanding that the importance of school ground is not merely for visual aesthetics but as environmental learning resources, therefore access for pupils to the physical elements of school ground should be maximized.

- There is a need for guidelines for teachers to optimize the utilization of school ground for learning activities, in order to support the objective of environmental education for the pupils as the future steward of the earth.

**Keywords**

Children, environmental education, nature, school ground.

**References**


A study of union effectiveness in developing countries: Indonesia and Malaysia

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Introduction
The effectiveness of union activities becomes more critical to achieve members’ needs in current uncertain situation. However, the literature on unions in developing countries does not provide any consensus on the effectiveness of unions. The purpose of this study is to explore union effectiveness in developing countries, particularly in Asian region. The research will be one of pioneer work on the study of union effectiveness in Indonesia and Malaysia. In relation to this, this study will assess the actual condition of union effectiveness in postal industry in Malaysia and Indonesia. The study will focus on the union in the postal industry to illustrate the industry’s importance to the two countries on the ground on their high level of union density (Satrya and Parasuraman, 2007).

Literature review
The success of an organisation is measured by organisational effectiveness. Daft (2004) relates effectiveness as the capability of an organisation to achieve its goals. Moreover, Cherrington & Dyer (2003) explain that the organisation is effective if ‘it has acquired resources from the environment, transformed them into usable products, and adapted to changing environmental demands’. However, a major point of debate concerns the way to measure it. Daft (2004) argues that literature of organisational effectiveness distinguishes between goal-oriented, resource-based, and systems approaches. Resource-based or adaptation approach shows the ability of organisations to acquire and manage vital resources, or to adapt to environmental changes. Non-profit organisations that frequently have unclear output objectives may adopt this approach, including suggests the use of resources quality and quantity, as well as level of adaptation (Harrison, 2005). Smooth internal process involving workers and teamwork would lead to higher productivity, such as comparison of outputs to inputs through total number of patients treated (Robbins & Barnwell, 1994). However, subjective measures are more often applied by non-profit institutions, such as subordinates partaking in decision makings (Daft, 2004; Harrison, 2005). Goals models assume organisations have clear and measurable objectives, including profitability, market share and product quality (Shetty, 1979 cited in Daft, 2004). However, non-profit organisations are complex entities and may have multiple goals, which can be abstract, inconsistent, or conflicting (Harrison, 2005). Therefore, employing multiple indicators or using subjective perceptions is possible alternative solutions (Daft, 2004).
From previous studies, Quinn and Rohraugh (1983) argue that there are common elements underlying any comprehensive list of organisation effectiveness criteria, which can be combined to create basic sets of competing values. Their approach is divided into two general levels: (a) the rational model that focuses on control, formalisation, and consolidation, and (b) the natural system model that focuses on adaptation or flexibility. At the next level, the
rational model is divided into the rational goal model that focuses on control and external aspects, and the internal process that focuses on control and internal aspects. The natural system model consist of the human relationship model that focuses in flexibility and internal aspects, and the open system model that focus in flexibility and external aspects. Their study finds that less than 25% of the studies have used all four models concurrently.

Apparently, the researchers in industrial relations prefer to use the goals model indicators. Bronfenbrenner (1997) employed membership growth and union density change, Boreham and Hall (1994) used unemployment level, whereas Fiorito et al. (1995) used merely three out of sixteen indicators of effectiveness that can be classified as system oriented variables. However, research in Indonesia (SMERU, 2002; Sutanto, 1998) showed the importance of process, wherein unions were considered effective if they could deal in collective bargaining, disputes process, or communicated and empowered members.

Several studies propose the multivariate measurement of union effectiveness (Boxall and Haynes, 1997; Fiorito et. al, 1995). Pyman (2002) proposes a multi-dimension of union effectiveness, including growth, internal democracy, and activism. Burchielli (2004) classifies union effectiveness into administrative, representative, and ideology. However, both studies are confusing. Some criteria of Pyman’s model are used in some dimension, i.e. culture, and resources. The work of Burchielli, such as social values and political environment, are not operational indicators. Besides, some indicators of both models, such as union strategy (activism, campaign, and alliance) were used as the determinants of union effectiveness (e.g. Bronfenbrenner, 1997). The other study by Satrya (2006) examined the relationship between union strategy and effectiveness by adapting the models of Quinn and Rohrbaugh (1983).

Research method and variables

This study based on a qualitative case study approach using a multi-method technique (Hartley, 2004; Yin, 2003). The management, union officials and workers were interviewed and observed, various meetings were attended, and documents were obtained. The comparative study serves as a mean to assess the validity of the phenomena observed (Hopkin, 2002).

The study adopted the framework of Quinn and Rohrbaugh (1983) that offers multidimensional measures of union effectiveness. A special questionnaire based on the literature review was developed. The measures utilised both objective and subjective indicators. Responses of each item in the questionnaire was a dichotomous variables (‘yes’ or ‘no’), which indicated the presence of indicator stated in the item.

The rational model was measured by: (1) instrumental or economic achievement: efficiency (establish collective bargaining, preventing lay-off, winning dispute cases), distribution of income (increase of wage or benefits, employee share ownership policy); (2) audit process, the presence of formal control of union performance; (3) self-rating, the only subjective indicator based on perception of union leaders on unions’ performances in achieving its recruiting, servicing, and overall objectives; and (4) communication channel, the presence of mechanisms for disseminating information to the members or public.

The natural system model was measured by: (1) membership growth; (2) resource acquisition, the support provided by employer and external parties; and (3) member-improvement, measured by the presence of member satisfaction survey, and members that have attended training on union issues.

Discussion

The results of the questionnaires demonstrated the applicability of the framework of Quinn and Rohrbaugh (1983) that adopts multidimensional measures. The measure covers all indicators of effectiveness measures, including the approaches of resource-based (e.g. resource acquisition, external support), internal process (e.g. member-improvement, communication, audit), and goals oriented (e.g. instrumental achievement, organising effectiveness, membership growth), as well as adopting objective and subjective type of indicators (namely organising effectiveness). Therefore, this is an improvement from previous
measures that was dominated by only one type of indicators, such as the goals model criteria (e.g. Bronfenbrenner, 1997; Fiorito et al., 1995). This research also makes an advancement of operationalising unambiguous indicators of Pyman (2002) and Burchielli (2004).

The Indonesian and Malaysian cases can be compared by counting the number of ‘yes’ and ‘no’ answers for each case, enabling the summation of all the items into a composite scale. The union in Indonesian case booked eleven ‘yes’ answers for collective bargaining, dispute cases won, recruiting, servicing, overall effectiveness, communication mechanism, member and density growth, support from employer, support from other parties, and member training. The Malaysian case booked ten ‘yes’ answers for collective bargaining, prevent retrenchment, recruiting, servicing, communication mechanism, member and density growth, support from employer, support from other parties, and member training. Therefore, the Indonesian case showed a slightly more effective performance, particularly in the area of organising effectiveness, creating a higher level of member activism.

**Conclusion**

There have been limited studies regarding union effectiveness, particularly in developing countries. This paper has contributed to providing some information that could assist in measuring union effectiveness within the context in Indonesia and Malaysia. Regarding future research, this paper can be improved by conducting a longitudinal study and be extended into other industries or conducted in other countries for international cross-country comparison.

**Keywords**

Indonesia, Malaysia, Union effectiveness.

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Immortalised aesthetics: Photography in the promotion of colonial tourism in the Dutch East Indies

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Introduction
If we heard about the record of history, we always refer to the writing. The photographs are just for the illustration, not as primary sources. Perhaps, it could be right because the photographs that are taken, for special purpose.
Meanwhile photographs and tourism have a relation. As a promotion medium, photographs (in postcard, illustration of guide book) can attract many tourists.
Before men use the technology of photography in Netherlands-Indies, the using of travelling journal in the early government newspapers such as Bataviasche Koloniale Courant (1810), De Java Gouvernment Gazette (Termorshuizen 1993:10; Termorshuizen 2001), and also Bataviasche Courant (1816), De Javasche Courant (Surjomihardjo et al. 2002:26) attract the public.
In the time of King William I, the information about the colony is very important. He sent then not only the experts such as botanicus, geologist, historian to the colony but also the drawer, painter such as C.W.M. van de Velde, A.A.J. Payen to draw and paint the situation in the colony (Van Goor 2000:213).
When the first technology of photography came to the Netherlands-Indies in the nineteenth century, it was only used for government purposes and was not yet meant for public consumption (Faber et al. 1988:16) On the other hand, the rise of colonial tourism in the Netherlands-Indies in the early twentieth century required a medium for promotion. Photographs were the right choice because, as the saying goes, pictures could tell more than words. Photographs for colonial tourism promotion were produced in various forms such as postcards, illustration in magazines, and guide books, and were published by the colonial government as well as by private publisher (Sunjayadi 2006).
This article discusses the role of photography in colonial tourism in the Netherlands-Indies and its influence in the process to ‘find Indonesia’. This article is also tries to answer the other question: what kind picture of photographs that were presented and used for the colonial tourism promotion.
The sources used are taken from published postcard collection, magazines, guide books, and also published government archives from colonial times (1821-1937)

The result
There were many photographers in the Netherlands-Indies during 1857 until 1900’s. They are the Englishmen, Walter Bentley Woodbury and James Page (Knaap 1995; Wachlin 1994) then in the next years build Isidore van Kinsbergen the photographs studio in Batavia. In 1870 the Germany and Dutch photographers, Petz & Co, C. Krüger, A Wulisch came to Batavia. Meanwhile the other photography studio also found in Surabaya such as J.B. Jasper, C.C.F. Perret and H. Salzwedel (Faber et al. 1988:54) We can also find the photography studio in Buitenzorg, Cirebon, Surakarta, Bandung, Magelang, Malang and also in Kotaraja, Binjai, Medan, Brastagi, Makassar (Faber et al. 1988:179-192)
The photographers took the order from their customer and also made the cartes-de-visites, the series of postcards with the pose of the natives, customs (Bonnet and Grant 1994:57)
The other famous photographer was K. Cephas who was the owner of a photography studio in Yogyakarta (Knaap, 1999). He was the official photographer for the palace in Vorstenlanden (Yogyakarta, Surakarta). It was interesting because we can find also the naked women photographs that used for attract the young men. Hopefully, they were become the soldiers in the colony (Spoor 1980:59-60; Brousson 2004). The half naked women photographs were also attract the Parisian in Exposition Universelle 1889. The colonial government had made Le village Javanais, the Javanese village in that exhibition. They presented the Javanese dancer with the breast cloth (kemben) as their costume (Bloembergen 2004:94)

In the early of twentieth century the object of photographs was change. The panorama of Netherlands-Indies, such as the river, rice field, mountain, and village were the favourite photographs. The individual photographer became the big company and produced the mass product. The photography company such the Armenians, Onnes Kurkdjian in Surabaya, Charls & Van Es & Co in Batavia, Hisgen & Co in Semarang, Thilly Weissenborn’s Foto ‘Lux’ in Garut.

When the Officieel Vereeniging Toeristenverkeer Bureau (VTV), the bureau of tourism board established in Batavia in 13 April 1908 by the colonial government, they started to organize where, how, what the tourist could enjoy the Netherlands-Indies, the tropical Holland. They needed the medium of promotion. The postcards, guide books, flyers, posters, magazines were the various forms that they could use for their tourism promotion.

Bonnef and Grant (1994:56) mentioned that there were many publisher published the postcards, such as G. Kolff in Batavia (74 pictures), Visse & Co in Batavia and Bandung (55 pictures), Van Ingen in Surabaya (34 pictures), G.C.T. van Dorp in Semarang (24 pictures), Alberti in Sabang (58 pictures), Liem Sioe Yaam in Fort de Kock-Bukit Tinggi (32 pictures) and Tio Tek Hong in Batavia (72 pictures).

The pictures were reproduced from the early photographers, such as Woodburry & Page in Batavia, Cephas in Yogyakarta. The pictures were the daily life of natives in Netherlands-Indies. Beside that object, the other object of photographs such as factory, building, harbour were also made (Haks and Wachlin 2004:22)

In the 1930’s the colonial government through VTV selected 12,000 pieces of photographs which were used for the postcards, the tourism guide books and they would send them to 30 countries all around the world (Tourism in Netherlands-Indië 1934)

Bonnef and Grant (1994: 57-58) also mentioned that there were 1000 postcards in the 1900-1930’s about the Netherlands-Indies. They categorize the postcards into the region in Netherlands-Indies: Java (659 pieces), Sumatra (239 pieces), Bali, Sulawesi, Maluku, Kalimantan, Flores and Lombok (100 pieces).

At the end of 1920’s Bali became the alternative destination after Java. Vickers (1989: 11) writes that the colonial government create Bali from the wild island to become the lost paradise. The object of photographs in Bali, especially the bare breast Balinese women were more attracted for the tourist.

On the exhibition Het daghet in den Oosten in June 1941 in Amsterdam presented a bare breast Balinese woman. The photographer was J.C. Mol, director of N.V. Multifilm Haarlem and took the order from Rotterdamsche Lloyd to take photographs in Java and Bali.

The photographs as the ‘official’ product of colonial government were also used in school textbook in the colonial time (Nugraha 1995; Hasse 2004)

The illustration of the school textbook we can also find on the photographs on Handbook of the Netherlands East-Indies (1930). The books were not only used by the Dutch children but also by the Indonesian children. The Indonesian children were ‘taught’ to know their country where they live and to imagine that they were a part of the whole community and country as Benedict Anderson said about ‘Imagined community’

**Conclusion**

The using of photographs from the colonial time are to record for posterity of aesthetics in the history of photography in Indonesia. The photographs used in the first time only for
government purpose, then private purpose (European/Dutch, natives noble). It used for the souvenir from Netherlands-Indies. The pictures developed during the colonial time. Then the Colonial government used the photographs as one of tourism promotion media for Netherlands-Indies. The form changed to postcards, illustration in magazines and guidebooks. Then the photographs used are taken to the illustration of the school textbook in the colonial time. The various of pictures present the representation about the beauty and the diversity of our country and through the photograph they teach us how to become ‘Indonesia’.

**Keywords**

Colonial tourism, Hindia-Belanda, photography, promotion.

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Koninklijk Besluit 1871 Nr.1
Kain gendong Jawa

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Introduction
Kain Gendong Jawa, (Javanese Gendong Cloth) is one of the Indonesian cultural heritage. As a part of Indonesian cultural heritage, Kain Gendong Jawa is also a part of traditional drawings, meaning that Kain Gendong Jawa is a reflection composed of local wisdom of the community ideas, actions, and arts. By the long tradition from generation to generation, this kain gendong became a special part of Javanese cultural., and also the community traditions of making batik leads the idea to produce kain gendong Jawa with batik motif on it. In the beginning, Kain gendong was made for a limited purpose, such as to carry children on the back or hip, but this then has developed for more other purposes, one of which is for a professional requirement. Also, from so many requirements, came an idea to make Kain gendong in various kinds of motives according to the needs of the people.

There is no specific research on kain gendong in this time. It happened because according to people's opinion, kain gendong is a part of batik or lurik. This opinion is correct but not precise, because of kain gendong has a different function. Second, kain gendong has a special physical size for length and width. Third, kain gendong has a long history of different uses.

Objective
The objective of the research is to express the local wisdom of traditional people which was left behind. People did not understand because they did not realize that kain gendong had its own function and meaning and also less of information and attention. In this time, people only know that the use of kain gendong without realize what the meaning behind this kain gendong?

Methodology
The research methodology is a field research, due to the fact that the preliminary research has found out that the data about kain gendong Jawa are limited. In addition, the specific research on is no available yet. If there is a note on kain gendong, its only a part of Javanese batik discussion. For example, Nian S. Djoemena (1990), Peppin Van Roojen (1995), H. Santoso Doellah (2002). That’s why in this research try to collect every data that connect to kain gendong. Start from the function of kain gendong, materials of kain gendong and history of kain gendong and the location was limited in middle Java, Tuban and a part of Madura or east Java.

Result
From the research, we found a couple of interesting problems. The use of kain is to carry children or thing on the back or hip. This action were always doing by women, like this picture below,
Kain gendong also has special physical size, with the length 2.5 meter and width 1 meter. The main characteristic of kain gendong with lurik materials is the motif of salur in the side edges, like this picture below.

At first the material of kain gendong was commonly kain tenun, and its known as lurik. But in the next time kain gendong was not only with lurik material but also with batik materials. In the kain gendong with batik materials craftsman proved their creativity by putting the salur in the side edges with many colours. In this way kain gendong more interesting and look different from previously. In the part of motive, now kain had their own motive, not only limited on something, but its freely motive with more attractive color composition, like this picture below.

This research is preliminary research, because we still collect many data about kain gendong, but we find so many interesting finding. This finding are the traditional people who were made kain gendong needs an assistance about patent and modern marketing.

**Conclusion**

Conclusion, people always think that kain gendong is a part of batik. This idea is correct but not precise, because kain gendong has different raw materials, motif/designves and different function. Up to the present time, the art of creativity of Kain Gendong Jawa has still existed.
and been dynamic. For these reasons, the protection from related government apparatus to keep this local wisdom is unquestionably needed.

References
Introduction

Liberalization in higher education as promoted by GATS/WTO encourages higher education institutions in the world into tight competition to be nominated as world class universities. In such a competition, ‘quality’ and ‘standardization’ become prerequisite. As with other national governments, the Government of Indonesia is developing its national policy on quality assurance of higher education. Accreditation is carried out for this purpose. National universities and institutes are competing to reach better rank in national accreditation. This trend affects the development of Islamic-based higher educational institutions in Indonesia. Since the last few decades, there have been a growing number of state and private Islamic higher educations in Indonesia. Nevertheless, few have acquired international reputation and recognized as world class research universities. Similarly, there are limited numbers of Islamic-based universities and institutes that have obtained the highest status according to national accreditation. How can Indonesian Islamic-based universities or institutes improve their quality; What are national policies required to develop Islamic-based higher education institutes in Indonesia; To what extent can international cooperation between Indonesia and other Moslem countries be used to enhance the quality of Indonesian Islamic higher education, in particular, and universities in Moslem countries in general? This paper discusses all these issues by elaborating the general impact of liberalization to higher education in Indonesia, the current condition of Islamic universities and institutes with regard to quality assessment, the obstacles of liberalization to improve the quality of Islamic-based education institutions, and possibilities to enhance international cooperation among Moslem countries in the field of higher education development.

Content of the extended abstract

The current trend of liberalization in higher education cannot be separated from the development of global liberalization as promoted by World Trade Organization (WTO) through a multilateral agreement namely GATS (General Agreement on Trade in Services). The agreement has successfully encouraged free trade and open market in services, including education services. National governments are urged to eliminate all barriers of cross-countries trades in services, capital and investment. Higher education institutes are induced to run effective organizations, to use resources efficiently and to be high competitive in global market. Unavoidably, liberalization that to some extents overlaps with internationalization of higher education raises the issues of commoditization and commercialization of education. Debates become more intensive and deal with the basic notion of education when WTO/GATS includes education as free and open ‘tradable services’ among countries. Controversies then come up with regard to education: whether it can be perceived as private goods that can be traded freely and commercially like economic commodities, or else, as public goods that serve for public interests and as media for transforming cultural and national identities.

How does the Government of Indonesia (GOI) respond to liberalization in higher education, in particular to GATS/WTO scheme of liberalization of trade in education?
Internationalization and international cooperation in higher education have been adopted in national policy. Nevertheless, there are two different perspectives of Indonesian government with regard to these issues. On one side, Law 20/2003 on National Education System (Art.64 and 65) and Government Regulation 60/1999 on Higher Education (Art.125 and 129) promote internationalisation of higher education that works on open market principle. Then, the Long Term National Education Development Strategy 2003-2010, even though agrees with open market principle, still places education development as non-commercial public services. On the other side, The Strategic Plan of Indonesian Ministry of National Education 2005-2009 clearly welcomes to liberalization and highly supports the GATS/WTO scheme of liberalization in education. The pro-liberalization education policy as manifested through the Plan is a consequence of the GOI’s decision to ratify WTO/GATS through Law 7/1994 that includes education services as tradable services. Then, Law 25/2007 on Investment opens the road of foreign investment in education. Other implementing regulations such as Presidential Regulations 77/2007 revised by Regulation 111/2007 concerning the list of open and close business for foreign investment has made foreign investment in education is easier than before. The Regulations require that foreign investment in education can reach by 49% of total investment. The Regulations are expected to improve national higher education quality as well as capitalization of education through open market competition. It is clear that WTO has strong influence to those national policies. Supporting liberalization in higher education without many restrictions has contradicted with Indonesian Basic Constitution 1945 and Law 2003 on National Education System that perceive education as a tool of character building and as public services.

Islamic-based higher education institutes have been facing difficulties to cope with liberalization in education. There are several factors, internally and externally, that generally contribute to this situation. The internal factors cover some problems: (1) self-finance incapability; (2) unprofessional university management and governance; (3) weak capacity to develop ICT as one requirement of modern higher education facilities; and (4) uncompetitive captive market.

The incapability of Islamic universities to develop their self-financing was rooted to the historical background as universities funded by non-profit Islamic foundations that as well know had less financial support, at least if compared with universities funded by big corporations. Thus, the only incomes of the Islamic universities are their students. In fact, nowadays they have to compete with other universities to get good fee-paid students. To respond their financial problems, Islamic universities need to carry out some efforts, such as (1) to develop their entrepreneurial activities; (2) to develop quasi market by establishing market friendly programs and activities and providing market with good graduates and research; (3) to make successful fundraising; (4) to develop ‘new universities’ business’; (5) to increase universities income like patenting research findings and joint venture.

Conclusions

Liberalization in higher education as promoted by GATS/WTO has successfully encouraged universities/institutes into competition that works based on free trade and open market in education services. As member of WTO and has ratified GATS, Indonesia has trapped into dilemma with regard to liberalization in higher education. Two different perspectives of Indonesian government can be found concerning the issue of liberalization. Firstly, the government, based on basic policies of national education as stated in Constitution and Law on National Education System, recognizes the need of internationalization of higher education that based on open market principle, but agrees that education development must be seen as non-commercial public services. Secondly, The Strategic Plan of Indonesian Ministry of National Education 2005-2009 welcomes to liberalization and highly supports the GATS/WTO scheme of liberalization in education without too much restriction.

The global trend of liberalization has enhanced competition among Indonesian universities: state-private and private-private. In such a situation, Islamic-based higher education institutes are those who always disadvantaged. Many Islamic universities or advance institutes are still...
struggling to achieve their better position as qualified national higher education institute. But, liberalization pushes them toward another situation of imbalance competition with ‘non-Islamic based universities’ or international standard oriented universities as established by large corporations in Indonesia. There is no alternative for survival for Islamic universities than improving their education quality. However, they have too much problems like self-finance incapability, unprofessional university management and governance, weak capacity to develop ICT as one requirement of modern higher education facilities and uncompetitive captive market. Support from government and Moslem society, as such, is still necessary. International cooperation is another option to assist Indonesian Islamic higher education improving their education quality.

**Keywords**
Higher education, Islamic universities, liberalization and globalization in higher education.

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Mausoleum as a centre of corporate identity: a study of mausoleum as an archival symbolic value in Japanese corporation

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Introduction  
Japanese corporate mausoleums transmit both content and contextual information about ancestor archival records: transmission of the symbolic values possessed by records. In global information era, both society and records keepings are undergoing rapid changes, banks of institutionally records, new ways of describing records and less apparent symbolic values assigned to records. The kind of records should be permanently kept, in the way both context and content should be communicated amongst the heads, staff and workers and its community is the founder records.  
In the last decades in Japan there are quite mausoleums of big corporation (zaibatsu) and companies founded before and after Meiji restoration. Odaira memorial hall represents for Hitachi inspire the next located in Hitachi Works (one of a company in Hitachi founded 1910) in Hitachi city. Besshi Copper Mine Memorial House represents Sumitomo in Niihama city, Ehime where Sumitomo corporate was founded in 1689. Mausoleums of Japanese leaders in Meiji era (1868-1912) and Nintoku mausoleum in Sakai city, Osaka of country’s leader of Yamato, mausoleum Tokugawa Ieyasu in Toshogu Shrine Nikko of bakufu shogun. Recently, quite a lot of Japanese corporate founders intendly have been found mausoleums in a pattern of jinja such as Shibusawa Eiichi jinja as the founder of Bank of Japan. There are many others could be traced down following the model of ancestor worship of Japanese (sosensuhai).

Method  
The method of interpretive is conducted through symbolic meanings to gain a comprehensive understanding on a corporate founder mausoleum exists along with its archival records as symbols that articulate in its community and society in whole. Social, economic, and cultural phenomena are the elements which can be used to explain the symbolic value of archive in the Japanese people that focuses on mausoleum.

Result and discussion  
The research is about Japanese corporate mausoleum as a centre of identity by its archival records. The explaination is corporate mausoleums in Japanese corporation have symbolic values of its founder ancestor archival records along with its informational value. Its meaning as a world, to connect the real world and the other world is going to be accomplished; to create realities and phenomena into symbols where the sensation of its existence is real into an order. Symbolic meaning of mausoleum turns corporation into archival or documents symbolic power overwhelmed with ancestor records and the symbolic power related to the destruction of documents. It turns into the best tradition of Japanese order or chaos paradigm, which stay very tight in the mind of the Japanese whom expressing it. The meaning of Hitachi corporate mausoleum as the founding ancestor documents is a symbol as well as carriers of information can be recognized and explained by understanding the public and institutional interest. The essential of it is the transmission of information which extracted into symbols have formed a sense of identity and make sense of it.
Conclusion

The goal of proposed researched to indicate the symbolic construction of mausoleum transfer the status, vitality and centrality of corporate founder. Mausoleums and Memorial Halls which preserve its founder’s archival records work in reciprocal. The image of extent, solid always present the back ground of the subconscious in the mind of the founder become a reason archive being preserved as Hitachi corporate revered mausoleum.

The significance of research proposed is to show the heritage community absolutely refuses ancestor archive to be destroyed, therefore the information within the documents serve in multiple sources, better indexed, better access, and better preserved physically. Mausoleum acts as paradigm of authority or endeavors for the creator institution moreover to individuals related.

Keywords
Ancestor, archival record, corporate founders, identity, symbolic meanings.

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Psycho-social approach towards humanistic-relocation


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Introduction

Rusun Cinta Kasih or Tzu Chi Flat House was built in 2003 by the Budha Tzu Chi Foundation in Indonesia. The flat house construction was a part of comprehensive efforts toward restoration of Angke River. The restoration of Angke River required a resettlement of squatters who lived on riverbank alongside of Angke River. The research on Tzu Chi Flat House was conducted to evaluate the facilities and gain the information about occupants adaptation process toward social and economic change. This extended abstract is based on the report titled Tzu Chi Flat House Final Report, 2008.

Methods

Using both quantitative and qualitative methods, this research involved 316 people, which consist of 253 quantitative respondents, 45 participants of focussed group discussions, and 18 in depth interviewees. An observation was held to gather more information.

This research focussed on eight variables. It can be seen below as:

1. Judgment toward facilities prepared by the Tzu Chi Foundation
2. Satisfactory level staying in rusun compared to their previous dwellings
3. Self identification as members of Tzu Chi community
4. Social opinion as Tzu Chi community
5. Social relationship of Tzu Chi community with surrounding people
6. Opinion toward Chinese
7. Opinion toward religion
8. Tolerance in religious life

Result and discussion

There were 253 respondents which consisted of 119 male and 134 female. The respondents consisted of heads of family (69 persons), housewives (91 persons) and youth (91 persons). The ethnicity and beliefs were diverse. The ethnicity of respondents consisted of Javanese 92 people, Sundanese 71 people, Betawinese 41 people, other 47 people, The beliefs of

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respondents were Muslim 237 people, Christian 9 People, Catholic 4 people, and Buddha 3 people. The combined variables showed few results such as:

1. **Social Welfare**
   - The economic level of Tzu Chi occupants is between $2-2.5 per day.
   - Social prosperity based on environmental condition and existing facilities (water and electric) had given satisfaction to occupants.
   - Totally, compared to their past life on riverside of Kali Angke, the occupants of rusun Tzu Chi felt enjoy to live in Rusun Tzu Chi.
   - Statistically, the influence of facility to satisfaction only contribute as big as 5.5%, this means other variable also plays important role to maintain this feeling.

2. **Public Health**
   - Enough health services by health clinic in area to occupants of Rusun Tzu Chi.
   - There is waste management to maintain the cleanliness of Rusun Tzu Chi.
   - The existing toilet and bathing system in each house is good and clean.
   - Water supplied by Tzu Chi from WTP can’t be used for drinking. It was used for bathing and washing clothes. All respondents bought water for drinking.

3. **Altruism**
   - All respondents were actively involved during national events and cleaning days
   - In general, the occupants were ready to support other families in need, such as death of a family member. The occupants of Rusun Tzu Chi knew each other (other occupants)

4. **Ethnic Relationship and Multicultural Abilities**
   - In general, occupants of Rusun Tzu Chi have an open-mind and positive attitudes as well as abilities to create positive relationship with other ethnic groups and different religions
   - In general, occupants of Rusun Tzu Chi have positive perception towards people with Tiong Hoa background
   - Occupants of Rusun Tzu Chi does not feel embarrassed and have developed positive perception as residents of the Rusun Tzu Chi
   - There is considered poor relationship between occupants of rusun Tzu chi with its surrounding neighborhood (Perumnas). This phenomena was line with correlation between variables that shows that the better self identification as occupants of Tzu Chi, the more negative perception towards its surrounding neighborhood

5. **Religious Life and Religious Tolerance**
   - There were strong religious activities within one religion such as praying (Shalat), reading Quran (pengajian), and involvement in reading group (majlis ta’lim) within Rusun Tzu chi.
   - Tolerance with followers from other religions is high and the occupants showed respect rituals from other religious groups

**Conclusion**
The people who had lived in squater areas alongside the Angke river was relocated to Rusun Tzu Chi. The resettlement program was conducted by Tzu Chi foundation in coordination with local government of DKI Jakarta. There area few conclusions bellow:

a. **Different level of satisfaction between the occupants of Rusun Tzu Chi toward provided facilities.** There was high satisfaction among members of community toward the help given by the foundation. However, through FGD, depth interview and observation, it was found that the occupants still have few complaints. However, researches failed to further investigate the matter due to bureaucracy. It was found that the occupants were glad that they only have to pay the rent Rp 90,000 per month plus electricity and water fee. Furthermore, they were also have the freedom to perform religious activities, even by the minority.
b. There is a misunderstanding between community of Rusun Tzu Chi and the Indonesia Tzu Chi Foundation. The Tzu Chi foundation think that community who lived in the Rusun Tzu Chi were the victim of Jakarta Flood and needed a help through a good housing program. On the other hand, the occupants felt that they were the victim of coercive resettlement. These facts should be consider before further problem solving.

c. Adaptation problem in economic. It was found that the occupants felt difficult to earn money as well as to develop economic activity since they still have to adapt to the new environment.

d. Despite of frequent philanthropistic practices shown by Tzu Chi volunteers to support people in Rusun Tzu Chi, such imita tional behavior is still quite to be, at least, referred by people observed. One way to explain this was those philanthropistic practices should be conducted more frequent for a better result.

Keywords
Altruism, ethnic relationships, multicultural abilities, tolerance of religious life.

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The state, ethnic violence and ethnic peace: a case study in West Kalimantan, Indonesia

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Introduction

Much has been written about ethnic violence in West Kalimantan, Indonesia. In general, most analysts seem to agree that three theoretical perspectives dominate an inquiry into the causes and dynamics of ethnic violence namely the institutional (Brubaker, 1998; Bertrand, 2004), the instrumental (Davidson, 2002; van Klinken, 2002) and the primordial. These perspectives respectively focus on the state breakdown, the role of ethnic elite and public masses and, the un-negotiable ethnic identity in bringing about violence.

While all perspectives focus on different emphases and provide useful analyses, they pay little attention on the structural processes that lead to the construction and contestation of specific state, businesses, civil society. This paper aimed at investigating these structural processes and dynamic relationships of those three macro institutions that finally lead to the Soeharto’s state failure and ethnic violence in West Kalimantan. Moreover, it also aimed at explicating processes of reconstruction of macro institutions in the current post-Soeharto era.

This paper argues that ethnicity has been manipulated by the ruling elite throughout the contemporary political history of West Kalimantan. During the authoritarian rule, local state fails to maintain its relative autonomy vis-à-vis business world, political parties, and civil society. Local state has been captured by business power, ruling political party and security apparatus on one hand, and it has co-opted ethnic elite on the other. The interpenetration among these structural components has formed un-negotiated hybrid authoritarian state that dominated the province for almost a quarter of century. Such type of the state has opened an extra-ordinary penetration of powerful private interests into the process of policy formulation and implementation at the expense of the interests of society.

Qualitative method has been used to collect data from various actors who have direct and indirect knowledge of both the conflict and post-conflict periods. A desk review to assess available research findings was previously conducted before visiting the research areas.

Theoretical Framework: Hybridisation

SN Eisenstadt (1994) rejected conceptual reification and urged to study the combination of basic components that formed existing social institutions or boundaries in any society. The basic components may consist of religion, primordiality, tradition and modernity, and they combined in different ways in different societies. Social institutions have never closed and they always changed.

His tenet on the construction of social institutions is useful for explicating the dynamics of hybridisation of state institution. Quoting Rowe and Shelling, Frank and Stollberg (2004) define hybridisation as the ways in which forms become separated from existing practices and recombine with new forms in new practices. The concept of hybridisation has often been contrasted to homogenisation and polarisation. While the former concept refers to westernisation of institutions, the latter deals with the resistance against westernised institutions in developing societies. Inspired by Frank and Stollberg, I try to develop three criteria of hybridity in order to assess a degree of hybridisation.
The first refers to the extents to which local objects or institutions are adopted in the state institution, and then contextualized in a certain set of meanings. Whether they wholly or partly adopted in the state institutions, the hybrid state has to intensively adjust itself to local conditions. Here the issues of interest representations and distribution of resources come to fore. Ethnic assemblies, for instance, which previous function as a medium of interest representation of ethnic members may continue to represent their members or transform into a new form with a new function in the hybrid state.

The second concerns with the degree of blending of local institutions in the hybrid state. Patrimonialism, for instance, has been merged into the South Korean state and it has contributed to the flourishing economy for almost a quarter century before this country moved toward democracy (Biggart and Hamilton, 1984). In contrast, the merging of familism into business organisation has caused the decline of business life in Bali, Indonesia (Geertz, 1963b). These two cases inform that a high degree of blending of local institution into modern institutions may or may not successful and it depends on the existence of two important elements, namely actors’ competency and distribution of resources. The success of Korean patrimonial states has been attributed to the strong leadership, competence economic planners and, more or less justifiable distribution of resources to a majority of citizens.

The third relates to the dominating elements in the hybrid state. This criteria explains the structures of relationships within the state institution in order to identify whether original elements – be they are the ruling political party, bureaucracy or security apparatus - are dominating or merging with local institutions such as ethnic assemblies and customary institutions. This criteria is useful for assessing the degree of hybridisation. The higher the domination of the original elements the lower the degree of hybridisation in the state institution. On the contrary, the higher the blending of local institutions the higher the degree of hybridisation in the state institution.

Discussion

A series of the deadly incidents of ethnic violence in West Kalimantan at the beginning of emerging democracy have to be situated in the specific political and economic circumstances. The eruption of ethnic violence was preceded by a number of structural factors. First, the long processes of the un-negotiable of two different ‘movements’: the inflexibility of the weak hybrid authoritarian state and, the Dayak revitalization counter-movement that demanded the application of adat law. It was weak hybridity in the sense that ethnicity as a component in the West Kalimantan state functioned as a complement and failed to represent the interests of its memberships. Second is the absence of mediating institutions. Mediating institutions are vital if any meaningful peace is to be built. In several “hot spot” areas, such institutions are absent and therefore ethnic crimes and violence became a legitimate means for the expression of grievances. Third refers to the severe demographic and economic pressures in the district of Sambas have sharpened the boundaries of inter-ethnic relations. These pressures have brought about the depletion of economic networks of the ordinary Malays on the one hand and the growing benefits of big entrepreneurs and the Jakarta-oriented local elite on the other. The Madurese, the small ethnic group, whose behaviour was seen as un-adaptable to that of the local communities, particularly in economic life, become the target of that anger.

The construction of the West Kalimantan hybrid state and its dynamic relationships with other societal actors has signified the working of the mechanism of decoupling, by ignoring and even abandoning the ethnic tradition and institutions. This is in contrast to most studies on hybridisation that find the working of close coupling between the original form and the transforming components derived from local society. Moreover, studies on hybridisation as the impacts of globalisation reveal the innovative elements of the blending of global and local components (Frank and Stollberg, 2004).

Very recently, however, there is an interesting development that might determine the future of polity in West Kalimantan. The gubernatorial direct elections have taken place in democratic and peaceful manners and for the first time in more than 35 years, a Dayak leader becomes a governor. This development is in line with national political development where gubernatorial
direct elections in most provinces have not only taken place democratically but also contributed to the rise of new political leaders. Such circumstances open opportunities for the West Kalimantan political leaders to gradually leave ethno-politics and begin to embark on civic-politics. This is a new politics based on ethnicity but it nurtures pluralism and democratic values. While a weak degree of hybridisation signified the West Kalimantan state in the Soeharto era, nowadays, a high degree of hybrid state indicated by the intermingling of democratic values and ethnicity has a chance to flourish.

Conclusions
This study shed lights on the processes of construction, contestation and reconstruction of the West Kalimantan hybrid state. It is shown how ethnicity has been manipulated throughout the contemporary political history of West Kalimantan. Only recently, in the midst of the country’s democratisation and active combating corruption, ethnicity may have opportunities to surface in different and constructive forms, intermingling with other components in political and economic institutions.

Keywords
Ethnicity, hybridisation, social contestation, social reconstruction.

References
ASEAN’s human rights body: new breakthrough for human rights protection in South East Asian region? Some preliminary notes from Indonesia’s perspective

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Introduction  
On 21 November 2007, there was a very important moment when ASEAN’s leaders concluded a charter, ASEAN Charter (the Charter). The Charter is not only provides legal basis for ASEAN’s legal personality but also provides other new legal norms for its member states. One of the new legal norms which need to be discussed is the establishment of ASEAN’s Human Rights Body (the Body). This obligation is stipulated in Article 14 of the Charter where it stresses the commitment of member states in human rights protection. However, the establishment of the Body is an interesting phenomenon because of many pessimistic opinions about ASEAN’s capability in protecting human rights due to its notorious reputation over this matter.

It can be argued that this achievement should be regarded as the highest commitment from ASEAN member states to acknowledge and to promote universal values of human rights. Instead of these positive beliefs, there are many challenges faced by ASEAN in its efforts to establish a human rights body. For that reason, it is important to note some factors that should be prepared concerning the Body. This article argues that there are some areas of concerns that need to be considered to put the Body into operation. Some important lessons from the European Human Rights Body will be examined as the comparative study.

The ASEAN Charter  
Based on many considerations in a practical condition, member states of ASEAN had grew their common need of legal document as their “articles of association”. This common need was stipulated in the 2004 Vientiane Action Programme. The ten member states hoped that the ASEAN Charter would establish ASEAN as a juridical and legal entity. By clearly defining the association’s objectives, it would make it easier for ASEAN to advance towards those objectives.

European Human Rights Mechanism: Lessons Learned for ASEAN  
Prior the discussion about human rights mechanism in ASEAN, it is significant to have another regional human rights mechanism as a comparison example. As it has been noted that there at least three regional human rights mechanisms that already established. They are in the European, African and American regions. Having considered their reputation and history, the writer argues that European mechanism is likely to be the better example for ASEAN to follow.

Preliminary Notes  
It is important to stress that the inclusion of human rights provision in the Charter is a significant achievement in ASEAN history. This huge initial effort needs to be followed up by TOR which will be decided later by ASEAN Foreign Ministers Meeting in the near future. Before ASEAN community celebrated the establishment of an ambitious ASEAN Human Rights Body, there are some factors which need to be considered by the people of ASEAN.
Human Rights Values within ASEAN in General
It is widely acknowledged that human rights development level in the ASEAN region varies in each member states. Therefore, it would be very difficult to generalise human rights condition in ASEAN without considering the situation or development in every member states in designing TOR for the Body. As the parameter of this, there are only four states that have National Human Rights Institution as the domestic human rights monitoring and protection body compare to other six member states.

ASEAN’s NHRIs Cooperation
It is obvious that human rights protection is a foremost domain for national authority in all ASEAN states member. Therefore, the establishment of National Human Rights Institution which is the national authority for monitoring and protecting human rights becomes very important to be pushed into reality. For this effort, Indonesia, Malaysia, Philippines and Thailand are the states that bear responsibility for. Since they have their NHRIs, they need to cooperate by exchanging of their best practices not only for their own good but also for other member states as their guidelines in establishing their own NHRIs.

Terms of Reference
As the main instrument for the Body, TOR should at least contain three elements which need to be reserved. First, the TOR should cautiously decide the Body’s name whether it is Council or Commission. Second, it is extremely important to determine the Body’s jurisdiction over the complaints of human rights violations which directed to it. Thirdly, it is important also to decide that what measures are if the remedies from national authority are considered by the Body not fulfilled the satisfaction of the violated rights.

ASEAN Charter’s Ratification Problem
As aimed in its preamble, the Charter will provide ASEAN’s existence becomes clearer as ruled-based international organisation that has international legal capacity. All future cooperation within or outside ASEAN will be based on legal agreement not on political compromise. Nevertheless, as mandated by the Charter, TOR for the Body will provide the commissioners to act according to their jurisdiction without any political interference from any states member.
All the dreams above-mentioned will meaningless if the Charter is not ratified by all member states as the compulsory requirement for the Charter entry into force. Even though the TOR already finish and ready for adoption by the Foreign Ministers Meeting, the ASEAN human rights body will never come into reality due to member states’ reluctance in ratifying the Charter.

Conclusion
There are many considerations that should be taken into account in designing the TOR for the Body which will be agreed by Foreign Ministers Meeting. It is important to bear in mind that human rights development among ASEAN member states are varies to each other. In order to improve the human rights standards, it is ASEAN countries that have their NHRIs to cooperate so they can have exchange of experiences (best practices). These experiences could be shared to other states that need an improvement in their human rights standards.
The terms of reference for the creation of an ASEAN human rights body will determine the extent of willingness of ASEAN to realize its human rights commitment. Therefore it should be carefully decided at least at two points. Firstly, the TOR should cautiously decide the Body’s name whether it is Council or Commission because it will have an effect to the membership of the body. Secondly, it is extremely important to determine the Body’s jurisdiction over the complaints of human rights violations which directed to it. The aim of this proportion is to minimise wider interpretation of human rights violations which will be reported to the Body since the main responsibility for protecting human rights is in domestic authority. Thirdly, it is significant to determine the procedure for individual to claim complains if his/her rights are violated by the member states.
Keywords
ASEAN, human rights body, human rights protection.

References
A DEA approach to explain relative productivity performance of Indonesia’s rural development bank

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Introduction
The objective of this study is to evaluate the relative productivity performance of rural development banks of Indonesia (also known as regional government banks) and to identify factors contributed to the variation of it. Productivity and efficiency analysis have been widely used as a tool for assessing the performance of banking sectors in the US, developing countries as well as in the emerging countries. For example, Hadad et al. (2003), Putra (2003), Soemonagoro, Viverita (2007 and 2008) have observed various issues relating to the productivity and efficiency performance of Indonesian banks. However, to date none of these studies conducted to evaluating the productivity and efficiency of the regional development banks (Hereafter: BPD). According to the government regulation, the main role of BPD is to help financing the development of infrastructure in the regions (provinces) throughout Indonesia as well as assist the SMEs and agricultural sectors. Therefore, the main motive of this study is to judge the performance of sample banks based on productivity changes and to identify sources of the changes by decomposing it into technical efficiency change and technological change. Focus on this study, therefore, is to identify the productivity performance of BPD relative to all banks in the sample and to identify sources of the productivity changes.

The Indonesia’s rural development banks (BPD) were established based on the government regulation No. 13, 1962. The main function of these banks is to provide funding for the development of the regions across the archipelago, either conducted by the government or private sector firms. However, these banks can only provide loans to other parties other than the government projects. These banks are located in the main cities of the region, i.e. the capital city of each province, and owned by the provincial government. The BPD is part of the Indonesian banking system, where its activities cannot be separated from the region economy. Not like other commercial banks, although considered as commercial banks, BPD cannot issue and accept current deposits, do not handle international transactions and allows to deposits their current assets only in the central bank and specific banks determine by the central bank. Therefore, it major activity mostly as a teller of the government expenses in a province.

To date, there are 26 BPD operated in the twenty six provinces. Based on its goal, in general, the role of these banks is to enhance the development of a province (region) to support the development of its infrastructure, SMEs, as well as agricultural sector. However, currently its role seems to slightly shift.

Methodology and data specification
This study applied a non-parametric approach of Data Envelopment Analysis (DEA) output orientated to measure the productivity performance of Indonesian regional government bank (BPD) and to investigate factors contributing to such performance. Researchers are increasingly employing DEA method to measure bank’s efficiency and productivity
performance. For example, Ariff and Can (2007), Berger et al. (1993), Chu and Guan (1998), and many more studies on bank’s efficiency performance.

**Findings**

This section presents findings on banks’ technical efficiency using the output orientation constant returns to scale (CRS) to formulate the Malmquist Index and its decomposition of each bank using semi annually data from the first semester of 2001 to the first quarter 2007. Semi annually financial data of 130 banks including 26 (twenty six) rural development banks (BPD) of Indonesia were obtained from the regional government banks’ association (ASBANDA). The specific data items used in this study comprises of total loans disburse by bank and other bank service and investment as output variables. In addition, personnel expenses, fixed assets and funds from third parties are considered as output variables. Table 1 includes summary statistics on the entire sample, which consists of 1690 observations. The output-orientated constant returns to scale, CRS, formulation is used to compute the Malmquist index for 26 Indonesian rural development banks (BPD) to measure the change in productivity over the period 2001 to 2007 relative to other banks in the industry. The total sample of this study comprises of 130 banks i.e. state banks (4); regional government banks (26); private national banks (71); and foreign banks and joint banks (28). To evaluate the productivity performance, we use 2 (two) output and 3 (three) input variables, i.e: total loan; other services and investment as inputs and labor; fixed assets; and third party funds, as outputs. The Malmquist DEA is used to calculate the various production frontier distances. Analyzing the relative productivity of the Indonesian regional government banks (BPDs) was such an interesting work. Not only because of these banks had a special role given by the government to provide financing for the region development, but they also experienced as the most efficient bank among the sample banks. Contrary to general belief that the efficiency of government-owned institutions are always behind those of privately-owned institutions, this study found that BPDs shown as the most technically efficient banks among the sample, with growth technical efficiency change of 6.5 percent. However, this performance is not supported by the way these banks conducted their operations, since most of these banks have operated at decreasing returns to scale. This means to be more efficient, these banks need to increase their operating scale by increasing its capacity as intermediary institutions. This can be done if the government set such regulation that improve business conditions in the region and allow SMEs to get funds from the BPDs easily. In addition to this, such regulation may be needed to require institutions or businesses to only acquire funds from the BPDs. In addition, in order to be technically and scale efficient, the government may merge all the BPDs into a holding regional bank, and re-grouping them based on their business activities.

**Keywords**

Productivity, rural development bank.

**References**


Benchmarking the efficiency of Indonesian cooperatives

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Introduction

The development of cooperatives in Indonesia began when the Dutch ruled in the colonialism era. The first cooperative was established by R. Aria Wiriatmadja in 1896 where it focused on credit cooperatives (Masngudi, 1990). Until now, most of cooperatives grew in the rural areas. Currently, the potential of cooperative development is able to begin an autonomous cooperative movement while the focus of its business should be directed to fulfill their members’ needs i.e. financial services, infrastructure services and collective buying activities. The opportunities of regional autonomy and local resource utilizations do have some conflict of interests that must be settle down at the regional level. With the integration of financing resources, network development and the existence of innovation and technological centers in regional areas, the needs of cooperative development are strongly needed.

This study examined the efficiency of 30 Indonesia cooperatives at the provincial level from 2000 to 2007. Firstly, we use a DEA approach to estimate technical and pure efficiency scores. Secondly, DEA-based Malmquist indices are calculated to examine productivity and efficiency changes. Finally, a SFA approach is carried out to identify the reasons of the differences existing among the cooperatives in terms of technical efficiency.

Efficiency Measures

Data Envelopment Analysis (DEA)

Charnes et al. (1978) introduced the DEA constant return to scale (CRS). It obtains into account multiple inputs that are used in the production process to generate outputs, to estimate total factor productivity or TFP, a score including all factors of productions. DEA can be estimated either input-oriented or output-oriented. In the input-oriented, the DEA approach defines the frontier by seeking for the maximum possible reduction in input usage, with output held constant, vice versa. The two results of both measures give the same technical efficiency scores when CRS assumption is assumed, but are different when variable returns to scale (VRS) are assumed. In this paper, an output-oriented measures and CRS is assumed because the DMUs want to maximize their outputs given inputs related to the production function.

This study is design to apply DEA-Malmquist productivity index to measure a cooperative’s TFP. TFP growth is the geometric mean of Malmquist TFP indices that can be decomposed in to two output-based measures: one index uses period t technology and the other period t+1 technology (Coelli, 2005). The Malmquist indices are defined using distance functions. This approach is argued to be superior in identifying the net gain in efficiency after input adjustments by the DMU. TFP is measured in two stages. The Malmquist index of total factor productivity change (TFPCH) over period t and t+1 is the product of technical efficiency change (EFFCH) and technological change.

Stochastic Frontier Analysis (SFA)

Similar to DEA, the SFA method defines efficiency as the relative distance of a firm from some best practice production frontier that is given the costs and output levels. This approach observed one of the components of the TFP namely the efficiency change and relates it to the
firm-specific factors. Different from the DEA approach, the SFA approach utilizes an econometric approach to estimate static technical efficiency: (See Aigner et al. (1977) and Meeusen and van den Broeck (1977). This study will follow Battese and Coelli (1995) formulation.

Data and methodology
Data are gathered from Annual Indonesian Cooperatives Statistics (Statistik Perkooperasian), published by State Ministry of Cooperatives and Small and Medium Enterprise. Data used are at the provincial level. We make adjustment on the number of provinces as decision making units from 34 provinces to 30 provinces because of regional autonomy policy. We also consider the analysis based on the location of the provinces. The input and output variables are chosen based on the approach used. For the data envelopment analysis (DEA), input variables are number of managers and amount of equity capital, whilst output is the surplus obtained by the cooperatives during the observation periods. In addition, the effect of number of member, amount of external funds and location of the cooperatives on the firm technical efficiency is examined using the stochastic frontier analysis (SFA) approach.

Findings
Table 1 shows the Malmquist productivity indices and its components measure changes across eight years. Values more than unity indicate productivity improvements, while values less than unity show productivity decline. Results of the Malmquist productivity show that on average, the Indonesian cooperatives experience productivity decline by 27 per cent during the period of 2000 to 2007. This deterioration is attributable to a considerable negative change in technical efficiency (5 per cent) although it compensated by increasing in technologic change by 1 per cent. The decline of technical efficiency is a result of deterioration both pure and scale efficiencies.

Table 1. Malmquist Productivity of Indonesian Cooperative, 2000-2007

<table>
<thead>
<tr>
<th>Periods</th>
<th>Technical Efficiency Change</th>
<th>Technological Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Pure Eff</td>
</tr>
<tr>
<td>2001-2002</td>
<td>0.969</td>
<td>0.539</td>
</tr>
<tr>
<td>2002-2003</td>
<td>1.005</td>
<td>0.667</td>
</tr>
<tr>
<td>2003-2004</td>
<td>1.002</td>
<td>0.761</td>
</tr>
<tr>
<td>2004-2005</td>
<td>1.038</td>
<td>0.807</td>
</tr>
<tr>
<td>2005-2006</td>
<td>0.999</td>
<td>0.860</td>
</tr>
<tr>
<td>2006-2007</td>
<td>0.959</td>
<td>0.826</td>
</tr>
<tr>
<td>Geometric Mean</td>
<td>0.995</td>
<td>0.734</td>
</tr>
<tr>
<td>Max</td>
<td>1.038</td>
<td>0.860</td>
</tr>
<tr>
<td>Min</td>
<td>0.959</td>
<td>0.539</td>
</tr>
</tbody>
</table>

Table 2 presents the summary results of factors influencing technical efficiency of the cooperatives.

Table 2: Summary Results of Factors Influencing Cooperatives’ Technical Efficiency

<table>
<thead>
<tr>
<th>Variables</th>
<th>Parameter</th>
<th>Coefficient</th>
<th>Standard-error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>$\delta_0$</td>
<td>-0.24212</td>
<td>0.05454</td>
<td>-4.4386</td>
</tr>
<tr>
<td>Number of members</td>
<td>$\delta_1$</td>
<td>0.0000003</td>
<td>0.0000001</td>
<td>3.2429</td>
</tr>
<tr>
<td>External funds</td>
<td>$\delta_2$</td>
<td>-0.0000004</td>
<td>0.0000001</td>
<td>-3.1827</td>
</tr>
<tr>
<td>Locations</td>
<td>$\delta_3$</td>
<td>0.4184</td>
<td>0.1272</td>
<td>3.2897</td>
</tr>
<tr>
<td>Sigma-squared</td>
<td></td>
<td>0.5503</td>
<td>0.0585</td>
<td>9.4118</td>
</tr>
<tr>
<td>Gamma 22/epsilon</td>
<td></td>
<td>0.00022</td>
<td>0.00006</td>
<td>3.7354</td>
</tr>
</tbody>
</table>

LR test of the one-sided error = 12.6

Note: *Critical value is 7.05 for 3 d.f. as for Table 1 of Kodde and Palm, 1986 (Coelli, et al., 1986) for technical inefficiency effect
Findings from this study try to explain that the government’s approach to establish cooperatives as an instrument to develop nation’s economy only to create weaknesses that build themselves as business institutions as well as social vehicles. Therefore, the government needs to have a new agenda in order to enhance the cooperative efficiency. Since the amount of external funds have a significant role in enhancing cooperatives’ efficiency, therefore the cooperatives need not to rely on internal equity, but to collect more financial support from the external sources. In addition, it is also need to increase the technical efficiency of the cooperatives, especially those in Java Island by creating more innovative products to attract more clients and at the end, to increase surplus.

**Keywords**
Benchmarking, cooperatives, efficiencc.

**References**
Civic organizations and governance reform in Indonesian cities

Introduction

Much has been written about Indonesia's decentralization since the fall of Soeharto. Several scholars have deliberated on the question of “right” governance, focusing on the weaknesses of transferring external concepts of governance into Indonesian regional politics (Hadiz, 2004), the persistence of irrational elements in regional bureaucracy (Bubandt, 2006), and the difficulties involved in replicating in other regions the success story of anti-corruption movement in Padang, West Sumatra (Davidson, 2007).

While all scholars have provided useful analyses and findings, they seem to have ignored a large hole in the study of decentralization, namely the organizational behavior of civic organizations. This paper aims to explore this issue by focusing on regional civic organizations engaged in governance reform. The purpose is not only to fill the gap in the study of decentralization, but also to contribute to research in the sociology of organization in democratizing societies.

Three cities – Padang, Bandung, and Yogyakarta – were chosen as the study locations for the conspicuous and even prominent engagement of civic organizations in these cities in the struggle for reform of public governance. The study targets are the Forum for the Care of West Sumatra or FPSB in Padang, Bandung Institute of Governance Studies or BIGS in Bandung, West Java, and the Institute of Research and Empowerment or IRE in Yogyakarta. The issues and institutional targets of governance reform initiated by these civic organizations differ. In Padang, the issue is budget abuse in provincial parliament; in Bandung, the issue is municipal budget transparency; and in Yogyakarta, the status of this special province.

The general questions raised in this paper are: What are the characteristics of civic organizations under study in terms of organizational cohesion, resource sustainability and networks? And, what kind of public arena do these civic organizations face and in what ways does that affect each organization and their patterns of interaction?

This study employed a qualitative method, involved two stages. The first stage was conducting a desk study to map all engaged organizational actors and to identify strategic civic organizations working in the field of governance reform; and then analyzing secondary data from local media and reports published by the participating organizations. The second stage was conducting in-depth interviews with thirty six individual actors representing twenty one organizations directly and indirectly involved in the support or opposition of current governance reform.

Discussions

Our case study shows that civic organizations in the three cities do not function as effective vehicles to achieve their stated goals. There are several characteristics that indicate their weaknesses.

Strong solidarity, weak networks

Like most social movements the world over, civic organizations in the three cities have a high degree of solidarity. However, they are weak when it comes to networking. They develop cooperation mainly on ad hoc, inter-personal relationships rather than on inter-organizational relationships. This kind of personal networking makes it difficult to sustain institutionalized
exchange and mobilization of resources. The basis of cooperation is program or project. Compared with the situation a few years ago, gatherings among NGOs tend to be fewer, as prominent civic organizations become more absorbed in their own programs. External funding agencies have urged them to be more “technocratic” – meaning their program activities should be more detailed.

**Personalized Networks**
A popular definition of ‘network’ is a group of people and organizations that are connected and involved in a common cause. The problem is that defining common cause is sometimes impossible, even unhelpful. Our study shows that organizational actors engaged in governance reform comprise a variety of organizations, all raising issues for different reasons; so different that their involvement in other kinds of activities might even be at odds with their goals. The tenability of the networks of civic organizations has much depended on the capacity of individual activists to maintain the direction of network. This raises the problem of agency within organizations. At this stage there is a growing gap between organizational and individual networks. The leaders of these organizations receive more invitations from various organizations at the local, national and international levels, and were thus able to rapidly develop their personal networks.

**Intense identity**
In contrast to the identities of public organizations with their wider roles, clear function and norms, the identities of civic organizations are “intense” and narrow. They are impacted by particular situations, such as when the state feels the need to create new rules of the game. As a consequence, they are more vulnerable in terms of public acceptance. The civic organizations in the three cities are painfully expanding their identities in the context of decentralization through the combination of critical appeal and expertise. Post-Soeharto Indonesia requires that civic organizations are not only capable of mobilizing the public – as they have frequently attempted to do in the public arena – but also of displaying technocratic competency.

**Shaky arenas of legitimacy**
The civic organizations faced difficulties when reaching out to a wider audience to gain legitimacy in three cities. Organizational theories tend to see legitimacy as something fixed in the environment, not only in terms of normative standards but also in the form of social agencies that execute it (Hensmans, 2003). In fact, analysis of an organization’s environment needs to look at the possibility of organizational actors actively creating legitimacy through arenas of social interaction, which we have dubbed ‘arenas of legitimacy’. Our study shows that although the organizations relied heavily on local communities and the mass media, the former as a public arena for building social legitimacy is shaky, fragmented, and only loosely connected to the real structure of decision making. The most effective arena for building social legitimacy is credible mass media. They have fix audiences that have certain characteristics considered socially and politically important to political players. But since the mass media has its own dynamics – with their own central figures –, it requires the constant attention of political players. The study shows that none of the organizations has a division dedicated to dealing with this, but that they rely more on individual capacities in this regard.

**Conclusions**
The concept of organizational field can in fact be used to indicate and predict the direction of civic organizations engaged in a similar cause or function. Using elements of field from Scott – boundaries, logics, governance, and structuration – a less promising future is indicated for the pro-reform civic organizations. Boundaries within and between organizations are not sharply defined by professionalism, skill and function since these aspects are not dominant prerequisites of acceptance. Certainly we cannot expect the professionalism and skills of these organizations to equal that in other organizational fields, such as the business and public sectors. But any organizational field needs certain standards that properly conceived of according to the goals they pursue and the challenges they are facing.
Much emphasis has been placed on the principle of “independency” and “freedom”. It seems that Indonesia’s civic organizations do not realize that the principle of accountability, among themselves and to the world outside, is an important pillar in achieving their goals. Lack of accountability has restricted mobilization of resources among civic organizations. Other societal organizations, such as the mass media, also find it difficult to engage more deeply with pro reform civic organizations. Structuration is short lived in nature: there are too many links and too little mesh within the organizational fields.

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Keywords
Civic organisation, legitimacy, network, sociology of organisation.

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Decentralization policy and equality: A Theil analysis of Indonesian income inequality

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Introduction
The impacts of income inequality on growth have been analyzed for years. In theoretical framework, economic growth can be effected by income inequality through 4 channels (Barro, 1999), i.e. credit market imperfections, political economy, social unrest, and saving rates. In the empirical framework, many studies have been conducted, for instance: Kaldor (1957), Bourguignon (1981), Alesina and Rodrik (1994), Bertola (1993), Perotti (1993), and Keefer and Knack (2000). Interestingly, both theoretical and empirical suggest that the relation between inequality and growth could be positive or negative.

Although the impact of income inequality on growth have been mix and conflicting, it is really important to understand the structure of income inequality. Therefore in this study we calculate gini coefficient as a measure of income inequality in more detailed figure during the decentralization. We compare income inequality between urban and rural area in each province in Indonesia.

In our perspective, one of inequality sources is the inequality problem in the sector. People earn their income by working in the sector. Consequently, if the sector has large inequality, it is expected that the economy has big gini coefficient. Thus, as a measure of inequality in the sectors we calculate Theil inequality index using both national and province level data.

Prior to the two inequality measures that we describe in the previous paragraph, we test the validity of the Kuznets hypothesis (the inverted-U shape curve). We would like to address the relationship between inequality measure and income per capita. Thus we could analyze Indonesia’s stage of development. Technically, it is quite different with other studies. Instead of using a broad panel of countries, we use a cross-province data within country.

Data and methodology
Data that we used in this study is National Socio-Economic Survey from 2002 up to 2006. Generally, we can group our analysis into three steps. First, we test the validity of Kuznets hypothesis by using panel data analysis. Here, we employ Panel-Corrected Standard Errors (PCSE) which is developed by Beck and Katz (1995) due to the existence of heteroscedasticity and autocorrelation problem in the model. In PCSE, we correct the standard error by using the square roots of the diagonal elements of panel corrected variance/covariance matrix.

Second, we calculate gini coefficient and theil inequality index in both national level and province level. Here we analyze the inequality in both rural and urban area. Gini coefficient is calculated to measure the people income inequality, whereas theil inequality index is a measure to analyze the structural change for the distribution of income between and within various sectors of the economy.

Result and discussion
Generally, there are two issues that will be addressed in this paper. First, whether the Kuznet hypothesis valid for Indonesian data. The basic question of Kuznet Hypothesis is whether income inequality increase or decrease in the evolution of country’s economic growth.
Kuznet (1955) argue that during the economic development process, inequality first increases and then decreases after a specific point. It is also known as inverted-U curve Kuznet Hypothesis. Here, we found that Kuznet hypothesis is not proven for Indonesian data since only income per capita that is significant at 5 percent level. These might be due to the length of period that we used. We use unbalanced panel data with 30 observations and 5 year periods. In the base paper of Kuznet hypothesis, Kuznet (1955) defines that the central topic of his paper is the causes of long-term changes in the income distribution. However, the “sign” of coefficient implies that higher per capita income would result higher income inequality. If we divide the inverted-U curve into two stages, the estimation result also indicate that Indonesia still in the early stage of development.

The next issue in this paper is the feature of inequality during the decentralization. The income inequality level has not much improved during the implementation of the decentralization. Since the first year in which the policy took place, instead of having lower income inequality level, gini coefficient fluctuated and even rose substantially in 2005. This might be occurred because local government did not have good coordination with central government. The local busied with their income generating activity and cause national program such as poverty alleviation program left behind. Moreover, the increasing oil price was also indicated as one of the main reasons of the significant rising gini coefficient in 2005. In the more specific analysis, it is shown that the income inequality in urban worse than rural for all period, except for Papua. This condition also occurred in many other provinces and national level data. It might be due to the natural centralization of economic activity that is usually in the city (urban). People prefer to move and try to find a job in the city since there are many types of jobs served by the city both skilled and unskilled. As a result, the city crowded with migrants and those who are not lucky enough would stay in slum area and create poverty problem in the city.

As we mentioned before, we expect that one of inequality sources is the inequality problem in the sector. Therefore, we calculate theil inequality index for all provinces. Since there are 33 provinces in Indonesia, we will only focus on provinces with the most severe inequality during 5 years analysis. The method that we used here is simply by choosing the provinces that dominantly appear as 7 provinces with highest gini coefficient during 2002 up to 2006. If we take out provinces that are always in the 7 provinces with highest gini coefficient at least for four years period, we will have DI Yogyakarta, DKI Jakarta, East Kalimantan and Papua. DI Yogyakarta and DKI Jakarta represented west region of Indonesia and East Kalimantan and Papua represented east region of Indonesia. Within 7 provinces with highest gini coefficient, west region of Indonesia was more dominant than east one with the constant comparison 4 : 3. Next, we will present theil index in four provinces above and national level for four years period (2002-2006). We divided sectors into 9 groups i.e. Agriculture, Fishery and Forestry; Manufacture; Construction; Trade, Hotel and Restaurant; Transportation and Communication; Banking and Real Estate; Services; Mining, Electricity, Gas and Oil. In DKI Jakarta, two sectors that have high inequality are Banking and Real Estate sector and Trade, Hotel and Restaurant sector. These two sectors were important sector for DKI Jakarta. Banking and Real Estate sector contributed more than 30 percent to total PDRB DKI Jakarta and become the largest sector for period 2002 - 2005 and Trade, Hotel and Restaurant sector contributes about 26 percent to total PDRB DKI Jakarta. Similar with DKI Jakarta, Banking and Real Estate sector and Trade, Hotel and Restaurant sector are two sectors with high inequality problem. In the next two provinces, East Kalimantan and Papua, the highest inequality exists in Mining, Electricity, and Gas sector. Again, this sector has highest contribution to the both East Kalimantan and Papua output (PDRB).

If we calculate Theil Inequality Index in the national data level, sectors that have large inequality are Manufacture; Trade, Hotel and Restaurant; Banking and Real Estate. This looks consistent with DKI Jakarta and DI Yogyakarta condition. However, if we compare it with Kalimantan Timur and Papua, we have completely different result.
Conclusion
To sum up, there are four important findings in this paper. First, Kuznet hypothesis is not proven for Indonesian data. The estimation result indicates that Indonesia still in the early stage of development. Second, the income inequality in urban is worse than rural area. Third, inequality problem is majorly arisen in the province’s important sector. Four, the inequality analysis in national level cannot capture the difference of inequality problem between provinces in Indonesia. Thus, the inequality-related policy should be derived from province level instead of national level.

Keywords
Decentralization, inequality, Theil indices.

References
Explaining union strategy in Indonesia

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Introduction

Strategy is fundamental to the organisation to preserve its existence, while adapting to its environment. The appropriate strategy chosen by the organisation will improve organisation performance with benefits such as to make clear and focus on the vision and objective of the organisation, and to understand the environment (Wheelen and Hunger, 2004: 4). In non-profit organisations, the use of strategy will ensure stakeholder satisfaction, growth in participation, and better financial performance (Courtney, 2002: 144-145).

Union strategy is not commonly associated with conscious, planned, and long-term planning characteristics, since union activity is usually characterised as defensive and reactive. Decisions are often collective, and made by different interest groups. The result of a number of studies (Boreham and Hall 1994; Gahan and Bell 1999) confirms that union strategy variables are among the most important determinants of organising success.

This paper attempts to evaluate the strategy of the Indonesian union movements in the telecommunications business, an industry which is still very attractive to foreign investors. I developed the work of Gahan (1998) to describe components of strategies adopted by unions. Based on the results, it further reviews which strategy pattern that dominates the activity of unions. This is a first work for explaining union strategy using a comprehensive model that employs simple, non-overlapping dimensions. The results would improve the understanding of union behaviour in particular, and employee behaviour in general, which in turn would improve collaboration of the parties in the Indonesian telecommunications industry.

Literature review

Boxall and Haynes (1997) examine the effectiveness of union strategy in relation to workers and employers. They show that in a neo-liberal environment, when the support from the government is decreasing, classic unionism strategy that combines solid organising with servicing, and implements less co-operations with employers, are more effective compared to other strategy patterns, namely: paper tiger, consultancy, and partnership unionism. Relying on servicing methods and neglecting members’ participation will threaten union effectiveness.

A similar argument also declared by Gahan (1999: 15) and Cahill (2001: 169) that traditional strategy such as strikes remain effective tools, as added by Kelly (1998: 64) that urges the use of union militancy, rather than the policies of moderation, in pursuing union goals. Gahan (1998) provides a simple but more systematic and thorough framework for union strategy, which consists of union methods (unilateral regulation, arbitration, collective bargaining, and political action); union goals (control of labour supply, direct bargaining with employer, strengthen organisation, and social change); union tactics (apprenticeship control, meetings, house call, bargaining, legal tactic, industrial action, link with political party, coalitions with other group, etc.); and the level at which strategy is developed (national, regional, workplace). Unions pursue their goals using methods selected at a certain level in the organisation. Tactics are then developed to implement the chosen strategy. Each method may have specific objectives and tactics, for instance, the political action may have an objective to create a social enhancement and supported with the political link and demonstration. However, other tactics such as legal tactic and meetings may also be employed when a union adopts political unionism. Gahan (1998: 27) assumed that unions
may implement a mixed method, but there will be dominant patterns of strategy. According to Gahan (1998: 20), his general model has incorporated all dimensions of union strategy based on theoretical and empirical reasons, thus removing the ambiguity found in the other models, whilst involving all the basic dimensions needed in union strategy.

Research method and variables

This research is based on a theoretical framework provided by Gahan (1998) to investigate union strategy, which consist: goals, methods, tactics, and levels of decision-making. I also explore union and company characteristics. The first set of variables highlights the importance of each union goal: wages and benefits, employment goals, organisation goals, and political goals. The second set of variables identifies which strategy method has been pursued, whether collective bargaining, arbitration, or political actions. The third set of variables consists of the respondent’s tactics, which comprise traditional, organising, services, and social movement tactics. The fourth set of variables identifies which levels of union organisation that have the most influence on the creation of strategy.

The unit of analysis of this study is the union as organisation, not the individual members. Therefore, each union, represented by its leaders, filled one questionnaire, which contains closed and open ended questions. I also interviewed some union leaders and made some observations to union activities. The respondents were seven nationwide enterprise unions: two full service operators, two cellular operators, one data telecommunications provider, one paging operator, and one telecommunication equipments manufacturer. Two companies have partly been privatised, as the other was state-owned. The remains were private companies, of which two were jointly owned by private and foreign telecommunications companies, and the others were owned by domestic companies. All unions were formed after 1998. Their members range from 50 to 28,000 workers, with union density between 20 percent and 95 percent. About 80 percent of 40,000 workers in those companies have been unionised. The union coverage ranges from low-level workers to general managers in any occupations, since the Trade Unions Act No. 21/2000 does not prohibit managerial employees from becoming union members or officials.

Discussion and conclusion

The research has identified component of the strategy of the Indonesian union in the telecommunications industry, which consisted of union goals, union methods, union tactics, and the level of strategy-making. The employment-security and economic oriented objectives were the most prevalent union goals. In the period of economic crisis of 1997-1998 that was indicated by massive retrenchment and high level of unemployment, the Indonesian unions were forced to prioritise the interest of members of securing current jobs in contrast of economic choices as happen in Australian (Gahan, 2002) and Korea (Jeong, 2007). If the unions were able to meet the requirement on bargaining, they would use collective bargaining agreement as primary union method for pursuing their goals. The chosen methods were enforced by combining tactics of organising member by utilising ICT (Diamond & Freeman, 2002), and building limited partnership in work, while implementing occasional adversarial approach (Gardner, 1989), and acquiring supports from union federations. Some studies in the developing and advanced countries show that the use of comprehensive union-building campaign will significantly influence union effectiveness (Bronfenbrenner, 1997; Kuruvilla, Das, Kwon, & Kwon, 2002; Satrya, 2006).

Partnerships are practised in the form of indirect participation through regular meetings or joint consultative committee (JCC). The importance of partnership is in line with the study in Indonesia and Malaysia (Satrya and Pararasuaman, 2007), the Philippines (Erickson, Kuruvilla, Ofreneo, & Ortiz, 2003) and Korea (Park & Leggett, 2004). However, management can use JCC in substituting union participation, as evident in India, Malaysia, and the Philippines (Verma, Kochan, Lansbury, 1995), or even at British Telecom (Barrett &
Heery, 1995). Other anti-union tactics were also found at most cases, at least by restricting unions to conduct activities during working hours, and discriminations in promotions. Referring to the framework of Boxall and Haynes (1997), all unions in the Indonesian telecommunications industry are better categorised as the consultancy unionism. The unions from the state-owned companies were actually more appropriate to represent such unionism, as they emphasised servicing and some adversarial engagement with employers. However, despite their extensive organising and cooperative efforts, the unions in private companies might not yet be classified as applying partnership unionism, since they showed inadequate signs of strong solidarity. Their bargaining powers were not enough to show both an opportunity and a threat to an employer (Boxall and Haynes 1997: 578).

Fierce competition, accompanied by rapid innovation in telecommunications technology creates more pressure and complexity for the unions. In order to survive, unions have to strengthen their commitment in organising (Brown, 2001; Kester & Sidibe, 1997), to improve solidarity and participation, and subsequently to construct a partnership based on members’ support (Gahan and Bell, 1999).

Keywords
Indonesia, telecommunications, union strategy.

References
Exploring the implementation of joint consultation committee in postal industry: case study in Malaysia and Indonesia

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Introduction
Strauss (1998) argues the effectiveness of direct participation will be restricted if it is not combined with indirect participation. The arguments supporting indirect participation are significant because many high level decisions affect the people in the organisation, and vice versa. This is because the strategic direction of the company is usually a determinant of the workers actions and beliefs (Wilpert 1998). They are constructed based on strong union solidarity and participation among their members (Gahan and Bell 1999; Heery 2002).
In most English speaking countries, indirect participation has been in the form of joint consultation committees (JCC), collective bargaining (CB), worker-director schemes, occupational health and safety. In Western Europe and in most Scandinavian countries, works councils and co-determination have been important mechanisms for indirect participation. While the developed world is working to achieve a balance for effective worker participation, the utilisation of effective schemes in developing countries, such as Malaysia and Indonesia, is far behind. The research will be our pioneer work on the practices of JCC in Malaysia and Indonesia. The paper will utilise the model of JCC proposed by Marchington (1992; 1994) in order to examine the actual practice of JCC in postal industry in Malaysia and Indonesia.

Literature review
Marchington et al. (1992, p.1) define a JCC as, “a mechanism for managers and employee representatives to meet on a regular basis, in order to exchange views, to utilise members’ knowledge and expertise, and to deal with matters of common interest which are not the subject of Collective Bargaining”. JCC is part of the concept of partnership between employees and employers (Gollan, 2002).
JCC can be traced from the Whitley Committee in the United Kingdom (UK) during 1917-1918 (Ramsay 1990). JCC were more popular in larger corporations (Cully et al., 1999). The influence of the Whitley Committee influenced Malaysian industrial relations practices in the workplace, which was formerly under the UK colonial administration (Parasuraman 2004). In Malaysia, JCC are more common in the public sector (Idrus 2001). JCC were established in private companies from 1994 because of the issuance of the Occupational Safety and Health Act 1994 (Aminuddin 2003). According to Todd and Peetz (2001:1381), other sorts of JCC in Malaysia include the sports and recreation committee, the canteen committee, the suggestion committee, and the religious affairs committee.
The principle of partnership between managers and employee representatives in Indonesia can be traced back since the introduction of the Governmental Decree No. 25/1961 that encouraged the establishment of Work Councils at State-Owned Enterprises. However, the attempts were never flourished (Sutanto 2001). In the era of Soeharto regime, the partnership was reinvigorated through the use of concept of Hubungan Industrial Pancasila (HIP -
Pancasila Industrial Relations), which was introduced in 1968. It positioned the parties in production process within a framework of unitarist national development, which discouraged the conduct of strikes and lock-outs, and encourages the use of deliberation to reach consensus (Sudono 1978). The Manpower Act No. 13 year 2003 mandates the establishment of compulsory JCC for the companies employing more than 50 workers.
The literature discusses four main models of JCC which impact on CB. They are alternative, marginal, competing, and adjunct models (Marchington, 1992; 1994). The first model is based on JCC being an alternative to CB. In this environment, employers will introduce and develop JCC in order to oppose CB. Employers establish this model of JCC in order to dilute the value and dependence of employees on unions. The next model regards JCC as being marginal to CB. In this model, JCC have minimum impact on workers and management, and little mutual benefit is gained. The trust between parties is lacking and management does not take the development seriously. The subject matter can be quite trivial. Third is the competing model, where the JCC is considered a direct competitor to CB. In this model employers are keen on JCC because their aim is to undermine the power of the union in the workplace. The subject matter is substantive with focus on reducing competitive friction and encouraging employees to commit to management actions and strategy. The final model sees JCC as an adjunct to CB. In this model JCC and CB have an integrative relationship where both can have different roles but together they achieve cooperation between management and employees. For example, CB is mainly to negotiate on wages, working conditions and distributive issues whereas JCC focus more on investment decisions, new business plans, takeovers and mergers, etc. Although JCC and CB have different interests both are beneficial for management and employees.

Research method and variables
This study based on a qualitative case study approach using a multi-method technique (Hartley, 2004; Yin, 2003). The management, union officials and workers of Posco in Malaysia and Posindo in Indonesia were interviewed and observed, various meetings were attended, and documents were obtained. Gumnesson (1991:76-79) argues that generalisation in case studies can be seen differently, and that rigorous investigation with only one case which identifies specific issues and systems, and other important characteristics may be reasonably used to generalise similar cases or situations. This research, however, is a study of firms that are heavily unionised, and therefore generalisation would be limited.

Discussion
The JCC brought beneficial to the unions. The unions perceived that the employers adopted a more willingness stance for in dealing with workers’ grievances. If previously the unions found had difficulties for persuading the management to discuss the disputes, now, they could use the meetings for escalating examining the problems. The most important benefit gained was that the unions were more involved in the process of decision-making. Out of four models of Marchington’s conceptual framework (1992; 1994), the fourth model – the adjunct model – is more applicable to Posco and Posindo. In the Posco and Posindo context, JCC and CB have separate roles. On one side, JCC is focused toward joint decision making on selected operational and strategic issues. On the other side, CB is concerned about pay structures and conditions of work. Both committees (JCC and CB) are thought to provide bargaining power. These success cases are supported by strong union solidarity and participation among their members, as suggested by Gahan and Bell (1999) and Heery (2002). Support from government towards partnerships is a critical requirement for the success of such arrangement (Oxenbridge and Brown 2002). In Malaysia, this situation is made possible because of the influence of the UK’s Whitley Committee. In Indonesia, the mandate of Manpower Act No. 13/2003 to establish partnership drives the promotion of JCC through various activities, such as bipartite workshop and the presentation of Bipartite Awards. However, there is always a possibility of degrading condition from the adoption of the adjunct model to the less balanced of power between JCC and CB. When the management starts to
undermine the role of unions, they will attempt to boost the role of JCC. Strategic matters are then discussed in the JCC as a competitor to CB, therefore, JCC can be used as a substitution of union as occurred in the Philippines (Bitonio Jr. 2004, p. 11). In order to prevent such condition, the unions must always prove that they have strong bargaining power, which is supported by high level of negotiation capacity and strong support from employees.

**Conclusion**

The findings from the research on JCC in both countries indicated that the adjunct model of Marchington is more appropriate to understand the role of unions and management in making decisions together at the company level in Posco and Posindo. Although there is collective bargaining established under the industrial relations law in both countries, both Posco and Posindo used JCC as an alternative employee representation in the workplace and do not challenge the collective bargaining (CB) practices. The adjunct model of Marchington (1992; 1994) is suitable to the ASEAN conditions, which is dominated by the form of enterprise-level unions (Parasuraman and Satrya 2008). The model, however, requires state support and a strong bargaining power of unions, which is showed by high level of negotiation capacity and strong member support.

**Keywords**

Developing, joint consultation committees, postal.

**References**


Introduction
This research focuses on how local partner learns knowledge from foreign partner in Japanese joint venture in emerging economies. It is an in-depth case study explaining internal learning capability transfer from foreign firms; resource sharing within business groups especially in developing human capital; and knowledge acquisition, assimilation, and exploitation process which is so-called absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002), in a leading electronic joint venture (JV) firm in Indonesia.

Focus of this study is to understand learning process in Panasonics Manufacturing Indonesia (PMI), a joint venture between Matsushita Electrical Industries and Gobel International.

Method
This research follows the replication logic, rather than sampling logic: whether case companies chosen could provide rich information in the aspects of research constructs (i.e. Lee, 2003). PMI as one of the leading JV firm in Indonesia fits with these criteria. Matsushita, a parent company of PMI, also recognized as high performance business group in terms of technological and managerial capabilities. In addition, PMI has shown their eagerness to be studied by providing access to informants. The author also has long acquaintance with one of directors in other member of Matsushita group in Indonesia who gave recommendation to PMI. It is useful to develop a relationship of mutual trust with respondents. Therefore, PMI also fits for practical reasons.

Letter of inquiry with a research’s proposal explaining the objective, design, protocols and advantage of the research is sent in early 2006. The approval is given shortly and followed by pilot study on April to May 2006. First fieldwork is conducted in June to July 2006 whereas the second is on August to September 2006. The following steps are taken to ensure the good quality of this in-depth case study. First, I met with vice chairman and three senior managers to explain the research protocols and get initial comments and set up the more detailed schedules for field studies.

Second, the main informants are senior manager HR and senior manager R&D. I conduct nine interviews during April to September 2006: twice interviews both with vice chairman and senior manager R&D, and five times interviews with senior manager HR. Each interview is carried out lasting between thirty minutes and two hours. Following the standard procedures in doing case study, I used open-ended and semi-structured questionnaire (Creswell, 1998). Creswell (1998) suggests that good case study should meet the standard of quality verification, therefore I conduct triangulation of information—searching for the convergence information—relates directly to data situation in developing case study from data sources, theory, methods, and my self as investigator. In addition, member checking is done by sending the rough draft of writing to the informants after the entire interviews finished. All the interviews are recorded and field notes are also created.
Third, the rationale of this study that makes this study as a single-case study is to confirm, challenge, or extend the theory (Creswell, 1998, Yin, 1994: 38). I use within-case study analysis in this study because several themes identified earlier are being confirmed, challenged, or extended within a single case.

**Results and discussion**

I found three types of learning processes as follows. First, learn how to manufacture the product. The objective of this type of learning is to understand one single task to perform manufacturing process. Focus of this learning is for new recruits both blue collars and white collars employees. Table 1 below provides summary of type and characteristics of internal learning mechanism at PMI. Second, learn how to improve manufacturing system. Objective of this type of learning is to improve better manufacturing system. Main focus is for relatively mature blue collars employees and well-experienced white collars employees. In particular I found that development of well-experienced white collars employees could be conducted through (i) project-based development; (ii) internal and external training and domestic/overseas seminars/courses; and (iii) on the job training in overseas. Third, learn how to find problems and solutions. Despite of the first two learning processes, I found the unique way of learning so-called how to find problems and solutions. This type of learning occurs for new recruits of white collars employees.

This research also highlights role of Japanese experts in JV Company. Japanese experts always remain in JV company as representative of parent company regardless new products, techniques, or system will be launched or not. They stay for long time usually for 5 years. Japanese experts sent to JV company has different expertise ranging from electronics, mechanical and production. The decision to send Japanese experts is dependent upon the strategy that JV will pursue to strengthen the company. For example, if in the first phase, they decide to strengthen engineering therefore parent company will send senior engineers who have expertise in engineering. Then, if they decide to strengthen production capacity and efficiency, therefore parent company will send senior production engineers.

I classify the role of Japanese experts as follows. First, as Advisor, they give advice to the company regarding particular matters such as engineering and production. Their main job is firstly to guarantee quality, reliability, and safety of the products or production processes meet the parent company standard. Second, as window, they teach JV company management as well as engineers regarding new rules, system, or special requirement as part of parent company standard. In this case, they act as “bridge” between parent company and JV company vice versa. Finally as motivator and mentor, they give motivation to local engineers to pursue better capability in the future. He tells one of informant about his experience as Japanese senior engineer including efforts to balance life as employee in Japanese company and his personal life.

**Key Success.** Some underlying key success in learning process at PMI as follows:

1. Good training system particularly with strong determination of managers (factory manager and HRD manager) to train blue and white collars workers. They conduct unique way of learning using checking mechanism, learning by finding problems and solutions, creating “embarrassing” environment for workers. This create strong fundamental of absorptive capacity ranging from acquiring, assimilating, transforming and exploitation into such technological capability.

2. Managers have been successful to motivate workers in human resources development by applying some principles as follows: (1) Long life learning process to acquire knowledge, not only from formal school but company as school for the workers; (2) Try to always be in the good health by regular sports exercises; (3) Discipline; (4) Responsibility; and (5) Hardworking.

3. The existence of Japanese experts has created mutual benefits and two-way rounds of learning both from parent company side and JV company. PMI earned more advanced techniques, skills and knowledge from parent company while Japanese experts learned about local knowledge such as culture, languages, and market. Local partner also perform daily
operations and deal with workers’ problems as well as with the government. Both parent and local partners work together in their own roles.

(4) Successful technology or knowledge transfer is based on principle “willingness to give from parent, and willingness to learn from local partner”. Matsushita gave opportunity to PMI to develop product based on their needs and local taste (such as audio products). On the other hand, PMI has put all their efforts to utilize this opportunity. This contributes to the concept of absorptive capacity that both foreign and local partner are needed to ensure successful absorptive capacity.

(5) Being part of group membership, especially as JV, PMI has benefited from world wide production networks that provide human networking, accumulating experience and knowledge and sharing testing facilities including R&D facilities.

**Keywords**
Absorptive capacity, Indonesian firm, Japanese joint venture, knowledge acquisition and sharing.

**Table 1. Internal Learning Mechanisms: Type and Characteristics**

<table>
<thead>
<tr>
<th>Type of learning</th>
<th>To manufacture products</th>
<th>To improve manufacturing system</th>
<th>To find and solve problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue collars (operators)</td>
<td>White collars (engineers)</td>
<td>Blue collars (operators)</td>
<td>White collars (engineers)</td>
</tr>
<tr>
<td>What to be learned</td>
<td>Detailed manufacturing system</td>
<td>Processes, routines of entire production system</td>
<td>Cell-manufacturing system</td>
</tr>
<tr>
<td>Objective emphasis</td>
<td>Able to perform one single task</td>
<td>Physical ability</td>
<td>Able to perform and capable to perform and supervise entire production process; thinking ability</td>
</tr>
<tr>
<td>Who</td>
<td>New recruits, high school graduates, 20-22 years old</td>
<td>New recruits, technical college or engineering bachelor graduates</td>
<td>Middle and well-experienced engineers</td>
</tr>
<tr>
<td>When/period</td>
<td>First time enter company; probation (3 months)</td>
<td>When the physical strength decreases, approximately at 40 years age</td>
<td>3-4 years after permanent status is given and upward</td>
</tr>
<tr>
<td>How/channel</td>
<td>General training (during probation), OJT based on education background</td>
<td>Groups of 4-5 workers</td>
<td>Project-based development, internal/external training, OJT domestic and foreign</td>
</tr>
<tr>
<td>Evaluation system</td>
<td>During probation (presentation exam; checking mechanism)</td>
<td>Checking mechanism</td>
<td>During probation; checking mechanism</td>
</tr>
<tr>
<td>Trigger</td>
<td>Start labor-intensive manufacturing process (mainly, low-cost manufacturing)</td>
<td>Decreasing physical ability and productivity (specifically for operators); pressure from global competition; technology advancement</td>
<td>Within each channel</td>
</tr>
</tbody>
</table>

**References**


Implementing social control at the Jakarta Public Library

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Introduction
In Indonesia, social control is necessary to handle the performance of employee’s daily work. At the Jakarta Public Library (JPL), it has been implementing control system more and more tightly. Basically, social control is referred to the capacity of society to regulate itself according to desired principles, values, rules, and norms (Janowitz, 1975).
The main research question: why do social controls do not work properly, even though the system is well organized? It contains two questions: 1) what are the symbolic forms of social control at the JPL? 2) how is the implementation of process of social control? The research, January 2007 to July 2008, uses ethnography method. All the informants’s names are disguised. The aim is to understand the implementation process of social control that has less impact to employees behavior in conduct the tasks.

The Condition of the Jakarta Public Library
The role of JPL, 30 years old (1978-2008), is serving public and government offices in information. Based on Government District vision, the JPL vision is to create modern public library in which Jakarta society as a smart and prestige reader. JPL manage six municipality branches, including Kepulauan Seribu Regency Public Library and public library at 124 unit of 267 Political District Administered by Lurahs at Jakarta. The library members which are around thirty thousand is limited for people who lives in Jabodetabek. The organization hold 18,289 titles and 43,356 exemplars. It hold competitions for teenagers to increase reading habits, such as competition of story telling, composing synopsis, book discussions, training of writing, etc. Usually, those are held at the Jakarta City Celebration Day, 22 June, and Independence Day of Republik Indonesia, 17 August. The library is open from 9 a.m. to 8 p.m., from Monday to Sunday, with 66 staff, consisting of 55 civil servants and 11 contract staff.

The form of symbolic social control
a. Rules and rewards. The value of rules and rewards is fairly balanced. The Head makes many rules, but she also gives rewards and sanctions. She spends her own money every month to buy some small presents for staff who come on time and do their job properly. She tends to focus on psychological aspect which is not aimed to scare people, but to warn the employees who are considered to make mistake.
b. Logogram. It consists of an eye, with an open book and globe as a background is made sense as inviting people to read. Curve lines vertically means stability, strenghts, glorious, and elegant. The figure of open book reflects human ideas, and the eye reflects the window where we can give world view. Logogram describes as an educational institution, but not correspondence to the values of employees.
c. Layout of the furniture and room. The employees of Division of Secretariat feel most important that Division of services, because they deal with organization life and continuity
and carrier. Furthermore, the chair of leader in the meeting room has high lean in the bag and located on the front and many doors locked, they show that social relation is not in harmony and no mutual trust. The whole office layout reflects the domination of power.

d. Ritual. At the JPL, the forms are calling for readiness, Korpri, religious activities, sport, arisan, a tour to out of town, and sarasehan. Eventhough the Head motivates employees to speak up, discuss, and solve their problems at workplace at rituals, the employees belief from the emperical experiences and knowledge that as an eastern community, instead of revealing other disgrace or criticizing supervisor in public, they prefer to remain silent.

e. Directly observation. She sometimes goes around to observe performance of the employee’s daily tasks, and comes to participate in shelving. She has caught with surprise some employees chatting, smoking, and taking a nap at kitchen, at working hours. By directly observing, she is trying to provide the best attitude or real model to employees, and to inform that they always have to be aware, and remain to work with or without her absent.

The process of construction the organizational culture
The emerging the need of control. The process begins from the result from interactions, then individual can see, feel, and know; she/he will compare it to her/his own experience, knowledge, and values. Based on the framework of thinking, there comes an expectation of ‘what should be’ to do (Hatch, 1993). Firstly, the Head found that the order of book on the shelves that are not arranged sistematically and some books vanished. Secondly, she finds that employees service people unproperly; they can not answer the questions of the number of books, the number of books borrowed per month, and which user is the most frequent borrow the books; some employees behave unmannered, and care less to users.

Socialization. There is transformation values through the forms of symbolic control. In order to socialize it, she always reminds the importance of a book and reading book. On the other hand, employees see book just like an object to be collected, processed, and preserved, then put in order at the shelves. Public services is understood as administration: registration, processing books, and watching the lockers and user’s behavior. Social values, such as taking care user’s emotional, listening user’s complaints, and so forth, are ignored. The system trial and error is more dominant comparing to the system of work which is more learned carefully. Moreover, employees seem to depend on employers, wait for instructions, and they are considered as an object, which does not have power or rights to do an action and make decision. Employers limit the freedom of employees in taking action. Between them, there is a conflict of interest. Both of them are not able to understand the consequences of the process.

Implementation. She always socializes it at sarasehan. Because employees always remain silent, employers consider the employees as incompetent, know nothing, can not motivate themselves, have poor work ethic, passive, and not appreciate what they earn much more money compared to other districts. The head of secretariat uses words ‘to develop and make them accustomed’ and ‘employees need superordinate’s guidance.’ Moreover, employees need attention, caring, presence, and greeting from employers, especially when they are working hard.

Response of employees
The response is divided into resistances and acceptance as below:

Resistances. 1) Complaining behind. Employers complain that employees need supervision all the time, and employees complain on feeling of being underestimated. 2) Not cooperative. Most of them prefer not to be presence at meeting, because they think that their voice will not be heard after all. 3) Making gossip. Employees need to share their experiences or feeling, to find justification and support, talking about the behavior of their employers as negative. 4) Mutation. Many employees think that is better to move to the district. Public libraries at the district do not implement the tight absent system.

Acceptation and creation of new values. When employees accept the social control process, it enables the friction of values. Oganization expects the values of commitment, discipline, after all, the appropriate way of perform in order to achive the goals. Few of employees accept the social control in mannered way. They obey the employers and perform appropriately their tasks, because they have a hope that employers will pay back their efforts.
Conclusion
The patriarchal culture that already exists in the Indonesian society cause a value of respect and obey to employers. This condition creates symbolic forms of control social in the suppressive form, dominated by authority of the leaders. The employers, who conduct hyerarchical system, do not involve employees, neither negotiate how to work which is in accordance with employee’s expectation and belief. There is lack of mutual trust. Therefore, the response of employees tend to shows more resistances than acceptation. They want to show that employees are not the weak and passive object, but they are active subjects who are able to decide whether they will accept or reject the social control to achieve the best performance. They also see that the level of knowledge of employers on library and information is almost the same with them. Moreover, they are not able to do the good services because they do not learn the importance of the servives. They understand the library services as administration work.

Keywords
Organizational cultures, resistances, symbols, social control, values.

References


Information dissemination focused on face to face interaction: A case study of news library in television

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Introduction
The library of news section television station is an entity in the system of television station as an organization system that function as a resource of information dissemination for producing news being broadcasted which is the substantive task of a television station organization. The urgency of this research is to indicate that information dissemination considered as a product of relation between interaction and working activities of individuals in the function of news producing in the organization system. The library becomes the headwater as well as the mouth-river of the whole internal and external information productions flow. Information and individuals in this entity mutually interdependence connected in the commitment of the need of every individual working assignment. As an input occurred from a requirement that makes information is under responsibility of the role management of librarians in managing the whole information of the news production function. Production of news as a substantive work in television station creates a position of library as central especially its dissemination of information. Librarians are responsible to creating channels for information to be able to fulfill the demand and requirement news producing in line. Channels of information between librarians and news producers become primary through effective and efficient interaction then news produced accurately.

Therefore, this paper is to show that information dissemination focuses on face to face focused interaction starting with introduction to provide frame of work, followed by concept of information dissemination in news library RCTI then the implication of face to face interaction in news library RCTI ends with conclusion.

Method
In order to get an accurate understanding about the process and policy of information dissemination and interaction between librarians and users in Indonesia television broadcast that is Rajawali Citra Televisi Indonesia (RCTI) the method of structuralism is applied. The method of functional structuralism treats information dissemination as a cultural product in its context as a mediator of constituents relevant. Actors related in the context of information disseminated posited important in each role.

Result and discussion
In this research it shows the process of dissemination of information focuses on face to face interaction becomes the primary in the unit of news producing in RCTI television station. Among other channels are telephone, internal mail, collection requirement form and fax always of and for focused and unfocused interaction. The library and librarians in information dissemination take the position of dominant function in the organization as its function to provide users in specialized field with access to information and collections not available in public and university libraries.

A group exists in simply saying as a product of abilities to behave morally or the ability to inspect each other of their actions. Ervin Goffman argues this phenomena as the order of interaction (1983): a set of product produce by the application or performance of rules or working action in a certain area which affect every one in touch within the environment. In
other word, wherever we are with other people form and direct our our actions by rules and understanding comprehended collectively actually aroused from demands in interaction. Interactional demands and prerequisites may be summarized within 2 categories: the informational and the ritual. When we interact we have desires to get information relevant to or in the context of mood, purpose, mutual trust, and reliability on other persons. It is necessary in order practical goals can be achieved such as answering questions, making promises with persons needed, getting direction). However, the important also is to give attention on ritual matters such give attentions and expression and control of emotion that show respect to ourselves and care of others as we have taken their times with questions.

The need of information and ritual in interaction in reality interchained every aspect in such interesting ways and keep in its context. The kind of condition works in control in the dissemination of information by librarians in news library of Rajawali Citra Televisi Indonesia (a television broadcast in Indonesia). The role of librarians as a source of information in news making by journalists, news anchors and editors work with the interest and based on content and context. Each party needs the understanding of each other to convey content of interaction well sent and received by each party without disturbing every party of existence. Hierarchy in the organization structure can not be neglected because hierarchy directs interaction amongst individuals moreover in face to face interaction. News library is a core in the organization system of RCTI and functions as resource of information for the making of news as an essential task in television broadcast.

Conclusion
In conclusion, I have the construction on the face to face focused interaction in the process of dissemination information amongst news producers and librarians provides as the mediator of information provided in the library and information needed by the news producers. In this case librarians have the frame of thinking as news producers that make them special as the representation of librarians of special library.

Keywords
Interpretative, service, quality, understanding, value.

References
International environment protection during armed conflict. Case study: Israel-Lebanon conflict

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Introduction
In the last ten decades, many armed conflicts have occurred among peoples and states. Generally speaking, at the beginning, people were only concerned to human as the victim of war. However, as the growing concern in international community to the environmental damage which have great impact to human life, people are now more aware of the war effect to the environment. Some had argued that the environment was frequently both being the victim and a tool of armed conflict. There are many examples of war which have great impact to environment. These include the Persian Gulf War in 1990, the Kosovo conflict in 1999, and the conflict between Israel-Lebanon (Hezbollah). The latter conflict will be the focus of this essay.

Before discussing a detail description of the environmental problem from the Israel-Lebanon (Hezbollah) conflict, the essay will begins with brief description of international legal protections of the environment during the armed conflict as the basis of analysis in international law in general and international environmental law in particular. In the following, this essay will describe the Israel-Lebanon (Hezbollah) conflict as a case study that had a result of environmental damages. Having given all the facts, it then examines whether the conflict had conducted under international law and tries to seek out state’s responsibility of environmental damages that have been produced by the conflict.

Environmental Damage from Jiyyeh’s Oil Spill and Naftali Forest Fire
In early July 2006, Hezbollah’s armed force, in small raid in Lebanon’s border with Israel, was kidnapping two Israeli soldiers as the respond to Israel occupation in southern Lebanon. Israel warned Hezbollah to surrender its soldiers but Hezbollah refused it. Israel sends their missiles to Hezbollah’s main assets and infrastructure in Lebanon territory such as Beirut and southern part of Lebanon. One of its targets was power supply to the government which was petrol station. This mission was the starting point to which the environmental damage was happened.

Between 13 and 15 July 2006, Israel attacked the Jiyyeh’s power station which located 30 km south of Beirut. Approximately 10.000 tonnes of heavy oil were spilled into Mediterranean Sea. Some reports suggest that the actual number could 35.000 tonnes of heavy oil. While local environmental groups claimed that the oil slick as an “environmental disaster” which could be compared with the 1989 Exxon Valdez tanker incident in Alaska. Furthermore, UNEP (United Nations for Environmental Programme) stated that this incident was a significant threat to some Mediterranean wildlife.

Besides the oil spill, environmental impact during the conflict was also experienced by Israel when Hezbollah’s rockets hit forests and fields across northern Israel. According to Michael Weinberger, the forest supervisor for the Jewish National Fund, the top administrator of Israel’s forests, the rocket fire has destroyed 16.500 acres of forests and grazing fields. These fires have threatened the ecosystem of the forest.
Legal Consequences of the Conflict
In discussing legal consequences from this conflict especially to the impact of the environment, there are two broad analyses in which recognised in international law concerning the laws of war. These broad analyses are determination of the legality use of force by the conflicting parties and justification factors i.e. necessity and proportionality. It can be argued that these discussion lead to the conclusion of which whether there is breach of international law especially to legal protection to the environment and whether the two conflicting States could be placed as the responsible parties of the environmental damages.

Legality Use of Force
It is clear that both Israel and Hezbollah justify their action based on self-defence reason under Article 51 UN Charter. Article 51 recognises that the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations. It is clear that action of self-defence is justified if an “armed attack” occurs. The ICJ, in its judgement in the Nicaragua case, determined that “armed attack” is including “action by regular armed forces across an international border and the sending by/on behalf of a state of armed bands, irregulars, mercenaries which carry out acts of such gravity as to amount to an actual armed attack by regular forces – or its substantial involvement therein”. It is obvious to note from the word “occurs” that the armed attack begins not until a state’s territory is affected.

It can be argued that Israel’s justification of its action was flawed under Article 51. Hezbollah’s military raid, of which claimed by Israeli government as an armed attack, was took place within the Lebanon’s territory and outside Israel’s territory where there is no significant implication. It also clear that there was no sending of armed bands by/on behalf of neither Hezbollah nor Lebanese government to Israel. In the other side, Hezbollah, in representing the government, had a clear justification of self-defence when Israeli missiles were launched into Lebanese territory.

Justification Factors: Necessity and Proportionality
During the armed conflict, the conflicting parties are required to take into account of their actions based on necessity and proportionality assessments. This statement was considered as international customary law and reaffirmed by the ICJ in its judgement and advisory opinion. These are also applied not only to actions which will influence human but also to the environment. Given the main protection rules in the Protocol I to the Geneva Conventions of 1949 and the ENMOD convention, States are obliged not to use its military force which might lead to cause widespread, long-term and/or severe damage to the environment.

From the facts above, it can be argued that both Israel and Lebanon (Hezbollah) violate international law in protecting the environment during their military conflict. This was because Israel and Hezbollah intentionally attack power station and forest respectively in which both of them caused a cause widespread, long-term and/or severe damage to the environment. Therefore, Israel and Lebanon have violated the protection rules in Protocol I and the ENMOD convention.

Finally, it can be argued that, based on the principle of State Responsibility, both Israel and Lebanon are liable for paying compensations in order to redress all the environmental damages as the result of the conflict. This obligation emerges from Article 3 of Hague Convention IV and Article 91 of Additional Protocol I. Compensation is a mean of peaceful settlement which had been practiced by States for over a century. One of the clear example of this application was in the aftermath of the 1991 Gulf War where the UNCC became the independent body to receive and manage for claims as the result of the conflict.

Conclusion
It is important to note that, because of armed conflict experiences, the international community has tried to protect the environment through conventional and customary international laws. However, until these days, if an armed conflict occurs, the environment
continues to suffer and no individual has been charged with an environmental crime. There are many reasons for this condition such as ambiguity in the elements of the acts which constitute a war crime to the environment because of political sensitivities such as victor’s justice and global social value system that allows environmental crimes to be overshadowed by humanitarian atrocities.

It is clear that armed conflicts cause destruction on different kinds of victims, but unfortunately when the victim is the environment, perpetrators walk off without punishment. However, it is important to argue that legal consequences for those who cause environmental damage should be attached to deter the acts and remedy damage in maximum efforts. Then, it is significant to say that the State’s responsibility is incur under international law if the armed forces of the State cause damage to the environment of other States by violating the laws of armed conflict.

Keywords
Armed conflict, environment protection, international environmental law, state responsibility.

References
On productivity performance gains of Indonesian Firms

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Introduction

This study compares the productivity performance gains of public-sector and private-sector firms in Indonesia over a recent 10-year period that includes four years of economic reforms by IMF. The motivations for this investigation are: to determine if private sector firms were more or less or equally efficient during the observation periods, by measuring gains in performance; and identify performance differences, if any, in the two sectors. The novel idea here is to use total factor productivity measure instead of the entrenched but increasingly-questionable financial performance measures so far used in performance studies. In particular, non-conventional firms such as state firms (or even Islamic banks versus conventional banks, where such variables as profits and interest costs/revenues) do not lend themselves for comparison across different forms of organisations, our proposed method of analysis is very well suited, and yields accurate results, besides identifying the slack in efficiency against the capacity potential.

This study employed Data Envelopment Analysis (DEA) and Malmquist Indices to consider the efficiency of samples of firms, and also examined productivity change after the financial crisis. The results show that both public and private sector firms experienced productivity declines during the study period. The declines were primarily due to technological regression, which arose from the inability of firms to adopt newer and better technology, we assume, given the scarcity and high cost of capital in the economy particularly after the financial crisis. The state sector firms were suffering more on these grounds than their private counterparts, perhaps because of the entrenched monopoly positions of some private firms. However, there was a catching-up effect in both sectors over time during the eleven-year study period.

The efficiency of Indonesian firms

The important aspect in evaluating firm’s performance is its performance gains over time. In the case of Indonesian firms, since public and private sector firms cover different purposes, therefore they are different in various management styles and regulations, which often lead to different goals and thus performance differences. Given the current thinking widely disseminated in the literature about how to assess the performance of economic entities, performance of the state enterprises has been measured according to the same criteria as that of a private sector firm. There appears to be two separate lines of assessment in practice, which is patently wrong-footed as measures such as profits (example return on equity) are biased against finding efficiency of state firms since the state firms are organised without the objective of profits, although it can be said that both state and private firms must recover all costs. That is, the before-tax profits must be equal to zero for state firms to be financially efficient as such firms are required to earn a rate of return on investment. The accounting-financial performance applied by accountants and financial professionals is based on the very old returns on capital and cost of sales measures (or some variants of these measures. We assume this approach to be a wrong research process. The other measures increasingly gaining attention is based on the production efficiency literature based on some variant of
Cobb-Douglas Production Function, and addresses the performance issue without considering profits.

Method, data and sample
This study measures firm’s efficiency performance as its productivity, which is based on its activity of converting inputs into outputs. Performance is to be measured as productivity ratios, which is the ratio of outputs to inputs. The larger ratio is associated with a better performance, showing increasing returns to scale. However, the term performance here is a relative concept, which means that it could be measured relative to the previous year or relative to the performance of other firms. Employing data envelopment analysis Malmquist indices follows Fare et al. (1994).

In order to calculate the firm’s efficiency analysis, inputs and outputs must be specified. The specific data items used in this study are: total assets, sales, and earning before interest and tax (EBIT) as outputs, data on production factors such as material used, labour cost and capital cost. These data are expressed in nominal monetary value in a country with a high inflation. Thus, data are adjusted for inflation (Ma et al. (2002; 298-312)), using the Consumer Price Index (CPI) with base year as 1993 prices, to obtain the real values. The theory of firm suggests that firms’ aim to create value, which is total assets; maximise sales; and create an annual value, which is net income. Since SOEs often do not have profitability objective, a practical variable is to consider operating income (EBIT) as another output. EBIT is used to replace net income or earning before tax, considering SOEs are not always required to make profit from their operations and these firms are also supported with state funds so these do not incur huge interest costs.

Findings
This section reports our results on production efficiency performance of SOEs and PSEs. The output-orientated constant return to scale formulation is used to compute the Malmquist index for 141 firms comprising two samples respectively. Coelli (1998; p. 43) notes that the CRS/VRS options have no influence on the Malmquist DEA because both are used to calculate the various production frontier distances using the Malmquist Indexes. Summary of statistics on annual efficiency change, technical change, and total factor productivity (TFP) of all firms as well as for each sector.

The results show the annual average of technical efficiency changes, technical changes, and TFP changes of all firms. The results described here are based on the full set of 141 matched firms with the following inputs and outputs. The inputs measure used are material cost (input 1), labour cost (2) and depreciation expenses (3) The last item is a proxy for capital input, while the outputs are total assets (output1), net sales (2), and earning before interest and tax (EBIT, the no. 3 output).

The results of the Malmquist productivity measures show that there is productivity improvements in Indonesian firms, which is primarily due to the use of technology, which is the use of new technology made possible by increased use of capital especially by the private sector firms in the test period. Deprived of capital because of budget constraints, the state firms sought and made improvements in efficiency rather than technology. However, if the firms are separated as public and private firms, instead of improvement, there was a productivity decline in both sectors over the whole period, which includes four years of industrial reforms over 1998-2001. The evidence shows that the decline is caused mostly by technological regression, despite smaller efficiency gains in both sectors during the study period. The results are the first to measure performance of corporations using, in our opinion, a bias-free measure of total factor productivity and its components. In some regard, these results are not merely robust, but are also tested appropriately to establish statistical support for the conclusions that the performance of both sectors are broadly similar statistically, although in index value terms private firms are marginally more efficient.

As mentioned in other sections of this paper, these results can be highlighted to show how the method of performance attribution of state versus private firms can be easily applied to the
study of conventional banks versus Islamic financial firms. Given the non-comparability of key financial ratios and variables traditionally used for study of Indonesian firms, the ready comparability of technical, efficiency and total factory productivity changes across the firms enables a valid comparison to be made, which we recommend for the study of Indonesian Islamic bank performance as well since the Islamic banks share the same dissimilar characteristics as does the state versus private firms.

**Keywords**
Data envelopment analysis, production efficiency, Indonesia, Malmquist indices.

**References**
Ownership reform: Does it matter? A study of privatization of Indonesia’s state-owned enterprises (BUMN)

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Introduction

State-owned Enterprises (BUMN) were considered special in Indonesia, besides receiving subsidies from the government in the form of capital participation, they also supporting the economy through their contribution to national income. The existence of Indonesia’s state-owned enterprises (SOEs, hereafter BUMN) can be traced to the Dutch colonial government, which started the BUMN in the late nineteenth and at the beginning of Twentieth centuries. The Article 33 of the country’s constitution also gave a legal foundation for the takeover of these Dutch companies. However, as oil prices began to decline in the early 1980s, the BUMN subsidies as well as their contribution reduced. The decline continued during and after the Asian economic crisis that riddled Indonesia since 1998. This situation led to a substantive reform of the BUMN, resulting in a policy of self-financing as had occurred for example during 1984 in Vietnam. Therefore, BUMN in the recent decade have to secure good economic outcomes, high financial and productivity performance to be able to sustain them.

To achieve these goals, the Indonesian government had launched a privatization policy by selling part of government ownership in some of BUMN through public offerings and private placements. However, some evidence indicated that so far, there no significant change BUMN performance of the privatized firms. Therefore, this paper aims to analyze whether the government policy to privatize some of state firms (BUMN) was a suitable policy to be made, or maybe there is such proper strategy could be chosen.

Therefore, this paper aims to evaluate whether the government policy to privatize some of BUMN in order to improve their contributions and performance was achieved, or maybe there is such proper strategy could be chosen before selling it to the private sector.

The Privatization Theory

Privatization is one of external change that can motivate internal change, such as corporate strategy which influences firm performance. The examples of internal changes are management turnover and corporate governance practice. Management turnover bring new skills and new capabilities to the firms as they did not have these before implementing privatization program. This practice makes the change in strategy, structure, and culture which is affecting the firm’s ability to gain profit maximization and shareholder value creation. Privatization of SOEs was regarded as an important means to introduce efficiency. In general, there are three reasons for the implementation of privatization policy: (1) reducing the government role in business, by promoting competition to increase efficiency and productivity; (2) generating new sources of cash flow and self-financing for state-owned enterprises - SOEs, by promoting foreign direct investment, and deepening domestic equity market; and (3) reducing the government financial deficits, by reducing fiscal transfer to SOEs and increasing tax revenues through the higher profits to be generated by privatized firms after privatization (Edited by Lieberman and Kirkness (1998)). In addition, privatization reduces the state control over the SOEs and increase control of private investors ((Bishop, et al., 1994)).
Privatization and BUMN performance

The economic crisis of 1997/1998 led to a substantive reform of the State-owned Enterprises (In Indonesia: BUMN), resulting in a policy of self-financing policy. Therefore, BUMN in the recent decade have to secure good economic outcomes, high financial and productivity performance to be able to sustain them. The research issue then is: Is the BUMN performance satisfactory under these reforms? Whether privatization was an accurate policy to enhance BUMN performance and its contribution to the national economy?

Until 2006, there were 12 out of 139 BUMN have been listing at the stock exchanges, the rest still under controlled and owned by the government of Indonesia. Looking at the activities of those BUMN, most of them are firms that establish to provide essential products and services. In terms of returns on asset (ROA) of the five categories of BUMN, i.e.: financial, non-financial, Pertamina (the oil producer), BUMN with financial support and privatized firms. It shows that on average, Pertamina has the highest ROA, while on average BUMN with financial support from the government has the opposite. In addition, those BUMN gained the highest ROA in 2005. In addition, the return on equity (ROE) of the BUMN for all categories shown that on average, publicly-owned (privatized) firms have the highest ROE (36.66 %), whilst BUMN with financial support from the government have the lowest ones (0.82%). This is an interesting phenomenon that those privatized BUMN achieved the highest return for their investors. This can be assumed that privatization policy may increase the BUMN ability to improve their performance. It implies that control by the independent investors lead to a better performance.

Performance of the BUMN can also be seen from the profit earned and the number of unperformed BUMN. This achievement is also indicated by a significant growth of their contribution in the form of dividends, tax payment to the government, and capital flows to small and medium enterprises except from the profit from privatization. It is shown that the average contribution from 2002 to 2006 was 27.72 percent, and dominated by contribution in the form of tax payment. According to the literature, state-owned enterprises broadly experienced poor efficiency performance compared with private sector firms. Thus, privatization has been shown to have led to efficiency improvement in several countries (Megginson et al. (1994); Boyco, Schleifer and Vishny (1996); Megginson and Netter (2001); Boubakri and Cosset (1998); and Lo (1999)). Evidence about inefficiency and lower profitability relative to the private firms can be found in the studies of Dewenter and Malatesta (2001) and Boardman and Vinning (1989).

In addition, examining the comparative financial performance between the SOEs and PSEs in each industry reveals that public sector firms in the two industries (industrial and mining industry and properties) have better returns and profit performance than private sector firms. This evidence can also be indicative of the fact that state firms in this industry have been financially supported by the government, and have also operated in a protected market. In summarize, the unsatisfied performance of Indonesia’s BUMN after being privatized might be for some reasons. Firstly, the objective of privatization of BUMN was mainly to help the government in fulfilling the government financial deficits. Therefore, this kind of an urgent and short-term objective made the government as the policy maker did not have much time to seek the potential investors who offer better transaction prices and set a lower price on the right issues than it could be to the private investors. As the results, there were many cases that privatization of BUMN could not provide an optimal sales revenue for the government (Yusuf, 2006 and Sunarsip, 2007). Secondly, BUMN was established to produce essential services as ports, printing, transportation and basic commodities. Such firms were and are still mandated to produce a large amount of outputs, in areas where the private sector is unable to provide the capital and organisational framework needed for large-scale production. Based on that, the government ownership of the BUMN represents society (people) ownership of these firms. Therefore, the government has to consider the people’s view for every decisions and policies made upon the BUMN. However, much of the privatization policy was made based on political consideration without taking into account the DPR’s view on the policy. This situation makes every implementation of privatization policy a debatable decision.
sirecumstances, actualy can be reduced by giving a clear information of the privatization program to the management as well as to the public, that it will not be painful to the society but benefits to increasing their wealth. Thirdly, another factor that can caused unsatisfied performance of BUMN after the privatization is the performance of BUMN itself before and at the time it was sold to the private investors. Most of BUMN sold experienced poor financial and efficiency performances. In some cases, there were a lot of unqualified managerial staff can be found in the management, as well as high cost of capital that limit BUMN effort to expand their businesses.

Based on those conclusions, some alternative solutions can be considered in implementing privatization policy to BUMN. For example, the privatization policy need to be well informed and socialized to the society (the people representatives, management of BUMN) before implement it. This can reduce the asymmetric information of the policy between the decision maker and the society as general. Furthermore, the implementation of privatization policy should taking into account the current performance of the BUMN to be privatized. It might be favorable if selling the firm when it has a good performance. Therefore, the government need to select, which BUMN is ready to privatized and would give maximum benefits to the public and at the same time be able to help fulfilling financial deficits. Moreover, to be able to secure optimum revenues from the sale of an outstanding BUMN, the government could sell the firm after improving its performance and profitability. In addition, to avoid underpricing IPO of the BUMN the government could consider other alternative in selling BUMN shares as follows. Stage one, the underperformed BUMN intended to privatized can be sold to such an institution owned by the government. This institution have a responsibility to improve its performance until it ready to sell with a proper price to private investors at the second stage.

**Keywords**

Efficiency, privatization, productivity, state-owned enterprises.

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The contestation of business networks in liberalising economy and polity: evidence from regional textile business in Indonesia

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Introduction

The 1997 economic crisis followed by the step down of president Soeharto in 1998 changed the landscape of Indonesia’s economy and polity. It was the beginning of the International Monetary Fund (IMF) in cooperation with the Indonesia’s democratising state sailed to a new economic destination. Preaching market solution to social and economic problems, drastically reduced the role of the state, and further trade liberalisation become new medicines for healing Indonesia’s economy. In the political sphere, the country radically shifted from authoritarian to democratic political systems marked by the existence of multi-party competition and free elections.

Recently, there seems to be a unanimous consensus among economic sociologists that the transplantation of institutional forms of economic liberalisation of the developed into developing societies will not produce the expected results and frequently backfired (Portes, 2006). Two cases are worth noting. Mexican economic liberalisation represents a failed model of transplantation. Under President Salinas, the privatization programme has been severely resisted by the managers of public owned companies, trade unions, the ministries dealing with programme’s supervision, and national entrepreneurs (Portes, 2006). Salinas’ privatization programme clearly ignores the dynamics of power as important element of institutional context in Mexico’s economy. Another case, the China case of the reform of agriculture collectivism, represents adjusted model of market transition. Before implementing market economy, Chinese government has launched land reform programmes with different emphasis from region to region (Walder, 1996). Reform in power structure has been the priority so as to harmonise with formal rules of market economy. China’s experience informs the strategic importance of institutional context before voyaging into a new ocean of market economy.

This paper intends to enrich studies on institutional contexts of economic liberalisation with particular reference to a certain region in Indonesia. The implementation of economic liberalisation in Indonesia has been eloquently called by Stiglitz as “crying fires in the theatre” (Hill, 2003). His statement has informed not only the ignorance of accounting institutional context but also the complete withdrawal of the state in the intervention of textile economy. Within such circumstances, this paper argues that Indonesia’s economic liberalisation brings about the processes of de-industrialisation. The existing bonding and bridging types of business networks are being contested and they face difficulties to response to the transplanted liberalisation. As a consequence, business inequality has sharply increased as indicated by the decreasing power of entrepreneurs in the structure of textile market. The mushrooming of political parties and civic associations, including textile association, in a democratising Indonesia may constrain a further process of textile de-industrialization as far as their voices are considered in the process of public policy making.
In order to support the above-mentioned arguments, in-depth interviews with strategic actors and content analysis of local newspapers and government documents were carried out in Pekalongan region, Central Java from April to August in 2006.

Theoretical discussions
Throughout the previous sections, this study shed lights on the processes of business contestation that has been occurring in one of Indonesia's medium-sized urban areas. It is shown how economic liberalisation within the context of political liberalisation has shaken the underlying social institutions of business networks in the region. It is evident that the strong imposition of economic liberalisation - without accounting for institutional context - has led to the increasing inequality within various business networks in the textile market. The findings of this study inform that the imposition of external institutional blueprint into liberalising economies and polities should be sceptically understood. Such imposition seems to be the dominant paradigm in various areas of life such as the implementation of Good Governance, development of civil society and social capital in Indonesia. It is not the economic liberalisation but the existing institutional arrangements that matter most. Walder (1996) warns the general claims about the impact of economic liberalisation on inequality. Market economies vary widely in their patterns of power and privilege, and the characteristics of emerging markets. They should be taken into account before the implementation of economic liberalisation.

In his seminal article, Nee (2005) offers a comprehensive institutional perspective of the economy in industrialising societies. His perspective, influenced by North, aimed at integrating informal social organization of close-knit groups and the formal rules of institutional structures, highlighting the mechanisms that regulate the manner in which both informal and formal institutions facilitate, motivate, and govern economic action. Moreover, he introduces concepts of close coupling and decoupling in order to explicate processes of integration and disintegration of both institutions. Following Nee’s perspective, Indonesia’s experience shows a mechanism of decoupling rather than close coupling occur in the process of managing textile crisis.

Conclusion
The rise of political parties and rejuvenation textile associations has opened public dialogue over the issues of textile deindustrialisation in the country. Unfortunately, the issues seem to be kept floating on the air considering the weakness in the connections between textile entrepreneurs and politician at the local level, as well as between local politicians and their colleagues at the national level. The local politicians do not communicate well with the entrepreneurs as they uphold different issues as their political stakes. The national politicians, as a consequence, do not have sufficient input to what has happened to the regions. Moreover, the weakness of the Indonesia’ political parties, organisationally and functionally as the articulation means for people’s interests, are widely known.

All in all, public dialogue or deliberation as a mechanism for salvaging textile industry seems to become an end itself. However, recently, new and small movements seem to shed some lights in the dark tunnel. Young and uncorrupted politicians begin to win elections in several cities and regencies in the country. This development may affect the 2009 general elections. Much hope to recover textile industry will be determined by the results of the 2009 parliament and presidential elections.

Today, the re-emergence of textile associations and political parties in the supports of the interests of textile entrepreneurs at regency level still need to be salvaged, nurtured and developed. By developing them, all textile entrepreneurs from different level of ownership have a say in the process of policy making. Liberalisation without devising the possible social costs would bring about human catastrophe.

Keywords
Coupimg and decoupling, formal and informal rules, liberalisation, social network.
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The economy-wide impact of controlling energy consumption in Indonesia: An analysis using a social accounting matrix framework

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Introduction
Oil has played an important role as Indonesia’s main energy source. In the last 10 years, approximately 65.5 percent of Indonesia’s total energy consumption has come from crude oil (Center of Data and Information – Ministry of Energy and Mineral Resources, 2005). Furthermore, crude oil has long been an important source of government revenue. Nowadays, however, more and more people are questioning whether Indonesia can continue to depend on oil as its main source of energy and as one of its main sources of revenue. That Indonesia depends too much on oil is one of the energy related concerns.

The second energy related concern is the government energy subsidy. The government has always controlled the price of domestic oil products —fuel oils— such as gasoline, automotive diesel oil and kerosene, so as to be lower than the world price, by providing a subsidy to Pertamina, the only oil processor and distributor of fuel oils in the country. The government also controls the price of electricity at a lower than production cost by subsidizing the national electricity company.

The third concern is energy intensity, which has not improved. Energy Information Administration (EIA) reported that, in the last two decades, energy intensity in several East Asian countries, particularly China, has improved significantly, and developed countries around the world have been able to keep their level low, while Indonesia’s has worsened at a rate of 1.94 percent annually1. This situation indicates, though not precisely, that there has been an increasing trend towards inefficiency in primary energy use in Indonesia. Hence, there has been growing pressure on Indonesia to improve its efficiency in using primary energy.

The fourth concern is negative externalities to the environment, both at local and global levels. At the local level, environmental problems related to energy use are generally human health problems caused by emissions from vehicles and industrial activities. At the global level, the main concerns are global climate change and global warming due to increasing emissions of greenhouse gases. The energy sector, through its production and exploitation activities, is considered to be the main contributor of greenhouse gases. EIA reported that the CO2 emission intensity of Indonesia has been worsening at a rate of 4.1% annually during the 1990s and early 2000s.

With the above mentioned problems in mind, the Indonesian government must develop various programs to promote better and more efficient use of energy. This paper aims to analyze the impact on the economy of energy policies aiming to reduce and to improve the efficiency of energy use, particularly on the income of various household groups. This paper will, first, construct a Social Accounting Matrix for Indonesia with detailed energy sectors and, second, utilize various multiplier analyses to observe and understand the impact of these energy policies.

1 http://www.eia.doe.gov
Data and methodology
Data that we used in this study is Social Accounting Matrix data in year of 2000, published by Indonesian Central Agency of Statistics (Badan Pusat Statistik or BPS). We extend it further to develop The Indonesian Energy SAM. The Energy SAM extends this original Indonesia SAM to include detail energy sectors, namely: (1) fuel oil sectors (BBM), comprising: gasoline, automotive diesel oil, industrial diesel oil and kerosene; (2) the gas fuel sector (BBG), i.e. refinery gas and urban gas, where BBG referred here is from refinery or oil production and is not a liquid natural gas; and (3) the electricity sector. Data on detail energy sector is available from the Center of Data and Information – Ministry of Energy and Mineral Resources. In extending the Indonesian SAM into the Energy SAM, we followed the procedure developed by Lewis in 1993 (Lewis, 1993).

Generally, this paper aims to predict the impact of an improvement of energy efficiency on household incomes for various different groups. The two particular methods implemented are: (i) an accounting multiplier matrix with backward linkage to analyze the impacts of improvement in efficiency of energy use (or energy-saving), both with and without subsidies; and (ii) a constrained fixed price multiplier to analyze the impact of restrictions in energy use.

Result and discussion
There are several conclusions that can be made. First, a policy improving the efficiency of energy use is relatively better than a policy restricting the use of energy. In general, an improvement in energy efficiency increases the income of most household groups, while energy restriction decreases their incomes. Furthermore, the simulations show that an improvement in energy efficiency most likely will not cause a rebound effect or an increase in energy use.

Second, a combination of reduction energy subsidy policy and policy improving the efficiency of energy use produces the best outcome in general. In the case where greater energy efficiency is reached without any reduction in government subsidy, household incomes will increase the most when all industry sectors and all households use electricity more efficiently. In case where more efficient energy use is achieved by a reduction of energy subsidy, household incomes will increase the most when all industry sectors and all households use automotive diesel oil more efficiently.

Third, an improvement in energy efficiency should be emphasised more in industrial sectors than in households, as the former will increase household income by a greater amount than the increase created by the improvement in household energy efficiency. In general, the improvement in efficiency in industrial sectors should focus on the use of automotive diesel oil and electricity. Furthermore, specific recommendations on the industrial sectors that are suggested to trial more efficiency in energy consumption in order to result in a positive effect on household income are: (i) The Pulp and Paper Industry, Construction and Land Transportation for automotive diesel oil; and (ii) The Trade, Pulp and Paper Industry and Textile Industry for electricity.

Conclusion
To sum up, there are four important findings in this paper. First, a policy improving the efficiency of energy use is relatively better than a policy restricting the use of energy. Second, a combination of reduction energy subsidy policy and policy improving the efficiency of energy use produces the best outcome in general. Third, an improvement in energy efficiency should be emphasized more in industrial sectors than in households, as the former will increase household income by a greater amount than the increase created by the improvement in household energy efficiency.

Keywords
Energy economics, government policy, social accounting matrix, technological change.
References


The effect of mergers on bank performance: Evidence from bank consolidation policy in Indonesia

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Introduction

An inclusive merger mechanism became one option for the Indonesian banking industry to respond the Asian Financial crisis under its bank consolidation program. Bank consolidation in the form of merger become one of the regulations initiated by the Indonesian central bank in order to improve banking system’s capacity to provide financial intermediation between savers and borrowers and restore public confidence. As merger activities around the world have the same purpose, the most common purpose for merger is to increase efficiency and reduce costs. In the depths of the crisis, initiated by the Government, sixty-seven banks were closed, merged or acquired by other institutions. To recondition bank balance sheets and public confidence, the government implemented a major restructuring and recapitalization program, directed by the Indonesian Bank Restructuring Agency (IBRA). The priorities were to reduce overlap in the banking sector and to create much larger and stronger entities that could serve the needs of a modern economy. Therefore, merger mechanism became one of the options for banking industry to survive the crisis. As a result, 19 banks were consolidated and formed 4 merged banks during the period of 1997 to 2000.

This study gives insight into the effectiveness of economic policy reforms in the Indonesian banking industry. This study examines the impacts of merger on commercial bank’s performance in Indonesia during 1997 to 2006. The period was characterized by financial deregulation, the Asian economic crisis, and bank restructuring programs. The traditional financial ratios and non-parametric Data Envelopment Analysis approach is employed to investigate any efficiency gains both in the pre and post merger periods, in order to detect whether bank mergers produce any efficiency gains as well as factors contributed to the performance. The evidence shows that merger created synergy as indicates by the statistically and significantly increasing the post-merger financial and productive efficiency performances. The main objectives of this study are to compare the financial and productivity performance of the Indonesian banks pre- and post merger and to identify factors that contribute to efficiency gains. This would also include five banks resulted from the merger program, as well as the evaluation of performance from the target banks. First we use financial ratio measures such as Capital Adequacy Ratio (CAR), Non-Performing Loans (NPL), Loan-to-Deposit Ratio (LDR), Net Interest Income (NII), Return on Assets (ROA), and Return on Equity (ROE), to understand the effect of merger on bank financial performance. Then, we use a non-parametric Data Envelopment Analysis (DEA) to measure bank efficiency performance before and after the merger. This study hope that empirical findings could provide a reference to government and bank authorities as to (1) Provide reliable financial information on the economic resources and obligation of the banks; (2) Provide support for identifying the variances which come up while calculating the financial ratios; (3) Provide assistant for financial information in estimating the gaining capability of a bank; and (4) Provide steadfast information about the changes in net resources that occur because of various banking actions.
Methodology and research design

In general, study on bank’s efficiency performance can use one of the following approaches: production approach and intermediary approach. Production approach viewed banks as a producer of services. The services related to the deposit and loan accounts. Therefore, the number of transactions associated with each accounts are taken as outputs where labor and capital are considered the inputs. Conversely, under the intermediary approach, bank is viewed as a financial intermediary transferring funds between surplus saving units and deficit spending unit (Heffenan, 2000). Therefore, bank accepts deposits and used them to make loans and investments. Under this methods, deposits are considered as input to produce loans and generate interest income (Havrylchyk (2006) and Canhoto and Dermine (2003). This study applies the intermediary approach with deposits and interest expenses as input variables, while total loans distributed and interest income are the output variables.

Sample for this study comprises input and output of unbalanced panel data of 19 Indonesian commercial banks between 1997–2006. Furthermore, we applied a multi-stage DEA to calculate banks’ technical efficiency performance (Coelli, et al. 1998), as well as financial ratio measures. Data were gathered from the central bank data based as well as from the individual banks’ annual financial reports. In addition, the F-test is conducted to test the difference between two variances of performances pre- and post merger. According to Levine et al. (2005), the important reason to test for difference between the variances of two populations is the need to determine whether the pooled-variance t test is appropriate or not.

Financial indicators measurement of bank performance

Some financial ratios used in this study to evaluate bank performance pre - and post merger is common. For example, return on asset (ROA), return on equity (ROE), non-performing loans (NPL), loan to deposit ratio (LDR), capital adequacy ratio (CAR), and net interest margin (NIM). Return on assets (ROA) is a comprehensive measure of overall bank performance from an accounting perspective (Sinkey, Jr., 1992, p. 43). It is a primary indicator of managerial efficiency. It indicates how capable the management of the bank has been converting the bank’s assets into net earnings. Indonesian banking industry, based on Bank Indonesia’s regulation in 2004 stated that the banks is considered healthy if they have a minimum ROA of 1.215.

Malmquist data envelopment analysis

Using the DEA methodology, one can calculate the relative efficiency of banks, which can be advantage the need for assigning a priori measures of relative importance of to any inputs or outputs. Therefore, one can define efficiency as full efficiency when none of its inputs or outputs can be improved without deteriorating some of its other inputs or outputs. In addition, a bank can be considered as 100% efficient if the performance of other banks cannot be improved without worsening some of its other inputs or outputs. DEA is used as a tool to evaluate operating performance of such a DMU or an organization. The performance is simply measured as unit (DMU) efficiency or productivity, which is a ratio of output produced to input used in the production processes. For example, partially we can measure labor efficiency as sales per number of employee. In addition, we can also measure total productivity by incorporating all possible inputs used to produce all possible outputs of such entity.

Discussion of findings

Using both financial ratio analysis and data envelopment analysis (DEA) approaches. The DEA can determine the production efficiency gain, as well as its decomposition, efficiency change and technological change. In addition, the traditional accounting and financial measures is also employed. The new findings for the literature would strongly suggest that corporate evaluation which is primarily based on accounting - financial ratios is definitely not getting at the more important, in our opinion, levels of how management of firms efficiently mix inputs to secure productivity gains. Thus, the use of productivity measures led a better conclusion on to bank’s overall performance by including all factors contributed to its outputs. Neither measure alone is useful for an evaluation of bank performance. Use of
production measures reveal the factors that are identified as the cause of the inefficiency, i.e. managerially inefficient or technologically inefficient. This paper provides interesting evidence using both accounting-finance and production efficiency with unbalanced samples using non-parametric statistics. This study reveals that merger did increase bank’s ability to gain profits. It indicates by the increasing most of performance indicators such as return on asset, return on equity, net interest margin, capital adequacy ratio and non-performing loans. In contrast, it is also found that merged banks could not improve their ability to carry out its function as an intermediary institution, indicates by declining the ratio of loan to deposits collected from their customers that could be due to slower activities in the real sectors. The results of the Malmquist productivity measures show that there is a significant productivity improvement of the merged banks over the observation periods and that is primarily due to the technological growth. It is also found that after the consolidation, merged banks could move their production frontier to the efficient level, specifies by achieving the technical efficiency change index of 1. Furthermore, evidence on the comparative performance of banks before and after merger shows that being merged they can boost operating efficiency by optimally used their production capacity. Findings of this study give us insight on how the merger can create more benefit to the public. For example, bank should increase managerial skill of its officers to increase the bank managerial efficiency. For example, distribute more loans to SMEs customers who had proven their income stability during the crisis periods, which in turn, increasing loan to deposit ratio (LDR). In addition, banks should consider lowering their cost of funds by changing the composition of funds from third parties to acquire more funds from current and saving accounts which apply lowest cost of capital to increase their net profit margin (NIM). Finally, despite of the some success stories of merger, based on findings of this study there is still a question of whether merger action could improve banks ability to accomplish their main task as intermediary institution between depositors and borrowers. Therefore, for the central bank as regulator it is also a question of whether merger is an appropriate tool to increase banks efficiency. However, this is a preliminary finding on the impact of merger on banks’ efficiency and still need more elaboration of what the main problems are.

Keywords
Bank, merger, performance.

References
Will there be an Asean human rights convention?

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Introduction
The development of international human rights law in all region of the world has grown rapidly in the last decades. However, in this rapid growth, it is important to note that human rights cultures are vary in all parts of the world. There are some regions which have advance in human rights cultures. These facts have raised many questions that challenged the norms and values of the recent universal human rights. Many states have not ratified the existing human rights international instruments as the evidence of compliance to the promotion and protection of human rights.

It is important to note that in reality there are human rights instruments which specially made and adopted regionally such as in Europe, America and Africa where as there are many universally adopted human rights instruments. In regards with Asian region, it is important to bear in mind that many countries that have not ratified international human rights instruments. These countries are including all the members of the Association of South East Asian Nations (ASEAN). This article tries to describe and analyse the possibility for ASEAN to have a special human rights convention which can be implemented regionally with some urgency conditions and some factors that need to be considered.

International human rights law & ASEAN
ASEAN member states as part of the international community have also take the prevailing universal human rights law into account of their respective domestic laws. For the purpose of this article, the author has conducted a small research on the status of ratifications of ASEAN member states to international human rights law.

It is clear from the data that there are only two conventions, CEDAW and CRC, where all ASEAN member states are parties. The second place for most of ASEAN member states with six states as parties are CERD, CESCR, CRC-OP-SC and CPPCG. Interestingly to note that ICCPR is ratified by only half of the ASEAN member states. Besides ICCPR, Optional Protocol to the Convention on the Rights of the Child on the Involvement of Children in Armed Conflict is also ratified by half of the member states. It is curious to discuss that this convention is only applies during the armed conflict whereas almost never happened a war between ASEAN member states since its establishment. The rest of the conventions are varying in number of ratification with four, three, two or even only one ratification. In general, the author concludes that most of ASEAN member states are not parties to international human rights law under the auspices of the United Nations with various reasons.

Why should ASEAN human rights convention?
As stated above, the debates over the possibility of ASEAN human rights convention is becoming visible not only in academic but also in practitioners such as government officials of the member states. This spirit needs to be guarded by some information on the urgency of ASEAN for having this kind of special convention on human rights. At least there are two
factors that need to be considered as the reason behind all of this spirit. They are cultural differences or civilisations and the relativity of states’ capability in promoting and protecting human rights.

Cultural differences or civilisations
It is important to note that Huntington rightly appointed to the situation happened at the UN Conference on Human Rights in Vienna in June 1993. At that conference, third world countries had challenged the universality of the prevailing human rights. Huntington argued that these countries in fact could not claim themselves as the third world countries since the Cold War was already over. They might claim as special group of states that represent one special culture (civilization). He said further that the conflict at that conference was dominated by the Islam and Confucian groups that reject the universality of human rights which came from western countries cultures.

The relativity of states’ capability in promoting and protecting human rights
It can be inferred from the data above that ASEAN member states are parties to some international human rights instruments. The fact that they have international obligations as parties to those instruments does not ensure the compliance for them to implement the rules within their national laws. Some of ASEAN member states even in allegation for serious violation of human rights according to those instruments. As repeatedly referred, the difference in cultures might cause the failure in fulfilling their obligations. These failures are alleged by most western states that have high expectation level of promotion and protection in human rights. Whereas the concerning states thought that they have fulfilled their obligation according to their capability.

Some areas of concern to the future ASEAN human rights convention

Human rights values within ASEAN in general
In this regards, ASEAN needs to improve its human rights awareness and develop a human rights culture in a similar level by still considering the conditions of each member states. This effort can be done by all the national governments in socialising human rights “values” by all means of communication especially through formal and informal education channel. This massive efforts need to be conducted consistently without time limitation until it creates an institutionalisation of human rights values in the society of ASEAN member states. Through ASEAN slogan “sharing values” where every member states practices and shares values to each other, it is hoped that there will be a common values which can be uphold as a hierarchy of values within ASEAN community.

Problems with ASEAN charter and its human rights standards
As of October 2008, all the ASEAN member states had ratified the Charter and it will start to be entry into force on 17 December 2008. The striking news about this was the ratification of the Charter by Myanmar, a country which many allegation of human rights violations. Special note for Indonesia, even though Indonesia become the last country in ratifying the Charter, it can be argued that Indonesia should not be in doubt for ratifying the Charter because there is no disadvantage for Indonesia’s national interests. Besides that, the foremost thing is that the ratification to the Charter is the articulation of recognition and acknowledgement of universal human rights values.

Reasonable Call Standard of Human Rights Protection to ASEAN Member States
It is important to bear in mind that the success of human rights promotion and protection is highly depends on the capability of a state in upholding those values and norms. Then, this capability is vary from one state to the other due to different level of political, social and economic development. This situation is very obvious within ASEAN member states. If the first effort to make human rights culture at the same level within ASEAN is failed then one
thing that ASEAN could do is by having reasonable call standards of human rights in its future human rights convention.

**Conclusion**
The promotion and protection of human rights is important matter not only for South East Asian region but also for the whole region in this world. ASEAN, once again, had announced to the world that this organisation is trying to uphold universal human rights values in its region by having efforts in establishing the human rights body which stipulates in ASEAN Charter. Further, the spirit is boosted by the growing concern over the possibility of ASEAN to have its own regional human rights convention. However, this plausible commitment to human rights promotion and protection will remain empty gestures unless they are followed by concrete action in a timely manner and take into account all the concerns from all stakeholders as constructive inputs.

**Keywords**
ASEAN, convention, human rights.

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