Monitoring of formulation and hazardous ingredients of residential insecticide which sold in Palembang

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Abstract. The insect-borne disease is one of health problem. The high mortality and morbidity rates of disease mostly controlled on chemical insecticide. Precaution was needed on selecting the residential insecticides since it can also harm human. This study was to identify the formulation and active ingredients of residential insecticides. This was a descriptive study with an observational design. The sample used was all insecticides sold in location of Palembang Square Mall. Variables observed were the insecticides’ forms, the insect targets, the active ingredients, and the class of toxicity. As conclusion, there were 57 type of insecticides and 14 type of active ingredients found in the location. Most insecticides were from liquid synthetic pyrethroid group, unfortunately categorized in the hazardous class. Further research is necessary to determined whether the insecticide already effects on human health.

1. Introduction
Pesticides that been widely used against insects may have unwanted side-effects, including cancer [1]. Residential pesticide use has been linked to health outcomes in numerous epidemiological studies [2]. Several studies examining the potential association between childhood leukemia [3]. Total pesticide exposure also associated with birth defects such as several congenital heart defects, the gastrointestinal, and genitourinary [4]. The incidence of testicular germ cell tumors has doubled over the last 30 years, thus a role of environmental factors such as insecticide exposure is strongly suspected [5]. Lifetime environmental exposure associated with Parkinson disease [6]. Several studies have suggested that exposure to DDT may be related to changes in thyroid hormone levels in animals and humans [7].

Residential-use pesticides have been shown to be a major source of pesticide exposure to people. However, little is understood about the exposures to household pesticides. One method to help ascertain the amount of pesticides present at home is monitoring of hazardous pesticide from marketing companies such as Palembang Indah Mall [8].

2. Methods
2.1. Study site
The study was carried out in Palembang Indah Mall Sumatra, Indonesia, between July 2014 until January 2015.

2.2. Study design
The design was descriptive study with an observational approach.

2.3. Samples
The samples are all products that can be used to control the insect population sold at study site.

2.4. Data collection and processing
The primary data was carried out by observing the samples, watching the preparations and label’s packaging. Recording the active ingredients, and documenting the insecticide products.

2.5. Data analysis
Data was displayed in form of tables, and explained in narrative. Univariate analysis was to describe each variable.

3. Results and Discussions
Table 1 showed the percentage of insecticide based on forms, which dominantly in liquid.

| Formes | Number | Percentage % |
|--------|--------|--------------|
| Solid  | 1      | 1.75         |
| Liquid | 40     | 70.18        |
| Gas    | 16     | 28.07        |
| Total  | 57     | 100.00       |

Regulatory guidance values (RGVs) are applied worldwide in an effort to limit exposure on human health risk considerations where children encounter contamination by soil ingestion, inhalation, and dermal contact [9]. Hand pesticide loadings were associated to children who exhibited object-to-mouth behaviors [10,11].

Intensive pesticide application during pregnancy is a risk factor for the induction of significant changes in umbilical cord blood form elements and fetal development [12]. Studies have revealed a positive association between residential exposure to pesticides and childhood brain tumors, with gliomas as outcome [13]. A study found that first and second but not third trimester exposure to pesticides was associated with preterm delivery [14]. Exposure during pregnancy may have a negative effect on the child’s mental and motor development and behaviour during the first stages of childhood [15].

Table 2 showed the percentage of insecticide based on target insects, which dominantly targeting mosquitoes.

| Target insects          | N (type) | Percentage % |
|-------------------------|----------|--------------|
| Mosquitoes              | 33       | 57.89        |
| Mosquitoes, flies       | 2        | 3.51         |
| Mosquitoes, flies, cockroaches | 13   | 22.81        |
| Mosquitoes, flies, cockroaches, ants | 8   | 14.03        |
| Cockroaches, ants      | 1        | 1.75         |
| Total                  | 57       | 100.00       |

There was widespread occurrence of urban-use where the presence of pyrethroids was relatively uniform in areas around a house, suggesting long persistence and redistribution [16]. Bendiocarb and
microencapsulated pirimiphos methyl are viable alternatives for indoor residual spraying where resistance to pyrethroids and DDT is high and may assist in the management of pyrethroid resistance [17].

The study near rice fields in Pathum Thani had higher organophosphate (OP) exposure than those reported in children residing in other areas in Thailand [18]. Fruit intake was the main dietary source of exposure to OP pesticides in young urban pregnant women in the Netherlands [19]. Table 3 showed the percentage of insecticide based on active chemical ingredients, which dominantly pyrethroids compound.

**Table 3.** The distribution of insecticide based on active chemical ingredients (N=57)

| Active chemical ingredients | N (type) | Percentage % |
|-----------------------------|----------|--------------|
| Organochlorine              | 0        | 0            |
| Organophosphate             | 0        | 0            |
| Carbamate                   | 0        | 0            |
| Synthetic pyrethroids       | 45       | 78.95        |
| DEET                        | 12       | 21.05        |
| **Total**                   | 57       | 100.00       |

Public health policies should be developed for that purpose, including educational measures to increase the awareness of the population, and particularly of young couples, women of childbearing age or pregnant women about the potential impact of residential pesticide use on children health. Table 4 showed the percentage of insecticide based on toxicity classes, which dominantly dangerous level.

**Table 4.** The distribution of active chemical on toxicity classes (N=57)

| Toxicity classes      | N  | Percentage % |
|-----------------------|----|--------------|
| Extremely dangerous   | 0  | 0            |
| Very dangerous        | 1  | 7.14         |
| Dangerous             | 7  | 50.00        |
| Harmful enough        | 3  | 21.43        |
| Not harmful           | 3  | 21.43        |
| **Total**             | 14 | 100.00       |

4. Conclusion

There were 57 type of insecticides and 14 type of active ingredients found in the marketing mall. Most insecticides were from synthetic pyrethroid group, in liquid form. Unfortunately, the most sold ingredients used were categorized in the hazardous class. Further research is necessary to determined whether the insecticide already effects on human health.

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