SUMMARY

Effect of Toluene Vapor Exposure To the Toluene Blood Level, Superoxide dismutase Enzyme, Liver Function, and Worker Health Complaints at Car Body Repair in Surabaya

Toluene is one type of volatile aromatic hydrocarbons, colorless, commonly used as a solvent paint, a mixture of gasoline, nail polish, and as a solvent in the printing business. Toluene contained in the thinner that is used as a solvent in spray painting business is highly volatile so that it can be inhaled by workers.

This study aim to analyze the effect of toluene vapor exposure to the toluene blood levels and the enzyme superoxide dismutase (SOD), liver function, and health complaints in car painting workers in Surabaya. The benefits of this research is to provide information to workers and owners of car painting workshop on the moisture level of toluene in workplace air car painting, toluene and SOD levels in the blood, liver function, and health complaints in car painting workers in Surabaya. So that, they cay prevent early against the dangers of exposure to toluene in their workplace.

The method of this study was an observational cross-sectional study. The population in this study consisted of two groups, they are the study group and the comparison group. The research group is the whole car painting workers who every day exposed to toluene, amounting to 35 people, while the comparison group are all workers of the administration in a workshop that is not exposed to toluene, amounting to 24 people. Both groups were then selected again in accordance with the study inclusion criteria, that is willing to become respondents, male, minimum working for 5 years, and no history of liver disease before working there. Measurements of air toluene vapor using Gas Chromatography (GC), measuring blood levels of toluene and SOD using ELISA method, measurement of liver function (SGOT and SGPT) using UV kinetic method, whereas the measurement of health complaints using a questionnaire that included questions about liver function disorders, CNS disorders , renal impairment, hearing loss, respiratory disorders, skin disorders, and impaired vision.

The results showed that the levels of toluene vapor in the air space car painting has exceeded the TLV is 51.7574 ppm, while the toluene level of the air space toluene administration of 0.55735 ppm. The average blood levels of toluene exposed group was 0.79 mg/l, while the unexposed group of 0.08 mg/l. The average blood levels of SOD exposed group was 310.36 µ/ml, while the unexposed group 192.84 µ/ml. The average blood levels of SGOT exposed group was 46.15 µ/l, while the unexposed group was 21.37 µ/l. The average levels of SGPT exposed group was 47.62 µ/l, while the unexposed group was 23.31 µ/l. Health problems are most complained exposed group was impaired liver function by 90.9%, while the unexposed group relative didn't have health problems. The results using linear regression analysis showed a significant effect on toluene

vapors exposure to blood toluene levels (β = 0.576; p = 0.000), impaired liver function SGOT (β = 0.530; p = 0.040), SGPT (β = 0.607; p = 0.026) , and SOD (β = 0.929; p = 0.001). Results of logistic regression analysis showed that there were significant effects of exposure to toluene vapors respiratory disorders (β = 2.862; p = 0.019) and there is significant influence blood levels of toluene to impaired liver function (β = 3,113; p = 0.041).

The conclusion of this study is the level of toluene, SOD, SGOT and SGPT increased blood exposed group, while the levels of toluene, SOD enzymes, SGOT, SGPT blood and unexposed groups are normal; health complaints most exposed group is perceived by impaired liver function, while the unexposed group has been without health complaints relative; exposure to toluene vapor the air affect the levels of blood toluene and complaints of respiratory problems in workers car painting; blood toluene levels affect the levels of SOD, liver function (SGOT and SGPT), and liver function impairment complaints in car painting workers.

The suggestion to minimize worker's health problems caused by toluene exposure is the owner of the shop need to restructure the air space garage with adequate ventilation (at least 15% of floor area), monitoring health and indoor air quality work on a regular basis, as well as the procurement and supervision of the use of personal protective equipment (special mask gas / vapor) in the car painting workers. In addition, there should be monitoring toluene vapor in car painting workshop and regular health biomonitoring for the workers.

ABSTRACT

Effect of Toluene Vapor Exposure To the Toluene Blood Level, Superoxide dismutase Enzyme, Liver Function, and Worker Health Complaints at Car Body Repair in Surabaya

Toluene is often used as a solvent in car painting, so toluene vapor can expose the worker through the respiratory tract. Toluene can cause liver dysfunction, lung dysfunction, central nervous system, kidneys, skin, hearing, and vision. This study aim to analyze the effects of toluene vapor exposure on blood toluene levels, liver dysfunction, and enzyme superoxide dismutase (SOD) levels, and health complaints.

The method of this study was analytical observation with cross-sectional study. The population was car painting workers and administrative workers with a randomly selected sample of some 11 people for each group. Sampling of air toluene levels done with NIOSH method 1501 and analyzed by Gas Chromatography-Hydrocarbon Analyzer. SGOT and SGPT enzyme analysis was conducted using kinetic UV Methods. While the measurement of blood levels of toluene and SOD using ELISA method.

The results showed that air toluene levels in car painting room was 51.7574 ppm, while the administrative room was 0.55735 ppm. The results using linear regression analysis showed a significant effect on toluene vapors exposure to the toluene blood levels ($\beta = 0.576$; $p = 0.000$), liver dysfunction SGOT ($\beta = 0.530$; $p = 0.040$), SGPT ($\beta = 0.607$; $p = 0.026$) , and enzyme SOD levels ($\beta = 0.929$; $p = 0.001$). Results of logistic regression analysis showed that there were significant effects of exposure to toluene vapors respiratory disorders ($\beta = 2.862$; $p = 0.019$) and there is significant influence blood levels of toluene to impaired liver function ($\beta = 3{,}113$; $p = 0.041$).

The conclusion of this study was toluena vapor exposure could increase toluene blood levels, SOD enzyme, liver function, and workers health complains at car body repair in Surabaya. The suggestion to minimize worker's health problems caused by toluene exposure, it is necessary to monitor the health of workers and indoor air quality regularly, as well as the use of special gas masks.

Key Words : toluene vapor; blood toluene level; liver function; SOD enzyme