Deteksi toksisitas pajanan toluena terhadap kenaikan nilai malondialdehid dan kenaikan jumlah vakuola lipid miokardium tikus wistar jantan = Toxicity detection of exposure to toluene towards increase in value of malondialdehyde and increase in number of lipid vacuoles on male wistar rat myocardium

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Abstrak

Toluena yang bersifat lipofilik dapat menyebabkan gangguan irama, fibrosis jaringan interstitial serta pembentukan vakuola lipid. Pajanan toluena perinhalasi dapat menyebabkan stress oksidatif pada miokardium melalui pembentukan Reactive Oxygen Species (ROS) yang akan memicu stress oksidatif dengan pembentukan lipid peroksidase sehingga membentuk malondialdehyde (MDA) yang dapat terdeteksi pada miokardium.

Tujuan: mengetahui tingkat pajanan toluena pada dosis rendah di bawah ambang batas yang menyebabkan kenaikan nilai MDA miokardium dan kenaikan jumlah vakuola lipid.

Metoda: Penelitian menggunakan 30 ekor tikus Wistar jantan usia 3 bulan dengan berat badan 150 - 200 gram, dibagi secara acak sederhana menjadi satu kelompok kontrol dan empat kelompok intervensi yang diberikan pajanan toluena 1,6 ml, 3,2 ml, 6,4 ml, 12,8 ml masing-masing terdiri dari 6 ekor tikus. Pajanan diberikan per inhalasi dengan cara menyemprotkan toluena cair ke dalam akuarium, disertai penambahan dosis tiap jam sesuai dengan perhitungan aliran udara dan volume akuarium. Pajanan dilakukan selama 4 jam per hari dalam14 hari berturut-turut. Pada akhir penelitian dianalisa kenaikan nilai MDA miokardium dan jumlah vakuola lipid. Secara mikroskopik vakuola lipid yang mengalami pergeseran inti ke tepi, dihitung dalam 10 lapang pandang.

Analisis data: Uji Oneway ANOVAdigunakan untuk mencari kebermaknaan tingkat pajanan toluena dengan nilai MDA miokardium serta tingkat pajanan toluena dengan jumlah vakuola lipid.

Hasil: Rata-rata tingkat pajanan ada hubungan bermakna secara statistik terhadap nilai MDA miokardium yaitu antara kelompok pajanan 12.8 ml dengan kontrol (p=0.024), kel. 12.8 ml dengan kel. pajanan 6.4 ml (p=0.002) dan kel. 12.8 ml dengan kel. 3.2 ml (p=0.002). Sedangkan rata-rata tingkat pajanan tiap kelompok tidak ada hubungan bermakna terhadap rata-rata jumlah vakuola lipid (p=0.248).

Kesimpulan: Tingkat pajanan toluena dibawah nilai ambang batas menyebabkan kenaikan kadar MDA miokardium pada kelompok pajanan 1,6 ml (12,5 ppm) sampai dengan 6,4 ml (50 ppm). Tidak terdapat kenaikan jumlah vakuola lipid pada tikus Wistar jantan.
<hr><i>Lipophilic nature of toluene can cause rhythm disturbances, interstitial fibrosis problems and disturbances in forming lipid vacuoles. Toluene exposure through inhalation can cause oxidative stress in the myocardium to form Reactive Oxygen Species (ROS) which will trigger oxidative stress with the

formation of lipid peroxide and forming Malondialdehyde (MDA) which can be detected in the myocardium.

Objective: To determine the level of exposure to toluene at low doses below the threshold that causes the increase in value of myocardial MDA and increase in the number of lipid vacuoles.

Method: The study used 30 male Wistar rats aged 3 months weighing 150-200 grams, were divided randomly into a control group and four intervention groups which were given exposure to toluene at 1.6 ml, 3.2 ml, 6.4 ml, 12.8 ml, each consisting of 6 rats. Exposure is done through inhalation by spraying liquid toluene into the tank, along with addition doses per hour according to the calculation of the air flow and the volume of the aquarium. Exposure is done for 4 hours every day in 14 consecutive days. At the end of the study, the increase in myocardial MDA value and number of lipid vacuoles is analyzed. On a microscopic level, lipid vacuoles which experience shiftednucleus to the edge are counted in 10 visual fields.

Data Analysis: Oneway ANOVA is used to find the significance level of toluene exposure with myocardial MDA values and exposure levels of toluene by the number of lipid vacuoles.

Results: The average level of exposure is statistically significant to the myocardium MDA value, which is between 12.8 ml exposure group with the control ($p = 0.024$), 12.8 ml exposure group with 6.4 ml exposure group ($p = 0.002$), and 12.8 ml exposure group with 3.2 ml exposure group ($p = 0.002$). While the average level of exposure for each group has no significant relation to the average number of lipid vacuoles ($p = 0.248$).

Conclusion: The level of toluene exposure below the threshold value causes an increase in myocardial MDA levels in the exposure group of 1.6 ml (12.5 ppm) to 6.4 ml (50 ppm), but the group of 12.8 ml (100 ppm), a decrease in the value of MDA transpires. There was no increase in the number of lipid vacuoles in male Wistar rats.</i>