Deteksi hepatotoksisitas dini pajanan akut toluena pada tikus wistar jantan = Early hepatotoxicity detection of toluene acute exposure on male wistar rat

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Abstrak

Latar Belakang: Pelarut organik, Toluena luas digunakan dalam industri dan dapat menyebabkan gangguan pada berbagai organ termasuk hati. Tujuan dari studi ini untuk meneliti efek pajanan inhalasi akut toluena pada berbagai dosis rendah terhadap hati tikus Wistar jantan.
Metode: Tiga puluh ekor hewan coba dibagi menjadi lima kelompok. Satu kelompok sebagai kelompok kontrol dan empat kelompok diberikan pajanan toluena masing-masing 1,6 cc, 3,2 cc, 6,4 cc, 12,8 cc selama 4 jam/hari selama 14 hari terus menerus. Pada hari ke 14, hewan coba didekapitasi, untuk pemeriksaan Malondialdehid (MDA) Hati, MDA Plasma (metode Will's) dan Histopatologi Hati (pewarnaan Hematoxilin Eosin).
Hasil: Rerata kadar MDA Hati antar kelompok pajanan berbeda bermakna (p=0,009). Perbedaan bermakna terlihat pada kelompok pajanan 6,4 cc dan 12,8 cc dibandingkan dengan kelompok pajanan 1,6 cc dan 3,2 cc. Perbedaan bermakna juga terlihat pada kelompok 6,4 cc dibandingkan dengan kelompok kontrol. Rerata kadar MDA Plasma antar kelompok pajanan tidak berbeda bermakna (p=0,118). Rerata skor gambaran Histopatologi Hati antar kelompok pajanan berbeda bermakna (p<0,001). Perbedaan bermakna terlihat pada kelompok pajanan 3,2 cc, 6,4 cc dan 12,8 cc dibandingkan dengan kelompok kontrol dan kelompok pajanan 1,6 cc. Perbedaan bermakna juga terlihat pada kelompok pajanan 6,4 cc dibandingkan dengan kelompok pajanan 3,2 cc dan pada kelompok pajanan 12,8 cc dibandingkan kelompok pajanan 6,4 cc. Pajanan toluena berkorelasi bermakna positif dengan kadar MDA Hati, kadar MDA Plasma dan gambaran Histopatologi Hati (r=0,415: p=0,025, r=0,416: p=0,025, r=0,719: p<0,001).
Kesimpulan: Pajanan akut toluena dosis rendah pada tikus Wistar jantan menunjukkan kerusakan sel yang ditandai dengan kenaikan kadar MDA Hati, skor gambaran Histopatologi Hati yang bermakna masing-masing mulai pada dosis pajanan 6,4 cc (setara dengan 50 ppm), 3,2 cc (setara dengan 25 ppm) dan menunjukkan korelasi positif kuat antara pajanan toluena dengan skor gambaran Histopatologi Hati.
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Background: An organic solvent, Toluene is widely used in industry and can cause disordes in various organs including the liver. The aim of the study was to investigate the effects of acute inhalation exposure to toluene at various low doses of the male Wistar rat liver.
Methods: Thirty male Wistar rats were divided into five groups. One group as a control group and four groups were exposed to toluene 1.6 cc, 3.2 cc, 6.4 cc, 12.8 cc respectively for 4 hours/day for 14 days continuously. On the 14th day, the animals were decapitated, for examination of Liver Malondialdehyde, Plasma Malondialdehyde (Will's method) and Liver Histopathology (Haematoxylin-eosin staining).
Results: The mean Liver MDA levels between exposure groups were significant differences (p=0,009). The significant differences were observed in the 6,4 cc and 12,8 cc exposured group compared to the 1,6 cc and 3,2 cc exposure group. The significant differences were observed in the 6,4 cc exposure group compared to the control group also. The mean Plasma MDA levels between groups were not significant differences

(p=0.118).. The mean Liver Histopathology feature between groups were significant differences (p<0,001). The significant differences were observed in the 3,2 cc, 6,4 cc and 12,8 cc exposure group compared to the control group and 1,6 cc exposure group. The significant differences were observed in the 6,4 cc exposure group compared to 3,2 cc and in the 12,8 cc exposure group compared to 6,4 cc exposure group also. Toluene exposure was positively significantly correlated with Liver Malondialdehyde level, Plasma Malondialdehyde level and Liver Histopathology feature (r = 0.415: p = 0.025, r = 0.416: p = 0.025, r = 0.719: p <0.001).

Conclusions: Low doses toluene acute exposure in male Wistar rats showed cell damage characterized by increased Liver Malondialdehyde level, Liver Histopathology feature score that statistically significant started at exposure dose of 6.4 cc (equivalent with 50 ppm), 3.2 cc (equivalent with 25 ppm), respectively and showed strong positive correlation between toluene exposure and Liver Histophatology feature score.