Studi deteksi toksisitas pajanan toluena pada saraf optik tikus wistar jantan = Toxicity study of toluene exposure in male wistar rat optic nerve

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Abstrak

Toluena adalah bahan kimia yang banyak digunakan sebagai bahan dasar dan pelarut di bidang industri. Toluena bersifat neurotoksik, dapat menembus sawar darah-akson sehingga dapat menyebabkan gangguan di sistim saraf pusat serta saraf tepi termasuk di saraf optik. Pada penelitian sebelumnya pajanan inhalasi kronis toluena dosis tinggi pada tikus dapat meningkatan kadar malondialdehyde (MDA).
Penelitian eksperimental ini bertujuan untuk mengetahui efek pajanan toluena terhadap saraf optik, dengan pemeriksaan kadar MDA plasma, MDA saraf optik dan histopatologi saraf optik. Tiga puluh tikus wistar jantan dibagi menjadi lima kelompok, yaitu kelompok kontrol, kelompok pajanan toluena 12.5 ppm, 25 ppm, 50 ppm, dan 100 ppm selama 4 jam/hari dalam waktu 2 minggu. Kondisi lingkungan dipertahankan pada suhu berkisar 25oC-32oC dengan kelembaban relatif 30%-70 % Pemeriksaan kadar MDA plasma dan MDA saraf optik dilakukan dengan metode Thiobarbituric Acid Reactive Substances (TBARS). Penilaian histopatologis saraf optik dengan pewarnaan biru toluidin dan mikroskop cahaya.
Dari hasil penelitian ditemukan perbedaan median nilai histopatologi saraf optik ($p<0.001$) yang bermakna antar kelompok. Nilai histopatologi saraf optik mulai menunjukan perbedaan bermakna pada kelompok dengan pajanan toluena 50 ppm. Tidak terdapat perbedaan rerata kadar MDA saraf optik yang bermakna antar kelompok pajanan toluena ($p=0.056$). Pajanan toluena menyebabkan degenerasi akson dan fibrosis pada saraf optik tikus.
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Toluene is a widely used chemical, mostly as basic material and as a solvent in industry. Toluene is neurotoxic, can penetrate the blood-axons barrier that can cause disturbances in the central nervous system and peripheral nerves including the optic nerve. In previous study, chronic inhalation exposure of rats to toluene in high doses can cause elevated levels of malondialdehyde (MDA).
The objective of this experimental study is to determine the effects of toluene exposure in the optic nerve, by examining the levels of plasma MDA, optic nerve MDA and optic nerve histopathology. Thirty male wistar rats were divided into five groups: control group, 12.5 ppm, 25 ppm, 50 ppm, and 100 ppm toluene exposure groups, exposure was 4 hours/day for a period of 2 weeks. The environment (temperature and humidity) was kept in 25oC-32oC and 30%-70%. Measurement of plasma MDA and optic nerve MDA level was conducted by using Thiobarbituric Acid Reactive Substances (TBARS). The optic nerve histopathologic was assessed by using toluidine blue staining and light microscopy.
The result showed there were significant differences in the optic nerve histopathology score ($p<0.001$) between groups. Optic nerve histopathology score began to show significant differences in the group with 50 ppm toluene exposure. No significant differences were found in the mean levels of optic nerve MDA between groups ($p=0.056$). Toluene exposure causes degeneration of axons and fibrosis in the rat optic nerve.