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Protective effects of thymoquinone over the 2,3,7,8-Tetrachlorodibenzo-p-dioxin induced hepatotoxicity

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Statement of the Problem: 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is the most toxic member of halogenated aromatic hydrocarbons. TCDD is able to pass from environment to humans through the food chain by absorption of the gastrointestinal system. TCDD has many biological effects such as carcinogenesis, immune system suppression, neuronal damage, liver damage, developmental defects and fertility problems. TCDD leads to lipid peroxidation resulting in molecular oxygen transport increase which causes formation of reactive oxygen species within the tissue. Thymoquinone (TQ) which is one of the active ingredients in *Nigella sativa* plant was reported to have anti-carcinogen, antitumor, antibacterial, anti-inflammatory, antioxidant and immune system supporter effects.

Aim: The aim of this study is to investigate the protective effects of TQ in liver tissues of rats exposed to TCDD.

Methodology & Theoretical Orientation: Fifty rats were randomly divided to 5 groups (n=10 for each group) as follows: control, corn oil, TCDD (1µg/kg/day), TQ (50 mg/kg/day), TCDD+TQ (1µg/kg/day TCDD and 50 mg/kg/day TQ). Biochemical, histopathological and electron microscopic analyses were performed for liver tissues obtained after the experiment.

Findings: TCDD significantly increased MDA, TOS, ALT, AST and ALP levels and reduced GSH, TAS, SOD and CAT levels ($p \leq 0.05$) when compared to all other groups. In the TCDD+TQ group, MDA, TOS, ALT, AST, ALP levels approached to the control group levels and GSH, TAS, SOD, CAT levels increased and approached to the control group levels and were significantly different from TCDD group ($p \leq 0,05$). In terms of histopathological evaluation, total damage score (TDS) findings demonstrated that TCDD group showed an increase in TDS when compared to all other groups. In contrast, TCDD+TQ group showed a statistically significant decrease in TDS compared to TCDD group ($p \leq 0.05$), Transmission electron microscopic analysis showed that ultrastructural changes seen in TCDD group were diminished in TCDD+TQ group.

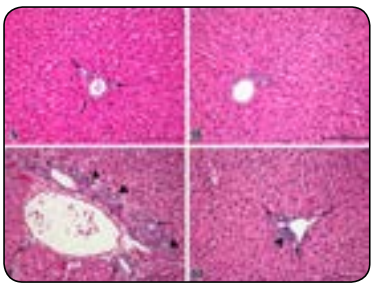

Figure 1. A: Corn oil, B: TQ, C: TCDD, D: TCDD+TQ. Arrows show portal area and arrow heads show inflammatory cell infiltration in periportal area. Hematoxylin-eosin (HE), 20x objective, scale bar: 100 µm.

Recent Publications:

1. Alhebshi A H, Goth M and Suzuki I (2013) Thymoquinone protects cultured rat primary neurons against amyloid β-induced neurotoxicity. Biochem. Biophys. Res. Commun. 433(4):362-367.
2. Galaly S R, Ahmed O M and Mahmoud A M (2014) Thymoquinine and curcumin prevent gentamicin-induced liver injury by attenuating oxidative stress, inflammation and apoptosis. J. Physiol. Pharmacol. 65(6):823-832.
3. Hassoun E A, Li F, Abushaban A and Stohs S J (2000) The relative abilities of TCDD and its congeners to induce oxidative stress in the hepatic and brain tissues of rats after subchronic exposure. Toxicol.145(1-2):103-113.

4. Aylward LL et al. (2005) Concentration-dependent TCDD elimination kinetics in humans: toxicokinetic modeling for moderately to highly exposed adults from Seveso, Italy, and Vienna, Austria, and impact on dose estimates for the NIOSH cohort. Journal of Exposure Analysis and Environmental Epidemiology 15(1):51-65.
5. Jaswal A et al. (2013) Therapeutic potential of thymoquinone against anti-tuberculosis drugs induced liver damage. Environ. Toxicol. Phar. 36(3):779-786.

Biography

Semir Gul is a PhD student in the Department of Histology and Embryology, Faculty of Medicine, Inonu University, Turkey and obtained his Master's Degree from the same university. He graduated from Molecular Biology and Genetics Department in 2010 from Izmir Institute of Technology, Turkey. His research interests are: toxicology, reproductive biology and developmental biology.

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