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## **Acute hepatotoxicity of nano- and micro-sized iron particles in adult albino rats**

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**Introduction:** In recent years, the use of zero-valent iron [Fe<sup>0</sup> (ZVI)] for the treatment of toxic chemicals in waters has received wide attention. Zero-valent iron is a strong reducing agent; it is cheap and easy to produce. It has already been proven effective in reducing chlorinated solvents including chlorinated organic compounds, nitroaromatic compounds, pesticides, nitrate, and metal ions. Mu et al. (2004) studied the reductive degradation of chlorinated organic compounds (COCs) and nitro aromatic compounds (NACs) by synthesized nano-scale ZVI in combination with batch anaerobic treatment systems. They demonstrated that the ZVI could transform the hazardous organic compounds into less harmful or harmless chemicals during in situ treatment of contaminated soils and groundwater. However, they found that compounds with more functional groups were difficult to degrade.

**Objectives:** Because of the increase use of micro and nano iron particles in many different fields, this study is undertaken to address the current knowledge of hepatic response to nano sized particle in comparison to micro sized particle exposure. The study evaluates the acute hepatotoxic effects of metal/metal oxide nano particles in comparison to micro sized particles proposed for future use in industrial and medical production methods.

**Materials & Methods:** Iron particles: Nano scale iron particles, Micro-scale iron particles.

**Animals:** In the study, 90 adult albino rats about 90–120 gm weight were supplied by the Experimental Animal Center, Cairo University. After acclimatizing, the rats were randomly divided into 4 groups:

- a) Group 1 (-ve control group) consists of 15 rats given 1% sodium carboxy methyl cellulose solution.
- b) Group 2 (+ve control group) consists of 15 rats given toluene.
- c) Group 3 (Nano group) consists of 30 rats given nano scale iron suspension in toluene at a dose of 2000 mg/kg.
- d) Group 4 (Micro group) consists of 30 rats micro scale iron suspension in toluene at a dose of 2000 mg/kg.

The dose used in the study was 2000 mg/kg for both micro and nano groups, this dose was conducted following Organization for Economic Cooperation and Development guidelines 420 (OECD, 2001).

**Results & Discussion:** In our study, there were severe symptoms of lethargy and significant growth retardation compared within the nano iron particles treated group in comparison to the micro iron treated groups. There were differences of blood biochemical assay between micro and nano scale iron particles treated groups. According to the literature and our findings, exposure to nano and micro iron particles at high doses may produce toxic effects on the biochemical system and organs like liver. Combined with the results of histopathological examination in this study, a preliminary conclusion could be drawn that the high dose nano iron particles oral exposure could induce more severe liver damage than micro iron particles with the same dose.

**Conclusion:** The present study results showed that the nano iron particles ingestion is more hepatotoxic than micro iron particles ingestion with the same dose.

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