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HISTOPATHOLOGICAL AND CYTOGENETIC EFFECTS OF COPPER OXIDE NANOPARTICLES IN THE MICE AFTER ORAL ADMINISTRATION

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ABSTRACT : The current study was conducted to investigate the histopathological and toxic effects of Copper oxide nanoparticles (CuONPs), which were synthesized by using Q-switched pulsed Nd: YAG laser ablation. CuONPs were synthesized by using Q-switched pulsed Nd: YAG laser ablation of a pure copper sheet submerged in aqueous media, their toxicity was studied on the albino mice *Mus musculus* by oral administration for twenty male albino mice that divided into four groups (5 male per cage). Four different doses of CuONPs (0, 25, 50 and 100) mg\kg were used. The animals were given the CuONPs once a day for one week, while the control group exposed to Distilled Water (DW). The acute toxicity was investigated by Histopathological changes for both liver and kidney of exposed animals beside genotoxic effects by investigation bone marrow cells' mitotic index (MI) and total chromosomal aberration (TCA). From findings the histological analyses refer to real histopath in liver in all doses, hepatocytes rupture, and dilated blood sinusoids in high dose (100) mg/kg accumulation of chronic inflammatory cells were noticed, while kidney tissue suffered from renal capsule damage, enlargement in glomerulus, loses in urinary space associated with cytoplasmic vacuolization. Cytogenetic parameters affected by this treated by a reduction in proliferative bone marrow index and elevation total chromosomal abnormalities. CuONPs not completely safe and has toxicity on internal organs of exposed mice also cytogenetic parameters showed significant cytotoxic effects on bone marrow cells of mice by reduction of Mitotic index (MI), and induced structural chromosomal changes.

Key words : Histopathology, liver, toxicity, Nd: YAG laser, CuONPs, oral exposure.

INTRODUCTION

As a result of the rapid development in the field of nanotechnologies and its use in many applied fields such as industry, biology, drug delivery, agricultural applications, and food additives, besides of its singular physicochemical characteristics and unique functions of these materials (Chen *et al*, 2006; Ogami *et al*, 2009; Abdelhalim and Jarrar, 2012; Aghamirkarimi *et al*, 2017; Atif *et al*, 2018). Occupational exposure to these substances has increased day by day because of their high permeability through biological barriers, depending on their surface characteristics and the rate of surface area to size and its high potential to penetrate the tissues and enter from different paths such as skin, mouth, nose and reproductive system causes severe damage in target organs like kidney, liver, gastrointestinal tract and lungs, besides their effects on immune system and hematological aspects, many toxicity studies were performed to diagnosed their health impacts. Copper nanoparticles are one of the most engineered nanomaterial's that are used in several implementations so, these engineered nanomaterial's released into the environment with increasing human health effects. It is indicated that copper nanoparticles are chemistry (Chen *et al*, 2006; Griffitt *et al*, 2007; Fahmy and Cormier, 2009; Gamboa and Leong, 2013; Magaye *et al*, 2014; Awaad, 2015; Chichiveishvili *et al*, 2019). Recent studies have referred that an increasing concentration of copper can induce many toxicological changes such as, oxidative stress, hepatocirrhosis, changing in the biosynthesis of lipid, gene expression, renal dysfunction, lung inflammations and reduction in the expression of CYP450 hepatic enzymes. Compared with other nanoparticles, copper nanoparticles are the most toxic depends on their shape, size, penetration route and synthesized methods (Marziyeh and Marziyeh, 2014; Khabbazi *et al*, 2015; Lee *et al*, 2016; Kadhim *et al*, 2017; Herbani *et al*, 2018; Huaqiao *et al*, 2018). In the current study, the toxic effects of daily orally administration of various doses (0, 25, 50 and 100 mg/kg) of copper oxide nanoparticles that synthesized by Nd: YAG laser ablation technique were studied in the males of albino Balb-C mice to investigate the histopathological and cytogenetic effects at one week of administration.