

Immunological, histological and immunohistochemical alternations induced by zinc oxide nanoparticles and mureer plant in spleen albino rats with the prospective anti-inflammatory action of gallic acid

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Abstract: The current study was proposed to evaluate the mortal impacts of either alone or mixed treatments of zinc oxide nanoparticles (ZnO NPs) and mureer or *Senecio glaucus* L. plant (SP) on spleen tissue via immunological and histological studies and to estimate the likely immunomodulatory effect of gallic acid (GA) for 30 days in rats. Rats were classified into eight groups with orally treated: Control, GA (100mg/kg), ZnO NPs (150mg/kg), SP (400mg/kg), GA+ZnO NPs (100,150mg/kg), GA+SP (100,400mg/kg), ZnONPs+SP (150,400mg/kg) and GA+ZnONPs+SP (100,150,400mg/kg). Interleukin-6 (IL-6) level was measured using an enzyme-linked immunoassay (ELISA). Also, the pro-apoptotic protein (caspase-3) expression was estimated using an immunohistochemistry assay. Our data revealed that ZnO NPs and SP triggered a significant increase in the levels of IL-6 and total lipids (TL) and the activity of lactate dehydrogenase (LDH), ($p < 0.001$). Furthermore, they overexpressed caspase-3 and caused lymphoid depletion. They revealed that the immunotoxic outcome of mixed treatment was more than the outcome of the alone treatment. However, GA restored the spleen damage from these adverse results. Finally, this study indicated that ZnO NPs and SP might be immunotoxic and splenotoxic agents; however, GA may be displayed as an anti-inflammatory and splenic-protective agent.

Keywords: Zinc oxide nanoparticles, mureerplant, Gallic acid, Spleen, pro-inflammatory cytokine (IL-6), pro-apoptotic protein (caspase-3).

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