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Hepatic and renal impairment and degenerative changes caused by carbon black nanoparticles in mice

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Carbon-based nanoparticles (CBNPs) have shown a notable increase in demand and are progressively encountering human exposure as a result of their extensive utilization across diverse industries and applications making it imperative to conduct comprehensive investigations of their potential impacts on human health. This study represents the inaugural investigation into the toxicity of CBNPs when administered orally (gavage) to mice over 30 days, dosing 5mg/kg, 10mg/kg, and 20mg/kg of the mice's body weight. The study depicted hyperactivity, social withdrawal, rolling behavior, the appearance of yellowish spots on the tail, alopecia, and a darkening of eye pigmentation. ALP and catalase levels decreased, ALT, AST, and glutathione levels increased, indicating liver and kidney physiological changes. High urea and creatinine levels indicated renal physiology disruption, whereas high bilirubin levels indicated hepatic physiology disturbance. Inflammation, necrotic foci, and binucleated cells were seen in kidney and liver tissue. The findings of the study suggested that the adverse effects resulting from exposure to CBNPs can be attributed to their tendency to aggregate, slow clearance rate, and excessive formation of reactive oxygen species (ROS), which in turn impair enzyme activities. Therefore, it may be deduced that exposure to CBNPs may induce a disruption of physiological processes, culminating in the development of severe and perhaps fatal illnesses.

Keywords: Gavage, Histology, Kidney, Liver, Morphology