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In vivo hepatotoxicity of chemically modified nanocellulose in rats

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Abstract

Chemical modification of cellulose is currently attracting attention as researchers attempt to take advantage of the abundance of hydroxyl groups on its surface to introduce extra biological functionality. However, the possible deleterious effect of exposure to functionalized nanocellulose (CSN) remains a concern. Therefore, this study aims to explore the potential mechanisms of hepatotoxicity of CSN modified with oxalate ester (NCD) in rats. A 7-day repeated oral toxicity study of NCD at the doses of 50 and 100 mg kg⁻¹ body weight was conducted, and plasma and liver tissue samples were assayed using biochemical analysis, liver histopathology, and protein expression. NCD, at both doses, did not significantly ($p > 0.05$) alter the relative weight of liver, alkaline phosphatase activity, and lipid peroxidation levels of the animals. However, NCD at the dose of 100 mg kg⁻¹ body weight significantly elevated aspartate aminotransferase, alanine aminotransferase, and myeloperoxidase activities. NCD also enhanced the immunohistochemical expression of inducible nitric oxide synthase and Bcl-2-associated X protein in the liver of rats. Histological observations revealed necrosis and severe cellular infiltration at the high-dose treatment. Our study provides an experimental basis for the safe application of NCDs.

Keywords: Immunohistochemistry; liver; nanocellulose oxalate ester; rats; toxicity testing.