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## Effect of thymoquinone on micronucleus frequency and proinflammatory cytokine secretion in rat liver on high-fat cholesterol diet

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This study investigates the effects of thymoquinone on micronucleus frequency and proinflammatory cytokine secretion in the livers of rats fed high-fat diet with cholesterol. Thirty-two male *Sprague-Dawley* rats were divided into four groups: control, high-fat diet with cholesterol (CHFD), high-fat diet with cholesterol+thymoquinone (CHFD+T), and thymoquinone (TQ). Histopathological examination revealed hepatocyte vacuolization in the CHFD group. In the CHFD+T group, both hepatocyte vacuolization and mild portal fibrosis were observed, whereas the TQ group exhibited only sinusoidal dilatation. Immunohistochemical analysis showed severe immunoreactivity for IL-6, IL-1 $\beta$ , and TNF- $\alpha$  in the control group, while no such immunoreactivity was detected in the CHFD group. Additionally, in the thymoquinone-treated group, IL-6 and TNF- $\alpha$  displayed moderate immunoreactivity, whereas IL-1 $\beta$  was not observed. In terms of genotoxicity, the CHFD was found to increase the number of micronucleated polychromatic erythrocytes (MNPCEs). However, thymoquinone treatment significantly reduced these elevated levels of MNPCEs. Furthermore, the ratio of polychromatic to normochromic erythrocytes (PCE/NCE), which was lowest in the CHFD group, increased following thymoquinone administration. These results suggest that, with appropriate timing and dosage, thymoquinone may be effective in mitigating liver and genotoxic damage induced by a high-fat diet with cholesterol.

**Keywords:** Cholesterol, High fat diet, Thymoquinone, Micronucleus, Liver