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Study of Superoxide Dismutase and Catalase Activity in a Rat Model of
Liver Pathology Induced by High-Fat Diet and Streptozotocin

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Annotation

Metabolic Dysfunction-Associated Fatty Liver Disease (MAFLD) is a complex, progressive condition that affects 38% of the population, despite its reversibility in early stages, effective therapeutic options remain limited. Based on the accumulated knowledge about the role of oxidative stress in general pathogenesis, the therapeutic potential of polyphenolic compounds with antioxidant properties has been discussed.

We aimed to study the effects of exogenous, natural polyphenolic compounds on the activity of certain antioxidant enzymes in a rat experimental model. We divided the animals into four groups: K1 (control), K2 (pathological), P (pathological with polyphenolic fraction treatment), and Q (pathological with quercetin treatment) and used a combination of a high-fat diet and injections of two doses (30 mg/kg) of streptozotocin to obtain experimental model of pathology. Polyphenols were administered to the relevant experimental groups for 10 days.

We observed an increase in superoxide dismutase (SOD) activity in the pathological (K2) group ($\alpha = 0.001$, $p \leq \alpha$, Fig. 1) compared to the control group (K1), due to the increased oxidative stress caused by fat accumulation. Interestingly, both SOD ($\alpha = 0.001$, $p \leq \alpha$, Fig. 1) and catalase ($\alpha = 0.05$, $p \leq \alpha$, Fig. 2) activity decreased in the polyphenol-treated groups (P, Q) compared to the pathological group (K2). This finding suggests a potential corrective effect of the administered compounds, possibly due to their direct antioxidant action. However, other mechanisms might also be involved and warrant further investigation.

In conclusion, our study provides preliminary evidence for the potential benefit of polyphenols in reducing oxidative stress in a rat model of MAFLD. Future research is needed to explore the efficacy of these compounds in higher organisms and optimize their formulation for therapeutic use.

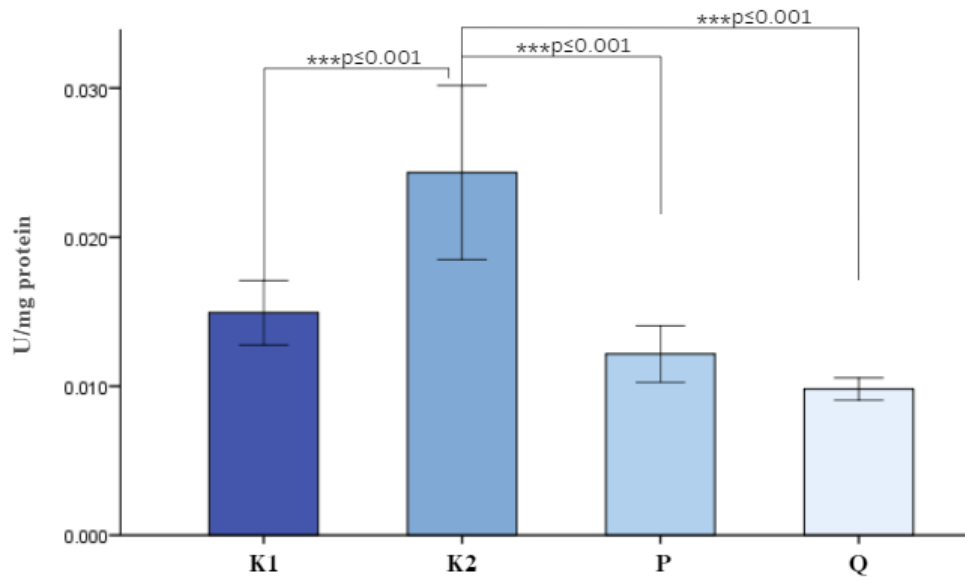


Fig. 1 – Superoxide Dismutase (SOD) Activity in Rat Liver (MEAN±2SEM).

(K1) – control group;

(K2) – pathological group;

(P) – pathological group with polyphenolic fraction treatment;

(Q) - pathological group with quercetin treatment.

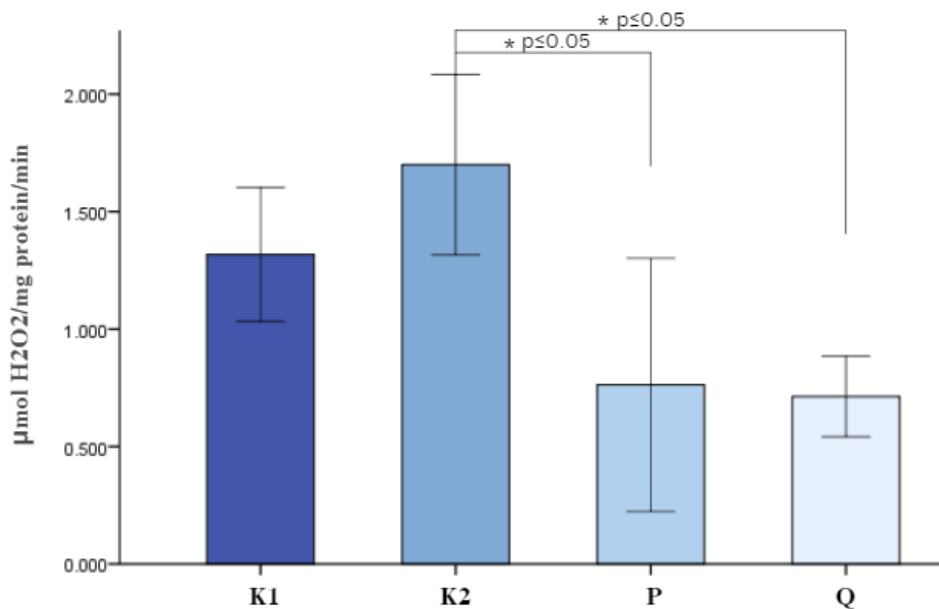


Fig. 2 – Catalase Activity in Rat Liver (MEAN±2SEM).

(K1) – control group;

(K2) – pathological group;

(P) – pathological group with polyphenolic fraction treatment;

(Q) - pathological group with quercetin treatment.