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Correlation Between Kidney Superoxide Dismutase (SOD) and Plasma Malondialdehyde (MDA) Levels in Rats Induced by a High-Purine Diet After Regular and Decaffeinated Coffee Intervention

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Objectives : Hyperuricemia-related oxidative stress affects both renal tissue and systemic circulation, characterized by reduced renal superoxide dismutase (SOD) and elevated plasma malondialdehyde (MDA). This study evaluated the correlation between these biomarkers in high-purine diet-induced rats after coffee intervention.

Methods : An experimental study was conducted using 24 male Wistar rats aged 1–2 months (100–150 g). The rats were randomly divided into four groups: normal (N), control (C), treatment 1 (T1), and treatment 2 (T2). All animals were fed ad libitum for one month. The control group received a high-purine diet consisting of beef broth (700 mg/kg BW/day). Treatment group 1 received a high-purine diet plus regular coffee (144 mg/200 g BW/day), while treatment group 2 received a high-purine diet plus decaffeinated coffee (144 mg/200 g BW/day). The normal group received standard feeding only. At the end of the experiment, kidney SOD activity and plasma MDA levels were measured. Statistical analysis was performed using ANOVA followed by Bonferroni post hoc testing, and Pearson correlation analysis was used to assess the relationship between renal SOD and plasma MDA levels.

Results : Mean kidney SOD levels (%) in groups N, C, T1, and T2 were 70.22 ± 2.41 , 23.50 ± 4.60 , 43.99 ± 5.43 , and 59.84 ± 3.98 , respectively. Mean plasma MDA levels (mg/dL) were 1.20 ± 0.22 , 9.80 ± 0.29 , 5.80 ± 0.55 , and 3.88 ± 0.47 , respectively. A very strong negative correlation was observed between renal SOD activity and plasma MDA levels ($r = -0.949$, $p < 0.001$).

Conclusions : Renal SOD activity is strongly and inversely correlated with plasma MDA levels in rats with high-purine diet-induced hyperuricemia following coffee intervention. These findings suggest that oxidative stress plays a key role in hyperuricemia-associated renal injury and may be modulated by coffee-derived bioactive compounds.