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Effects of prebiotic oligofructose-enriched inulin on gut-derived uremic toxins and disease progression in rats with adenine-induced chronic kidney disease

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Abstract

Recent studies suggest that dysbiosis in chronic kidney disease (CKD) increases gut-derived uremic toxins (GDUT) generation, leads to systemic inflammation, reactive oxygen species generation, and poor prognosis. This study aimed to investigate the effect of oligofructose-enriched inulin supplementation on GDUT levels, inflammatory and antioxidant parameters, renal damage, and intestinal barrier function in adenine-induced CKD rats. Male Sprague-Dawley rats were divided into control group (CTL, n = 12) fed with standard diet; and CKD group (n = 16) given adenine (200 mg/kg/day) by oral gavage for 3-weeks to induce CKD. At the 4th week, CKD rats were subdivided into prebiotic supplementation (5g/kg/day) for four consecutive weeks (CKD-Pre, n = 8). Also, the control group was subdivided into two subgroups; prebiotic supplemented (CTL-Pre, n = 6) and non-supplemented group (CTL, n = 6). Results showed that prebiotic oligofructose-enriched inulin supplementation did not significantly reduce serum indoxyl sulfate (IS) but did significantly reduce serum p-Cresyl sulfate (PCS) (p = 0.002) in CKD rats. Prebiotic supplementation also reduced serum urea (p = 0.008) and interleukin (IL)-6 levels (p = 0.001), ameliorated renal injury, and enhanced antioxidant enzyme activity of glutathione peroxidase (GPx) (p = 0.002) and superoxide dismutase (SOD) (p = 0.001) in renal tissues of CKD rats. No significant changes were observed in colonic epithelial tight junction proteins claudin-1 and occludin in the CKD-Pre group. In adenine-induced CKD rats, oligofructose-enriched inulin supplementation resulted in a reduction in serum urea and PCS levels, enhancement of the antioxidant activity in the renal tissues, and retardation of the disease progression.

Figures

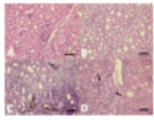


Fig 1. Histological kidney sections stained with...

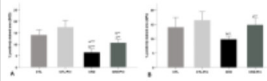


Fig 2. Bars represent the quantitative analysis...

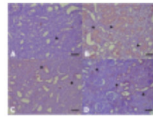


Fig 3. Immunopositive staining of SOD; (A)...

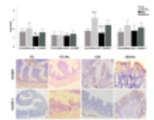


Fig 4. Immunoperoxidase expression of occludin

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