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Omega-3 fatty acid mitigates mitochondrial dysfunction and modifies renal myostatin expression in adenine-induced uremic rats

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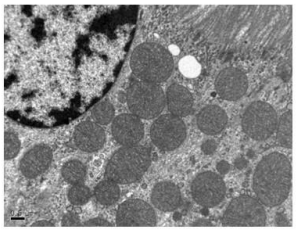
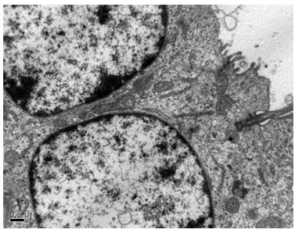
Objectives : Mitochondrial dysfunction and inflammation play a central role in the progression of chronic kidney disease. Myostatin may be related to inflammation but renal myostatin expression is not clear. We aimed to investigate whether omega-3 fatty acids (FA) regulate mitochondrial dysfunction in adenine-induced uremic rats. We also tried to elucidate whether omega-3 FA on renal myostatin expression and renal mitochondrial morphology.
Methods : Male Sprague-Dawley rats were fed diets containing 0.75% adenine and 2.5% protein for three weeks. Rats were randomly divided into four groups that were fed diets containing 2.5% protein and saline with cholecalciferol (3000 IU/kg/week) or omega-3 FA (300 mg/kg/day) with cholecalciferol by gastric gavage for two weeks: normal control, adenine control sacrificed at 3weeks, adenine control sacrificed at 5weeks, omega-3 FA group sacrificed at 5weeks. The renal expression of myostatin and mitochondrial mediators was examined by western blot analysis. Renal mitochondrial morphology was evaluated using transmission electron microscopy.
Results : Compared to normal, serum creatinine in adenine control was increased and improved in the omega-3 FA group. Compared with normal, PGC-1α, SIRT1/3, and Nrf2 were down-regulated in adenine control. DRP-1 was up-regulated in adenine control and recovered with omega-3 FA supplementation for 2 weeks. PINK1, BNIP3, and NIX were down-regulated in adenine control and recovered in the omega-3 FA group. Compared to normal, renal myostatin expression was continuously downregulated at 3 weeks and 5 weeks and recovered with omega-3 FA. The size and number of tubular mitochondria were decreased at 5 weeks and mitigated with omega-3 FA supplementation for 2 weeks.
Conclusions : Omega-3 FA is beneficial for mitochondrial dysfunction and morphology in uremic rats. Further studies are necessary to find the pathogenic mechanism for decreased renal myostatin expression in uremia.

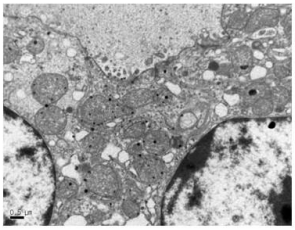
tubule EM.jpg



Normal control



Adenin control group



Omega-3 supplemented group