Histological and Molecular Study of N-acetyl Cysteine's Effects on Salivary Glands in Fructose-Induced Metabolic Syndrome in Albino Rats

ABSTRACT:

Introduction: A diet high in fructose can result in metabolic syndrome (MetS). MetS is caused by a combination of hereditary and acquired variables that induce oxidative stress, cellular malfunction, and systemic inflammation. N-acetylcysteine (NAC) is the gold standard for treating paracetamol toxicity . Additionally, NAC became the ideal of a "antioxidant" throughout time. The majority of researchers use and evaluate NAC with the hope of preventing or alleviating oxidative stress.

Aim of the Work: To evaluate the possible ameliorating effects of NAC on the salivary glands of fructose-induced MetS in rats.

Materials and Methods: Forty male albino rats, 10–12 weeks old, were randomly divided into five equal groups. Group I (negative control) received tap water for 12 weeks. Group II (positive control) received 60%w/w fructose syrup instead of tap water for 12 weeks. Group III (NAC) received tap water and (IP) injection of NAC (150 mg/kg/day) for 12 weeks. Group IV (protection) took 60%FS by mouth along with an NAC injection (150 mg/kg/day) for 12 weeks. Group V (treatment) received 60%FS for 8 weeks, followed by 4 weeks of drinking tap water with NAC IP injection (150 mg/kg /day). Rats were euthanized at the end of the 12 weeks. Salivary glands were dissected and examined histologically and for mitochondrial DNA copy number (mtDNA-CN).

Results: Histologically, group II exhibited eosinophilia, atrophy and necrosis. Group III displayed a normal architectural picture. In group IV, there was a normal architectural picture with mild epithelial degeneration. In group V, most tubules returned to their glandular appearance, but there was still eosinophilia and some degeneration and necrosis. Molecularly, in group II, there was a significant decline in mtDNA-CN. Group III showed the highest mtDNA-CN among all groups. In group IV, a significant increase in mtDNA-CN was observed, but less than in group III. Group V also showed a significant increase, but less than group IV.

Conclusion: High fructose diets induce MetS and are proven to harm the salivary glands. NAC, on the other hand, has been shown to alleviate MetS and protect and cure salivary glands from MetS's deleterious effects in a time-dependent manner.