Influence of umbelliferone on membrane-bound ATPases in streptozotocin-induced diabetic rats

Balakrishnan Ramesh, Kodukkur V. Pugalendi

Department of Biochemistry, Faculty of Science, Annamalai University, Annamalainagar - 608 002, Tamilnadu, India

Correspondence: Kodukkur V. Pugalendi, e-mail: drpugalendianarchanet.in

Abstract:
The activities of membrane-bound ATPases are altered both in erythrocytes and tissues of streptozotocin (STZ)-induced diabetic rats and diabetic patients. Umbelliferone (UMB), a natural antioxidant, is a benzopyrone occurring in nature, and it is present in the fruits of golden apple (Aegle marmelos Correa) and bitter orange (Citrus aurantium). Earlier we evaluated and reported the effect of UMB on plasma insulin and glucose, and this study was designed to evaluate the effect of umbelliferone on membrane-bound ATPases in erythrocytes and tissues (liver, kidney and heart) of STZ-induced diabetic rats. Adult male albino rats of Wistar strain, weighing 180–200 g, were made diabetic by an intraperitonial administration of STZ (40 mg/kg). Normal and diabetic rats were treated with UMB dissolved in 10% dimethyl sulfoxide (DMSO) and diabetic rats were also treated with glibenclamide as drug control, for 45 days. In our study, diabetic rats had increased level of blood glucose and lipid peroxidation markers, and decreased level of plasma insulin and decreased activities of total ATPases, (Na"+K")-ATPase, low affinity Ca"²"-ATPase and Mg"²"-ATPase in erythrocytes and tissues. Restoration of plasma insulin and glucose by UMB and glibenclamide seemed to have reversed insulin, glucose and lipid peroxidation markers, and diabetes-induced alterations in the activities of membrane-bound ATPases. Thus, our results show that the normalization of membrane-bound ATPases in various tissues, is due to improved glycemic control and antioxidant activity by UMB.

Key words:
diabetes, streptozotocin, umbelliferone, membrane-bound ATPases