Fructose intake impairs baroreflex sensitivity in the early stage of fructose-induced hypertension through central nervous system regulation in rats

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ABSTRACT

National Health and Nutrition Examination Survey (NHANES) data show that an increased intake of sugar, especially the fructose intake, increases the risk of cardiovascular disease mortality. Sympathetic overactivation and baroreflex sensitivity are important factors in the cardiovascular disease. Fructose intake associated with ROS production lead to disruption of NO bioavailability in hypertension. However, the mechanism involved in hypertension development due to increased fructose intake is still uncertain. The aim of this study was to investigate the blood pressure and the mechanisms involved in excessive fructose intake using fructose-fed rats at the early stage. The rats were fed with 10 percent fructose water, leading to increased fructose and glucose levels in central and peripheral nervous system. We first demonstrated that increased fructose intake led to the up-regulation of fructose concentrations in the cerebrospinal fluid, and observed the up-regulation of blood pressure in the early stage of the fructose-fed rats. Consumption of excess fructose also increased triglycerides in the serum; however, inhibiting the production of triglycerides did not attenuate sympathetic nerve hyperactivity, but led to insignificant lowered blood pressure. Most importantly, our data showed that increased fructose intake down-regulated nitric oxide in nucleus tractus solitarii and caused impairment of the baroreflex sensitivity within a week. This study suggests that excessive fructose consumption up-regulates blood pressure through the central nervous system.

Keywords:

Fructose, baroreflex sensitivity, nucleus tractus solitarii, sympathetic nerve activity, blood pressure, nitric oxide

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