Potential Anti-Obesity Effects of Mirtazapine on Hepatic Energy Metabolism in Streptozotocin-Induced Diabetic Rats

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Abstract

Objective(s): The aim of this study was to explore the potential anti-obesity effect of mirtazapine on energy metabolism in the liver of rats by immunohistochemistry and Western blot analysis.

Materials and Methods: Twenty-one male Sprague-Dawley rats were assigned into 3 groups including control, type 1 diabetes mellitus (T1DM) group (55 mg/kg Streptozotocin, IP) and T1DM+mirtazapine (20 mg/kg, PO) group. At the end of the experiment, blood glucose levels were measured and liver tissues were stained by Periodic acid–Schiff. Moreover, leptin and glucose transporter 2 (GLUT2) proteins were analyzed by Western blot and immunohistochemistry; however, galanin was analyzed only by immunohistochemistry.

Results: At the end of the study, in the T1DM group, blood glucose level, GLUT2, and galanin expressions increased, while leptin expression decreased when compared to the control group. Mirtazapine treatment restored the decreased leptin expression and reduced the elevated blood glucose level and galanin expression toward control values. It also decreased GLUT2 expression even below the control group level. These findings indicate that mirtazapine may regulate metabolic pathways associated with adiposity and energy homeostasis.

Conclusion: We concluded that mirtazapine may exert anti-obesity-related metabolic effects by decreasing GLUT2 expression through modulation of leptin and galanin signaling in the liver of diabetic rats. Mirtazapine may contribute to the regulation of glucose metabolism and energy balance and could be considered a promising therapeutic agent for obesity-associated metabolic disturbances.

Keywords

Mirtazapine, Liver, GLUT2, Leptin, Galanin, Type 1 diabetes mellitus, Obesity.