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Aspalathin improves hyperglycemia and glucose intolerance in obese diabetic *ob*/*ob* mice

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Abstract

Purpose

Although several researches have demonstrated that rooibos extract has hypoglycemic effect, the role of aspalathin, a main polyphenol in the extract, remains unclear. Our aims were to find specific mechanisms for anti-diabetic action of aspalathin employing a rat skeletal muscle-derived cell line (L6 myocytes) and a rat-derived pancreatic β-cell line (RIN-5F cells) and to investigate its effect in type 2 diabetic model *ob*/*ob* mice.

Methods

We investigated in vitro the effect of aspalathin on the glucose metabolism through the studies on molecular mechanisms of glucose uptake using cultured L6 myotubes. We also measured the antioxidative ability of aspalathin against reactive oxygen species (ROS) generated by artificial advanced glycation end product (AGE) in RIN-5F cells. In vivo, *ob*/*ob* mice were fed 0.1 % aspalathin-containing diet for 5 weeks, and the effect of aspalathin on fasting blood glucose level, glucose intolerance, and hepatic gene expression was studied.

Results

Aspalathin dose dependently increased glucose uptake by L6 myotubes and promoted AMP-activated protein kinase (AMPK) phosphorylation. Aspalathin enhanced GLUT4 translocation to plasma membrane in L6 myoblasts and myotubes. In RIN-5F cells, aspalathin suppressed AGE-induced rises in ROS. In vivo, aspalathin significantly suppressed the increase in fasting blood glucose levels and improved glucose intolerance. Furthermore, aspalathin decreased expression of hepatic genes related to gluconeogenesis and lipogenesis.

Conclusions

Hypoglycemic effect of aspalathin is related to increased GLUT4 translocation to plasma membrane via AMPK activation. In addition, aspalathin reduces the gene expression of hepatic enzymes related to glucose production and lipogenesis. These results strongly suggest that aspalathin has anti-diabetic potential.

Keywords

Aspalathin AMPK GLUT4 translocation Hyperglycemia Advanced glycation end products (AGEs)

Electronic supplementary material

The online version of this article (doi: 10.1007/s00394-012-0466-6) contains supplementary material, which is available to authorized users.