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Anti-diabetic and anti-obesity effects of natural flavonoids

It is well known that flavonoids possess various health beneficial effects such as prevention of carcinogenicity, cardiovascular diseases, obesity and diabetes mellitus. Here, we show a new aspect of prevention mechanism of diabetes mellitus by natural flavonoids. GLUT4, AMPK, and GLP-1 are key molecules for prevention of hyperglycemia and maintain glucose homeostasis. We found epigallocatechin 3-gallate (EGCg) promotes GLUT4 translocation on the plasma membrane of muscle cells and stimulates glucose uptake into the cells through PI3K- and AMPK-dependent signaling pathway. Moreover, drinking of green and black tea improves hyperglycemia and glucose intolerance through stimulating glucose uptake accompanied by GLUT4 translocation in skeletal muscle of mice fed a high-fat diet. Cacao polyphenols consisting of epicatechin and procyanidins also improves hyperglycemia and glucose intolerance through GLUT4 translocation in muscle cells *in vivo* and *in vitro*. The activation of AMPK in muscle and increase in GLP-1 secretion from intestine are involved in the underlying mechanisms. AMPK is also key molecule for prevention of obesity. The activation of AMPK is involved in the suppression of adiposity through modulating lipid metabolism and energy expenditure, resulting in the prevention of insulin intolerance. Prenylated chalcones, 4-hydroxyderricin and xanthoangelol from *Ashitaba*, are other effective compounds. They also promote glucose uptake accompanied by GLUT4 translocation in muscle cells. Moreover, these compounds suppress adipocyte differentiation and modulate lipid metabolism through AMPK-dependent action. These results indicate that certain flavonoids are able to prevent diabetes mellitus and obesity.

Biography

Hitoshi Ashida is a Professor of Department of Agrobioscience, Graduate School of Agricultural Science, Kobe University, Japan. His major is Food and Nutritional Chemistry. He is also interested in Food Chemical Toxicology. He has over 200 original research papers in peer-reviewed journals; 18 invited reviews; and 28 book chapters. He is a Fellow of Royal Society of Chemistry and currently serving on the Editorial Board of *Food & Function* and *PLOS ONE*.

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