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Phytochemicals produced by fermenting Korean foods, prevent and alleviate metabolic diseases by modulating the insulin signaling pathway

Metabolic diseases such as diabetes, hypertension, dyslipidemia, obesity, stroke, retinopathy, myocardial infarction and neurodegeneration are inter-related with increased insulin resistance by attenuated insulin signaling in different tissues. Type 2 diabetes occurs when β -cell dysfunction develops simultaneously and as a consequence of insulin resistance increasing in the liver and skeletal muscles. Since Asians have lower insulin secretion capacity and β -cell mass, their susceptibility to develop type 2 diabetes is higher than in Caucasians. There is some evidence that hepatic insulin resistance is connected to brain insulin resistance, especially, in the hypothalamus. In addition, β -amyloid accumulation in the hippocampus results in cognitive dysfunction and exacerbates hepatic insulin resistance and glucose metabolism. Traditional Korean dietary and lifestyle patterns have contributed to a low incidence of insulin resistance and diabetes in the past. However, the westernization of the modern Korean lifestyle has increased the incidence of insulin resistance that cannot be compensated for by increased insulin output due to low β -cell function. Korean fermented foods have enhanced bioactivities over the original foods. For example, soybeans contain various phytoestrogens that improve energy, glucose and bone metabolism. However, their bioavailability is low. Fermentation changes the structure of phytoestrogens to form isoflavonoid aglycones, DDMP soyasaponin β , E soyasaponin Be and lysophosphatidylcholines. These fermentation products are absorbed better in the gut and exhibit enhanced functionality for metabolism. Bioactivities of fermented foods are modified by the major microorganisms that ferment them. Soybeans are traditionally fermented with *Bacillus licheniformis* (chungkookjang) and *Aspergillus oryzae* (meju), without added salt, improve insulin sensitivity and insulinotropic actions better than unfermented soybeans in non-obese type 2 diabetic rats fed high fat diets. This improvement is associated with potentiating insulin signaling in the liver and pancreatic islets. Chungkookjang made with *Bacillus licheniformis* decreases the accumulation of β -amyloid deposits in rats with β -amyloid (25-35) infusion into the CA1 region. Therefore, traditional Korean fermentation of soybean foods improves their bioactivities for alleviating metabolic diseases, especially type 2 diabetes and Alzheimer's disease.

Biography

Sunmin Park is a Full Professor of Nutrition at the Korean Academy of Science and Technology. She has expertise in the study of diabetes with an emphasis on the etiology of Asian Type 2 Diabetes. Type 2 diabetes involves various organs of the body, and much of her recent research has focused on the modulation of insulin signaling in the brain and liver. Recent studies have shown that the gut microbiome also plays an important role in various diseases, including diabetes. However, the mechanism of gut microbiota changes by diets and disease status remains elusive, so she is interested in studying the interactive effects of disease states, diet, and gut microbiota.

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