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REVIEW ARTICLE

Cinnamon: Potential Role in the Prevention of Insulin Resistance, Metabolic Syndrome, and Type 2 Diabetes

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Abstract

Metabolic syndrome is associated with insulin resistance, elevated glucose and lipids, inflammation, decreased antioxidant activity, increased weight gain, and increased glycation of proteins. Cinnamon has been shown to improve all of these variables in *in vitro*, animal, and/or human studies. In addition, cinnamon has been shown to alleviate factors associated with Alzheimer's disease by blocking and reversing tau formation *in vitro* and in ischemic stroke by blocking cell swelling. *In vitro* studies also show that components of cinnamon control angiogenesis associated with the proliferation of cancer cells. Human studies involving control subjects and subjects with metabolic syndrome, type 2 diabetes mellitus, and polycystic ovary syndrome all show beneficial effects of whole cinnamon and/or aqueous extracts of cinnamon on glucose, insulin, insulin sensitivity, lipids, antioxidant status, blood pressure, lean body mass, and gastric emptying. However, not all studies have shown positive effects of cinnamon, and type and amount of cinnamon, as well as the type of subjects and drugs subjects are taking, are likely to affect the response to cinnamon. In summary, components of cinnamon may be important in the alleviation and prevention of the signs and symptoms of metabolic syndrome, type 2 diabetes, and cardiovascular and related diseases.

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Abbreviations: (apoB48) apolipoprotein B48, (AD) Alzheimer's disease, (CD36) cluster of differentiation 36, (CE) cinnamon extract, (FRAP) ferric-reducing antioxidant power, (GLP-1) glucagon-like peptide-1, (HFD) high fructose diet, (IL) interleukin, (IR) insulin receptor, (IRS1) IR substrate-1, (MDA) malondyaldehyde, (MTP) microsomal triglyceride transfer protein, (MW) molecular weight, (NO) nitric oxide, (PCOS) polycystic ovary syndrome, (PI3K) phosphoinositide 3-kinase, (RBP4) retinol-binding protein 4, (SREBP) sterol regulatory element-binding protein, (T2DM) type 2 diabetes mellitus, (TNF) tumor necrosis factor, (VEGF) vascular endothelial growth factor, (VEGFR) VEGF receptor

Keywords: cardiovascular diseases, cinnamon, diabetes, insulin sensitivity, metabolic syndrome

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