Investigation of molecular mechanism of glucose-lowering activity of *Aquilaria crassna* L. leave extract in HepG2 cells

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Abstract

Type 2 diabetes mellitus is a chronic metabolic syndrome characterized by hyperglycemia which can further develop microvascular and macrovascular complications. *Aquilaria crassna* L. was reported as a traditional Thai medicinal plant that possesses an anti-diabetic effect in animal model. The present study revealed the mechanism by which this plant extract lowered glucose levels in cultured hepatocellular cell line, HepG2. ALE at a concentration of 6.25, 12.5 and 25 µg/mL significantly increased glucose consumption in a dose-dependent manner. The increase of glucose consumption of ALE-treated HepG2 cells was accompanied by 2-fold increase of the glycogen synthase 2 (GYS-2) mRNA expression and 50% suppressing of glucose-6-phosphatase expression. These data indicate that the anti-diabetic effect of ALE on HepG2 cells is mediated through the increased of glycogen synthesis and the decrease of gluconeogenesis. Gas-chromatography and mass spectrometry (GC-MS) analysis of the ethanolic extract of ALE consisted of nitrogen containing compounds (39%), terpenoids (31%), polyketide (18%), and phenylpropanoids (12%). Investigation of glucose-lowering effect of these compounds is currently underway.

Image

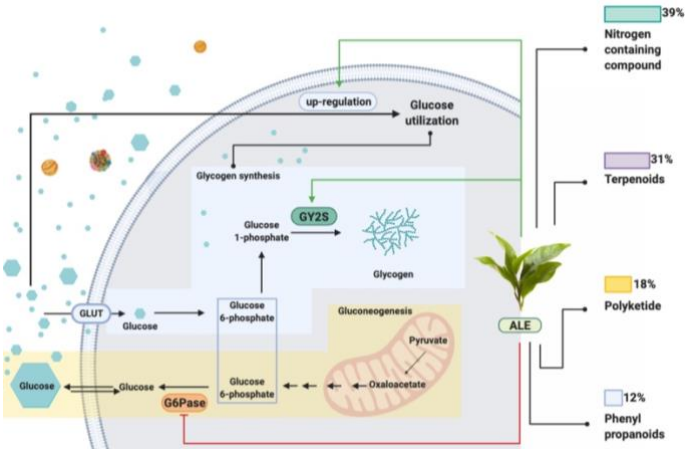


Figure 1: Mechanism of glucose-lowering effect of *A. crassna* leaves extract (ALE) in HepG2 cells, (↑; Increase, ⊥; Decrease).

Related Publications

1. American Diabetes, Association (2009) Diagnosis and classification of diabetes mellitus. Diabetes Care 32 Suppl 1: S62-7.
2. Andrikopoulos S, Proietto J (1995) 'The biochemical basis of increased hepatic glucose production in a mouse model of type 2 (non-insulin-dependent) diabetes mellitus. Diabetologia 38: 1389-1396.
3. Edghill EL, Bingham C, Slingerland AS, Minton JA, Noordam C, Ellard S, Hattersley AT (2006) Hepatocyte nuclear factor-1 beta mutations cause neonatal diabetes and intrauterine growth retardation: support for a critical role of HNF-1beta in human pancreatic development. Diabetic Medicine 23: 1301-6.
4. Manoka S, Sungthong B, Sato H, Sugiyama E, and Sato VH (2016) Hypoglycemic and Antioxidant Activities of the Water Extract of Aquilaria crassna Leaves in Streptozotocin-Nicotinamide-Induced Type-2 Diabetic Mice. Natural Product Communications 11: 757-61.
5. Sattayasai J, Bantadkit J, Aromdee C, Lattmann E, Airarat W (2012) Antipyretic, analgesic and anti-oxidative activities of Aquilaria crassna leaves extract in rodents. Journal of Ayurveda and Integrative Medicine 3: 175-9.

Photograph



Biography

Phanupol Mongkolsiri is a graduate student in the Biochemistry Program at Mahidol University where he investigates biolochemical activities of natural products which may be used as anti-diabetic drugs. He completed his B.Sc. in Chemistry from Mahasarakham University.

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Notes/Comments