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Barley sprout containing hexacosanol and saponarin ameliorates hypercholesterolemia and hyperglycemia in HepG2 and obese mice by modulation of AMPK and SREBP2 activities

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AMPK and SREBP2 are major regulators of hepatic glucose and cholesterol homeostasis. The active AMPK phosphorylates and inhibits HMG-CoA reductase (HMGCR) activity, and SREBP2 regulates HMGCR transcription. AMPK also regulates hepatic gluconeogenic gene expressions, thus lowers fasting plasma glucose concentrations and improves insulin sensitivity. Here, we investigated the mechanism of barley sprout (BS) and its two major bioactive compounds, hexacosanol and saponarin, on cholesterol and glucose metabolism in cultured hepatocytes and high-fat-diet fed mice. BS significantly reduced hepatic cholesterol concentrations with the activation of AMPK and subsequent induction of HMGCR phosphorylation. BS also suppressed nuclear translocation of SREBP2, thus, reduced HMGCR transcription. Hexacosanol regulated cholesterol biosynthesis with the similar mechanisMS mediated by BS. Activation of hepatic autophagy was confirmed with protein expressions of LC3-II and LAMP that reduced hepatic triglyceride concentrations in BS and hexacosanol fed mice. In addition, AMPK activation with BS reduced fasting glucose in mice by repressing the hepatic gluconeogenic genes including fructose-1, 6-bisphosphatase and pyruvate carboxylase. In the same manner, inhibition of hepatic gluconeogenesis and induction of glucose uptake in myocytes were achieved in cells stimulated with saponarin, a key flavonoid of BS. Collectively, these results demonstrate appropriate intake of BS may have hypocholesterolemic and hypoglycemic activities to ameliorate hepatic steatosis. Hexacosanol and saponarin may be key effective compounds.

Biography

- 2011.03 - PhD student, Korea University
- 2008.09 - 2010.08: MS, Korea University MS thesis: Effect of defatted soy proteins on body weight control in C57BL/6 and apoE2 transgenic mice.
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