Acute sulforaphane action exhibits hormonal and metabolic activities in the rat: in vivo and in vitro studies

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So far, only the chronic effect of sulforaphane (SF) on metabolism was examined. This study sheds more light on SF potential ability of regulating lipid, carbohydrate, and hormonal metabolism during its acute action in in vivo and in vitro conditions. In the in vivo trial, rats were given once intragastrically 10 or 20 mg/kg of SF and were decapitated 4 h after the single intragastric treatment. The serum and the liver were collected to assay lipid, carbohydrate, and hormonal parameters. Additionally, we evaluated the acute direct in vitro action of SF (1.5 h) on basal and insulin-stimulated lipogenesis and basal and epinephrine-induced lipolysis in isolated primary rat adipocytes at 1µM, 10µM, and 100µM concentrations. The SF hormonal action was dose-dependent. In the in vivo trial, the higher dose evoked a significant insulin release ($P \leq 0.01$) and showed a tendency to limit the secretion of leptin from adipocytes compared with the control animals. Surprisingly, two applied SF doses did not cause any changes in serum glucose level and liver glycogen content. Both SF doses reduced HDL- and increased LDL-cholesterol level ($P \leq 0.05$), evoked a drop of liver triacylglycerol content ($P \leq 0.05$) compared with the control rats. In the in vitro study, only 100µM SF evoked elevation of basal- and epinephrine-induced lipolysis and inhibition of basal- and insulin-induced lipogenesis in comparison with the control ($P \leq 0.001$). SF adipocyte influence was independent of epinephrine and insulin action. Recapitulating, SF exhibited a tendency towards limiting lipid synthesis in adipocytes as well as in the liver, possibly via Nrf2 pathway. The disturbance in the LDL- to HDL-cholesterol ratio and dose-dependent increase in insulin concentration at normal glycaemia were connected probably with the SF capability to generate temporarily ROS in the pancreas and in the vascular endothelial cells in in vivo trials.

Keywords:

broccoli; hormones; lipid metabolism; carbohydrate metabolism

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