Effects of dietary biotin supplementation on glucagon production, secretion, and action.

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OBJECTIVE: Despite increasing evidence that pharmacologic concentrations of biotin modify glucose metabolism, to our knowledge there have not been any studies addressing the effects of biotin supplementation on glucagon production and secretion, considering glucagon is one of the major hormones in maintaining glucose homeostasis. The aim of this study was to investigate the effects of dietary biotin supplementation on glucagon expression, secretion, and action.

METHODS: Male BALB/cAnN Hsd mice were fed a control or a biotin-supplemented diet (1.76 or 97.7 mg biotin/kg diet) for 8 wk postweaning. Glucagon gene mRNA expression was measured by the real-time polymerase chain reaction. Glucagon secretion was assessed in isolated islets and by glucagon concentration in plasma. Glucagon action was evaluated by glucagon tolerance tests, phosphoenolpyruvate carboxykinase (Pck1) mRNA expression, and glycogen degradation.

RESULTS: Compared with the control group, glucagon mRNA and secretion were increased from the islets of the biotin-supplemented group. Fasting plasma glucagon levels were higher, but no differences between the groups were observed in nonfasting glucagon levels. Despite the elevated fasting glucagon levels, no differences were found in fasting blood glucose concentrations, fasting/fasting-refeeding glucagon tolerance tests, glycogen content and degradation, or mRNA expression of the hepatic gluconeogenic rate-limiting enzyme, Pck1.

CONCLUSIONS: These results demonstrated that dietary biotin supplementation increased glucagon expression and secretion without affecting fasting blood glucose concentrations or glucagon tolerance and provided new insights into the effect of biotin supplementation on glucagon production and action.

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