

# Abstract

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## Oral glutamine increases circulating glucagon-like peptide 1, glucagon, and insulin concentrations in lean, obese, and type 2 diabetic subjects.

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**BACKGROUND:** Incretin hormones, such as glucagon-like peptide 1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP), play an important role in meal-related insulin secretion. We previously demonstrated that glutamine is a potent stimulus of GLP-1 secretion in vitro.

**OBJECTIVE:** Our objective was to determine whether glutamine increases circulating GLP-1 and GIP concentrations in vivo and, if so, whether this is associated with an increase in plasma insulin.

**DESIGN:** We recruited 8 healthy normal-weight volunteers (LEAN), 8 obese individuals with type 2 diabetes or impaired glucose tolerance (OB-DIAB) and 8 obese nondiabetic control subjects (OB-CON). Oral glucose (75 g), glutamine (30 g), and water were administered on 3 separate days in random order, and plasma concentrations of GLP-1, GIP, insulin, glucagon, and glucose were measured over 120 min.

**RESULTS:** Oral glucose led to increases in circulating GLP-1 concentrations, which peaked at 30 min in LEAN (31.9 +/- 5.7 pmol/L) and OB-CON (24.3 +/- 2.1 pmol/L) subjects and at 45 min in OB-DIAB subjects (19.5 +/- 1.8 pmol/L). Circulating GLP-1 concentrations increased in all study groups after glutamine ingestion, with peak concentrations at 30 min of 22.5 +/- 3.4, 17.9 +/- 1.1, and 17.3 +/- 3.4 pmol/L in LEAN, OB-CON, and OB-DIAB subjects, respectively. Glutamine also increased plasma GIP concentrations but less effectively than glucose. Consistent with the increases in GLP-1 and GIP, glutamine significantly increased circulating plasma insulin concentrations. Glutamine stimulated glucagon secretion in all 3 study groups.

**CONCLUSION:** Glutamine effectively increases circulating GLP-1, GIP, and insulin concentrations in vivo and may represent a novel therapeutic approach to stimulating insulin secretion in obesity and type 2 diabetes.

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