Abstract

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Chromium (D-phenylalanine)3 supplementation alters glucose disposal, insulin signaling, and glucose transporter-4 membrane translocation in insulin-resistant mice.

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OBJECTIVE: Chromium has gained popularity as a nutritional supplement for diabetic and insulin-resistant subjects. This study was designed to evaluate the effect of chronic administration of a novel chromium complex of d-phenylalanine [Cr(D-phe)(3)] in insulin-resistant, sucrose-fed mice.

METHODS: Whole-body insulin resistance was generated in FVB mice by 9 wk of sucrose feeding, following which they were randomly assigned to be unsupplemented (S group) or to receive oral Cr(D-phe)(3) in drinking water (SCr group) at a dose of 45 mug.kg(-1).d(-1) (approximately 3.8 mug of elemental chromium.kg(-1).d(-1)). A control group (C) did not consume sucrose and was not supplemented.

RESULTS: Sucrose-fed mice had an elevated serum insulin concentration compared with controls and this was significantly lower in sucrose-fed mice that received Cr(D-phe)(3), which did not differ from controls. Impaired glucose tolerance in sucrose-fed mice, evidenced by the poor glucose disposal rate following an intraperitoneal glucose tolerance test, was significantly improved in mice receiving Cr(D-phe)(3). Chromium supplementation significantly enhanced insulin-stimulated Akt phosphorylation and membrane-associated glucose transporter-4 in skeletal muscles of sucrose-fed mice. In cultured adipocytes rendered insulin resistant by chronic exposure to high concentrations of glucose and insulin, Cr(D-phe)(3) augmented Akt phosphorylation and glucose uptake.

CONCLUSION: These results indicate that dietary supplementation with Cr(D-phe)(3) may have potential beneficial effects in insulin-resistant, prediabetic conditions.

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