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

Dong F, Kandadi MR, Ren J, Sreejayan N.

University of Wyoming, School of Pharmacy, Division of Pharmaceutical Sciences and Center for Cardiovascular Research and Alternative Medicine, Laramie, WY 82071, USA.

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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