

Abstract

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Characterization of the metabolic and physiologic response to chromium supplementation in subjects with type 2 diabetes mellitus.

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OBJECTIVE: The objective of the study was to provide a comprehensive evaluation of chromium (Cr) supplementation on metabolic parameters in a cohort of type 2 diabetes mellitus subjects representing a wide phenotype range and to evaluate changes in "responders" and "nonresponders."

METHODS: After preintervention testing to assess glycemia, insulin sensitivity (assessed by euglycemic clamps), Cr status, and body composition, subjects were randomized in a double-blind fashion to placebo or 1000 mug Cr. A substudy was performed to evaluate 24-hour energy balance/substrate oxidation and myocellular/intrahepatic lipid content.

RESULTS: There was not a consistent effect of Cr supplementation to improve insulin action across all phenotypes. Insulin sensitivity was negatively correlated to soleus and tibialis muscle intramyocellular lipids and intrahepatic lipid content. Myocellular lipids were significantly lower in subjects randomized to Cr. At preintervention, responders, defined as insulin sensitivity change from baseline of at least 10% or greater, had significantly lower insulin sensitivity and higher fasting glucose and A(1c) when compared with placebo and nonresponders, that is, insulin sensitivity change from baseline of less than 10%. Clinical response was significantly correlated ($P < .001$) to the baseline insulin sensitivity, fasting glucose, and A(1c). There was no difference in Cr status between responder and nonresponders.

CONCLUSIONS: Clinical response to Cr is more likely in insulin-resistant subjects who have more elevated fasting glucose and A(1c) levels. Chromium may reduce myocellular lipids and enhance insulin sensitivity in subjects with type 2 diabetes mellitus who do respond clinically independent of effects on weight or hepatic glucose production. Thus, modulation of lipid metabolism by Cr in peripheral tissues may represent a novel mechanism of action.

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