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Chromium dinicocysteinate supplementation decreases vascular inflammation and Insulin resistance in type 2 diabetic patients mediated by Cysteine up regulation of Insulin signaling pathways of glucose metabolism

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Chromium and cysteine supplementation have been shown to improve glucose metabolism in animal studies. This study examined the hypothesis that chromium dinicocysteinate (CDNC), a complex of chromium and L-cysteine, is beneficial in lowering oxidative stress, vascular inflammation and glycemia in type 2 diabetic patients (T2D). Cell culture studies using monocytes and adipocytes models were performed to delineate the molecular mechanisms by which L-cystiene supplementation supplementation increases the glucose utilization. Diabetic patients enrolled in this study were given placebo for one month for stabilization and then randomized into one of three groups: placebo (P), chromium picolinate (CP) or CDNC, after which they received daily oral supplementation for 3 months. Of the 100 patients enrolled in the study, 74 patients completed it. There were 25 patients in P group, 25 in CP and 24 in CDNC supplemented group who completed the study. Blood markers of glycemia, vascular inflammation, HOMA insulin resistance and oxidative stress were determined at randomization and after 3 months of supplementation with P, CP or CDNC. There was a significant decrease at 3 months in insulin resistance ($p=0.02$) and in the levels of protein oxidation ($p=0.02$) and TNF-α ($p=0.01$) in the CDNC supplemented cohort compared to baseline. However, there was no statistically significant change in these markers in the CP supplemented group compared to baseline. Insulin levels significantly decreased ($p=0.01$) for subjects receiving CDNC but not CP. Cell culture studies using monocytes and adipocytes models demonstrate that L-cysteine supplementation supplementation increases the glucose utilization by up-regulating the insulin stimulated (PI3K/AKT) and insulin independent (SIRT1/AMPK/PPARγ) glucose metabolism pathways essential for maintenance of glucose homeostasis. CDNC supplementation lowers insulin resistance by reducing blood levels of TNF-α, insulin, and oxidative stress in type 2 diabetic patients. Therefore, CDNC supplementation has potential as an adjunct therapy for individuals with type 2 diabetes. (Supported by NIH RO1 DK072433 and Malcolm Feist Chair in Diabetes)

Biography

Jain is a Professor of Pediatrics, Physiology and Biochemistry & Molecular Biology and Chief of the Section of Pediatric Research at Louisiana State University Health Sciences Center, Shreveport. Dr. Jain is also appointed to the Malcolm-Feist Chair in Diabetes. Jain serve/has served on the editorial boards of the Diabetes, Diabetes Care, Free Radical Biology and Medicine, Antioxidants and Redox Signaling, Metabolic Syndrome and Related Disorders, J Amer College of Nutrition, Nutrition and Dietary Supplements, and Experimental Diabetes Research journals. Dr. Jain is member of several advisory panels of the National Institutes of Health. Jain has authored 165+ peer reviewed publications with over 5000+ Citations. Dr Jain has received several prestigious awards. Dr. Jain's research focuses on the mechanisms by which dietary nutrients, such as vitamin D, chromium, curcumin and vitamin E reduces complications of diabetes. Dr. Jain is funded by the NIH and the American Diabetes Association.

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