

Effect of Chromium Picolinate/Biotin Supplementation with Diabetes Education on Blood Sugar Levels in Type 2 Diabetes: A Pilot Program

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Citation

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Abstract

Aims: To determine the effects of diabetes education in combination with chromium picolinate and biotin supplementation on fasting and post prandial blood glucose levels in individuals with type 2 diabetes mellitus

Methods: An open-labeled, 12-week controlled study was conducted to determine the effects of diabetes education with the combination of chromium picolinate (CP) with biotin supplementation on fasting blood glucose (FBG) and PPG levels in people with type 2 DM (N=23) who were on prescribed oral medications for at least the previous 6 months, HbA1c >7%, and at least a one-year history of type 2 DM. These subjects received a combination of CP (300mcg Cr) and biotin (150mcg) twice daily for 3 months. Baseline glucose values were compared to glucose levels at 15 days, 30 days, 60 days and 90 days treatment. Risk factors such as blood pressure, smoking, family history, exercise, and body mass index (BMI) were recorded.

Results: Patients given diabetes education and taking the dietary supplement showed a significant decrease in PPG ($p<0.01$) and FBG ($p<0.05$) levels at the end of 3 months supplementation. No significant changes were observed in BMI and blood pressure.

Conclusion: The combination of diabetes education with CP and biotin supplement is efficacious, and likely useful as a nutritional adjuvant with hypoglycemic medications to help lower elevated blood glucose levels in individuals with diabetes. Controlled double blind clinical studies are ongoing to explore the mechanism of action and to study the effect of the CP and biotin combination on diabetes risk factors.

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INTRODUCTION

Glucose control remains the cornerstone of therapeutic strategies designed to reduce the risk of long-term complications in people with type 2 DM. The goal of diabetes treatment is to achieve and maintain fasting blood glucose levels within or near the normal range (90 to 126 milligrams per deciliter [mg/dL]). One of the most important tasks for healthcare professionals in diabetes care is educating patients about their diabetes and ways they can improve self-care. Chromium (Cr) is an essential trace mineral for normal insulin function. Recent studies suggest that Cr status is associated with type 2 DM₁ and cardiovascular disease₂. Type 2 DM subjects have been

shown to have low levels of plasma Cr and high levels of urine Cr₃. Experimental_{4,5} and clinical trials suggest that chromium picolinate (CrPic) improves insulin sensitivity, glycemic control, and symptomatology in diabetes₆, while biotin favorably affects abnormalities in glucose regulation₇.

SUBJECTS AND METHODS

SUBJECTS

This pilot program was designed to improve blood glucose levels in people with poorly controlled type 2 DM through an initiative involving diabetes education, nutrition intervention [CrPic (300 mcg Cr) and biotin (150 mcg) twice daily] and self-glucose monitoring. Twenty-three subjects with type 2 DM were enrolled in the 90-day program. Subjects were on prescribed oral medications (\geq previous 6 months), had HbA1c $\geq 7\%$, and had at least a one-year

history of type 2 DM. Fasting and postprandial blood glucose levels (after 2 hours of taking a regular meal) were measured at baseline, 30 days, 60 days and 90 days treatment. Blood pressure and body mass index (BMI) were recorded.

STATISTICAL METHODS

Statistical analyses were performed using SAS v 8.2 (SAS institute, Cary, NC, USA). Data are presented as mean \pm SD. Comparisons between baseline and final visits were carried out using paired t tests. $P < 0.05$ was taken as conventionally significant.

RESULTS

Table 1 shows the subject characteristics at baseline and after treatment. No significant changes were noted for BMI and blood pressure. The HbA1c levels decreased after treatment, although not significantly. Figure 1 shows fasting and post prandial blood glucose levels at baseline, 30 days, 60 days and 90 days. Fasting blood glucose (FBG) and postprandial blood glucose (PPG) levels decreased significantly with diabetes education and with CrPic and biotin supplement. The change in FBG levels at 90 days was -21 mg/dL, $p < 0.05$. The change in PPG levels at 90 days was -28 mg/dL, $p < 0.01$.

Figure 1

Table 1: Subject Characteristics

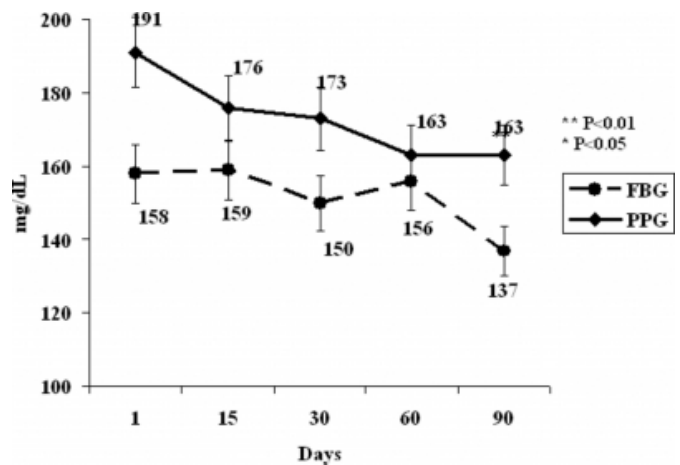
Subject Characteristics	Mean \pm SD
Age (years)	56.8 \pm 10
Sex (M/F)	9/14
Use of Medications (N) ^a	
Yes	18
No	5
Body Mass Index (BMI)	
Baseline	32.98 \pm 5
Final	32.7 \pm 5.5
Blood Pressure (SBP/DBP mmHg)	
Baseline	137 \pm 14 / 80 \pm 9.6
Final	137 \pm 12.5 / 81 \pm 9.2
HbA1c (%)	
Baseline	7.3 \pm 1.5
Final	6.8 \pm 1.3

^aMedications such as metformin, glucophage, Actos, Avandia, glucovance, zocor, lipitor mevacor and lovastatin; N: Number of subjects; HbA1c: glycosylated hemoglobin;

SBP : Systolic blood pressure; DBP: Diastolic blood pressure

Figure 2

Figure 1: Mean Levels of Fasting Blood Glucose (FBG) and Post Prandial Blood Glucose (PPG) Levels In Type 2 Diabetes Individuals



Fasting and Post Prandial Blood Glucose Levels in Type 2 diabetes individuals following 90 days twice daily supplementation with 300 mcg of chromium as chromium picolinate and 150 mcg of biotin. [N=23, * $p < 0.05$ – difference from baseline, ** $p < 0.01$ – difference from baseline (pre-supplementation)]

DISCUSSION

We report here a substantial decrease in fasting and post prandial blood glucose levels in diabetic subjects following diabetes education materials and taking a nutritional supplement containing CrPic and biotin. In this pilot program, glycosylated hemoglobin was not significantly reduced, but showed a decrease from baseline (mean difference: 0.5%). The effect would likely have been greater in a controlled study with more participants, or at higher levels of chromium supplementation. Nevertheless, the results indicate that diabetes education to the patients in combination with CrPic and biotin supplementation decreases blood sugar levels in type 2 diabetes. This study is in line with earlier studies, which show significant beneficial effects for subjects with type 2 DM with CrPic supplementation and diabetes education_{6,8}. It is concluded that a program including nutrition education, glucose monitoring and supplementation with CrPic and biotin can be safely and effectively used with hypoglycemic medications to help lower elevated FBG and PPG levels in individuals with diabetes. Large-scale, randomized, controlled, double blind clinical trials are ongoing to evaluate the direct effects of CrPic and biotin on glycemic control, lipids and lipoproteins in diabetics. Such studies are

necessary to substantiate any benefit of these dietary supplements with life style modifications and glucose monitoring might provide high-risk patients.

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References

1. Rajpathak S, Stampfer MJ, Rimm EB, Willett WC, Li t, Hu FB, Morris JS. Lower Toenail Chromium in Men With Diabetes and Cardiovascular Disease Compared With Healthy Men. *Diabetes Care* 2004; 27:2211-2216.
2. Guallar E, Jimenez FJ, van't Veer P, Bode P, Riemersma RA, Gomez-Aracena J, Kark JD, Arab L, Kok FJ, Martin-Moreno JM. Low toenail chromium concentration and increased risk of nonfatal myocardial infarction. *Am J Epidemiol.* 2005;162(2):157-64.
3. Morris BW, MacNeil S, Hardisty CA. Chromium homeostasis in patients with Type II diabetes. *J Trace Elements Med Biol* 1999;13:57-61.
4. Kim DS, Kim TW, Park IK, et al. Effects of chromium picolinate supplementation on insulin sensitivity, serum lipids, and body weight in dexamethasone-treated rats. *Metabolism* 2002; 51:589-94.
5. Mita Y, Ishihara K, Fukuchi Y, Fukuya Y, Yasumoto K. Supplementation with chromium picolinate recovers renal cr concentration and improves carbohydrate metabolism and renal function in type 2 diabetic mice. *Biol Trace Elem Res.* 2005; 105(1-3): 229-48.
6. Cefalu WT, Hu FB. Role of chromium in human health and in diabetes. *Diabetes Care.* 2004; 27:2741-2751
7. Maebashi M, Makino Y, Furukawa Y, Ohinata K, Kimura S, Sato T Therapeutic evaluations of the effects of biotin on hyperglycemia in patients with non-insulin dependent diabetes mellitus. *J Clin Biochem Nutr* 1993; 14:211-218.
8. Anderson RA, Cheng N, Bryden NA, Polansky MM, Cheng N, Chi J, Feng J. Elevated intakes of supplemental chromium improve glucose and insulin variables in individuals with type 2 diabetes. *Diabetes.* 1997; 46(11):1786-91.

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