Literature Review & Commentary

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Chromium and Biotin for Type 2 Diabetes

Four hundred forty-seven overweight or obese patients with poorly controlled type 2 diabetes (HbA1c ≥ 7.0%) were randomly assigned to receive, in double-blind fashion, 600 μg per day of chromium (as chromium picolinate) plus 2 mg per day of biotin or placebo for 90 days, along with their usual oral hypoglycemic agent. The mean HbA1c level fell by 0.54% in the active-treatment group and by 0.34% in the placebo group ($p = 0.03$ for the difference in the change between groups). Among patients with a baseline HbA1c level ≥ 10%, the mean HbA1c level fell more in the active-treatment group than in the placebo group (−1.76% vs. −0.68%; $p = 0.005$). The mean fasting blood glucose level fell more in the active-treatment group than in the placebo group (−9.8 mg/dl vs. +0.7 mg/dl; $p = 0.02$). Reductions in fasting glucose were most marked in patients whose baseline HbA1c was ≥ 10.0% (active treatment, −35.8 mg/dl; placebo, −16.2 mg/dl; $p = 0.01$ for the difference in the change between groups).

Comment: Chromium and biotin have each been shown to improve glycemic control in patients with diabetes. Chromium probably works by enhancing the binding of insulin to its receptor. Biotin induces the enzyme glucokinase, which plays a role in the catabolism of glucose. Biotin is also essential for the function of pyruvate carboxylase, which plays a role in the conversion of pyruvate to oxaloacetate. Biotin deficiency would presumably interfere with pyruvate catabolism, resulting in an accumulation of pyruvate and subsequent hyperglycemia. There has been no research examining whether the combination of chromium and biotin is more effective than either of these nutrients alone. However, since they improve glycemic control by different mechanisms, it is likely that some patients would have a better response when they supplement with both nutrients.

Albarracin CA et al. Chromium picolinate and biotin combination improves glucose metabolism in treated, uncontrolled overweight to obese patients with type 2 diabetes. *Diabetes Metab Res Rev.* 2008;24:41-51.

Vitamin D for Diabetic Neuropathy

Of 51 patients with type 2 diabetes and typical neuropathic pain, all were vitamin–D insufficient (defined as a serum 25-hydroxyvitamin D concentration < 24 ng/ml [< 60 nmol/L]). Each patient received vitamin D3 at a mean dose of 2,059 IU per day for three months. The mean pain score improved significantly by 48.5% on a visual analog scale ($p < 0.05$) and by 39.4% on the McGill pain questionnaire ($p < 0.05$).

Comment: Neuropathy is a frequent and often debilitating complication of diabetes. Patients with diabetic neuropathy are at increased risk of developing foot ulcerations because of a combination ischemia and lack of pain sensation after accidental trauma. These ulcers may lead to infection and gangrene and may eventually require amputation of the foot or leg. A number of nutritional treatments have been shown to be beneficial in the treatment of diabetic neuropathy; these include vitamin B12, alpha-lipoic acid, acetyl-L-carnitine, and magnesium. In addition, the combination of a vegan diet and an exercise program resulted in substantial improvement in one study. Vitamin D deficiency is common in patients with diabetes, and correcting this deficiency may improve insulin secretion and insulin sensitivity. The results of the present study suggest that vitamin D is also an effective treatment for diabetic neuropathy. Controlled trials are needed to confirm this promising finding.

Lee P, Chen R. Vitamin D as an analgesic for patients with type 2 diabetes and neuropathic pain. *Arch Intern Med.* 2008;168:771-772.

Vitamin B12 for Diabetic Retinopathy

Fifteen patients with type 1 diabetes received 100 μg per day of vitamin B12 subcutaneously along with insulin for two years. The mean duration of diabetes prior to vitamin B12 treatment was 11.8 years, and all of the patients had retinopathy. After one year of treatment, signs of retinopathy had disappeared in 7 of 15 patients. After 2 years, 8 of 15 were free of retinopathy. Vitamin B12 treatment was also associated with an increased feeling of well-being. Vitamin B12 was effective only in patients with incipient hemorrhagic retinopathy whose disease started before age 10. In a group of 22 adult diabetics, vitamin B12 was not beneficial.

Comment: This study suggests that diabetic retinopathy can be reversed (and presumably prevented) in a subset of