Literature Review

Chromium Picolinate:

Beneficial in Helping Control Blood Sugar?

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Summer 2002
I.D. # 9848
Abstract

The purpose of this literature review is to research the effectiveness of using chromium picolinate as a nutritional supplement to aid in regulating blood sugar levels in mild diabetics. Even in individuals who are unwilling to make prudent changes in their diets and sedentary habits, the administration of some nutrients may help control diabetes. There are several articles and studies showing varying results of chromium picolinate as an aid regulating blood glucose. With the increasing prevalence of diabetes it is prudent to explore alternative treatments. This literature review is an effort to explore such alternatives in an objective and unbiased manner.

Key Words: Chromium Picolinate, Alternative Treatment, Diabetes, Blood Glucose

Introduction

Since the 1950s it has been known that chromium is important for the expression of glucose tolerance and that in chromium deficiency the use of glucose is impaired.1 Chromium picolinate is a commonly used nutritional supplement marketed in supranutritional dosages for the treatment of diabetes mellitus. It was discovered to have a hypoglycemic effect when added to the total parenteral nutrition given to diabetic patients in intensive care units. Chromium picolinate can also aid muscle insulin sensitivity, and initial reports suggest that this is an effective therapy for type 2 diabetes.3

It should be noted that up to a quarter of adult Americans display a degree of insulin
resistance comparable to that seen in type II diabetes. The main point of treating type II diabetes is to prevent the macrovascular, microvascular, and neurologic complications associated with this disease.4

This literature review will explore the recent literature and studies regarding the use of chromium picolinate to help regulate blood sugar. With the data that has been found, a possible low cost alternative to medication may be a viable treatment for people with glucose regulation problems.

Materials and Methods

The literature review search started at Logan College of Chiropractic Library. The review began with a search on Pubmed and the Index to Chiropractic Literature with headings “chromium picolinate”. More than 80 articles were found with dates of publication ranging from the mid 1970s to 2000.

Of the more than 80 articles, 20 were selected to review based on predetermined criteria, including, but not limited to their titles, the date of publication, and the usefulness of the information. Only case reports and reviews relevant to chromium picolinate and diabetes or blood glucose were used. Only the most current articles were used with their publishing dates mostly in the 1990s.

After reviewing the 20 articles, 9 articles were selected for more critical evaluation. The
articles, dating from 1997 to 2000, consisted of 9 literature reviews. The articles were taken from medical and nutritional magazines.

Discussion

Although hereditary is likely to play a role, the fundamental cause of most cases of type II diabetes is readily apparent: high-fat, excessively refined modern diets, sedentary lifestyles, and the abdominal obesity with often results. Type II diabetes as well as coronary disease are virtually unknown in hunter-gatherer or other pre-modern cultures in which activity levels are high and dietary fat intakes are minimal.4 The complications of diabetes include neuropathy, nephropathy, retinopathy, arteriosclerosis and other health related risks. The need for education of risks is followed only by the need for low cost non-pharmaceutical treatments. As diabetes becomes more and more common, the research on alternative treatments becomes more vital to help aid in the battle against the disease and its destruction.

An article by Vincent et al explaining the biochemistry of chromium states chromodulin appears to play a role in the autoamplification mechanism in insulin (blood sugar) signaling. The exact transport and storage of chromium is poorly understood and there is debate whether chromium picolinate use may elevate free radical levels. In conclusion, Vincent suggests studies of long-term effects of chromium picolinate usage are required to determine the significance of this chemistry.5

In 1997, McCarty writes that impaired glycemic control in type II diabetes results from
Peripheral insulin resistance, hepatic insulin resistance, and a relative failure of beta cell function. Nutritional and pharmaceutical measures are now available for addressing each of these defects, presumably enabling a rational and highly effective clinical management of non-insulin-dependent diabetes mellitus. Peripheral insulin resistance can be treated with high-dose chromium picolinate.

Most cases of type II diabetes can be controlled through lifestyle changes including regular exercise, low-fat diets, fiber-rich foods and weight management. Many fallible humans, however, are unwilling or unable to make such changes and will continue to require pharmaceutical measures and nutritional supplements to achieve adequate control of diabetes. McCarty mentions supranutritional doses of chromium as just such a supplement.

McCarty references three successful animal studies using chromium to improve the glucose tolerance in the subjects. Furthermore, in humans with mild glucose intolerance or modest induced chromium deficiency, chromium supplementation has improved glucose tolerance in several studies and a small controlled cross-over study demonstrated a reduction of fasting glucose and glycated hemoglobin in type II diabetics receiving chromium picolinate - a finding which, however, could not be confirmed by another group.4

McCarty later cites a Chinese study with humans with type II diabetes in a large randomized placebo-based control that showed significantly reduced fasting and 2-hour post-prandial blood sugar, as well as glycated hemoglobin levels. The articles cites other
possible benefits of chromium - improved glucose tolerance and antiatherogenic effects.
McCarty 1997 article concludes that nutritional supplementation seems a viable first step along with lifestyle changes in the treatment of mild type II diabetes.

In a 1999 article by McCarty he further addresses the use of chromium picolinate in the treatment of diabetes, in this article the combination of chromium and biotin is explored. The recently demonstrated utility of chromium picolinate in type II diabetes appears to reflect improved peripheral insulin sensitivity - a parameter which is unlikely to be directly influenced by biotin. Thus, the joint administration of supranutritional doses of biotin and chromium picolinate is likely to combat insulin resistance, improve beta cell function, enhance postprandial glucose uptake by both liver and skeletal muscle, and inhibit excessive hepatic glucose production. Conceivably, this safe, convenient nutritional regimen will constitute a definitive therapy for many type II diabetics, and may likewise be useful in the prevention and management of gestational diabetes.

McCarty notes that oral trivalent chromium is exceptionally safe and no side-effects have been noted to date in clinical studies with chromium picolinate - which has been used by millions of American consumers since 1989.

Anderson writes chromium improves the glucose/insulin system in subjects with hypoglycemia, hyperglycemia, diabetes, and hyperlipidemia with no detectable effects on control subjects. Chromium improves insulin binding, insulin receptor number, insulin internalization, beta cell sensitivity and insulin receptor enzymes with overall increases
in insulin sensitivity. There have been several studies involving chromium supplementation of subjects with non-insulin dependent diabetes mellitus (NIDDM) and/or lipemia and most have reported beneficial effects of chromium on the glucose/insulin system. In a recent study, Chinese subjects with NIDDM were divided into three groups of 60 subjects and supplemented with placebo, 100 or 500 microg of chromium picolinate 2 times per day for 4 months. Improvements in the glucose/insulin system were highly significant in the subjects receiving 500 microg twice per day with less or no significant improvements in the subjects receiving 100 microg twice per day after 2 and 4 months. In summary, chromium is involved in the control of the glucose/insulin system and the amount, and likely form of chromium, are critical when evaluating the role of chromium in this system. Although Anderson seems confident in the benefits of chromium supplementation and glucose regulation, he yields that further studies are necessary to define specific mechanisms.7

In a 1998 article authored by Fox and Sabovic the confidence in chromium is less clear. The authors state chromium picolinate continues to fall squarely within the scope of “alternative medicine”, with both unproven benefits and unknown risks. It deserves closer scrutiny with additional prospective, randomized, double-blind, placebo-controlled trials to evaluate its efficacy in improving outcomes in patients with diabetes.8 Fox and Sabovic continue to caution, stating patients are using alternative therapies, some sources claim 50% of the American population use dietary supplements. Marketing chromium picolinate as a nutritional supplement complicates any claim made for it...there is little rigorous scientific data supporting these claims.8
In conclusion the authors heed this warning...it remains to be determined if any patients with diabetes truly respond to chromium picolinate and, if so, which ones. If there is benefit, it is important to demonstrate benefit not only in improved glucose control, but also for more definitive, patient-oriented outcomes (for example, retinopathy, renal preservation, and life expectancy). In the meantime, there is at least equally scant scientific evidence of harm from chromium picolinate. Physicians may encounter patients who can not afford medication, but can afford the “alternative” chromium and as long them demonstrate quantifiable reductions in blood glucose measurements, without apparent toxicity they meet criteria for continuation of use of the “alternative”.8

A November 1999 article by Jeejeebhoy acknowledges chromium is important for the expression of glucose tolerance and that in chromium deficiency the use of glucose is impaired. The article goes on to dispute claims of any evident toxicity from chromium picolinate. In conclusion, the article states that trivalent chromium has potential as a ‘nutraceutical’ for the amelioration of diabetes, gestational diabetes, insulin resistance, and lipid abnormalities and studies prove the safety of chromium supplementation at high doses.1

In a 2000 article by Morelli and Zoorob the reserved praises for chromium picolinate continue. A U.S. human study is cited, 180 patients with type II diabetes, subjects were subdivided into three groups: a placebo group and two groups taking different dosages of chromium supplements (100 microg twice daily or 500 microg twice daily). Patients
continued their usual medications and diet. At two months, the group receiving 500 microg of chromium picolinate twice daily experienced significant improvements in glycosylated hemoglobin compared with the placebo group. After four months, subjects in both treatment groups had improved glucose levels, compared with the placebo group. The article cautions that although initial human studies show positive effects, more studies are needed before chromium can be recommended as a supplement to improve serum glucose levels in patients with diabetes.2

In a 2000 article by McCarty it is stated that new evidence indicates that modestly supranutritional intakes of chromium picolinate can have a very favorable impact on insulin sensitivity and diabetic glycemic control. McCarty seems more confident it the safety of chromium stating no evident side-effects have been noted in clinical studies. He states evaluation of this nutrient in prevention trials appears warranted.3

Conclusion

It appears, according to the literature, that supplementing chromium picolinate for glucose regulation is warranted in at least a trial format. The extensive amount of literature as of late leads one to believe that the effects are very promising and are the basis for many studies and informational reviews. The literature cited seems to understand the growing problem of diabetes and the sometimes human failure to control it with lifestyle changes. It is promising that the medical community is giving such attention to an ‘alternative’ treatment for both patient health and economy. The fear of toxicity or drug interaction seems to be needless if under the guidance of a physician or
qualified nutritionalist. The main goal in treating diabetes should be patient benefit. The benefits of chromium picolinate supplementation, according to the cited literature, appear favorable in aiding blood glucose control. Although most authors qualified their conclusions by stating further studies are needed, those studies cited included ‘significant’ results. Based on the information in this literature, chromium picolinate shines as a beneficial supplement for patients with glucose regulation problems, such as in diabetes.
References


