

# SUPPLEMENT Industry Executive™

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## The Compelling Case for Chromium Supplementation © SIE

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Chromium is an essential nutrient required for maintenance of proper sugar and fat metabolism. Chromium is present throughout the body, with the highest concentration being in the liver, kidney, spleen, bone, brain and muscle. Good sources of chromium include liver, eggs, brewer's yeast, beef, poultry, broccoli, whole grain cereals, nuts, oysters, mackerel, and spinach.

Chromium deficiency is relatively common in patients with Type II diabetes. Symptoms of chromium deficiency include impaired glucose tolerance, high blood fat and cholesterol levels, and diabetes-like symptoms such as weakness, thirst, hunger and frequent urination.

In a 1997 study, researchers analyzed chromium levels in hair, sweat, and serum samples obtained from over 40,000 patients. The results showed highly significant age-related decreases, which may play a part in the increased risk of diabetes and atherosclerosis in older people.

Dietary supplements containing chromium are gaining popularity among Americans, especially those seeking a weight-loss program. Chromium supplements are available in various forms including chromium picolinate, niacin-bound chromium (also called chromium polynicotinate or chromium nicotinate), and chromium-enriched yeast. Brewer's yeast is considered the most biologically active and absorbable form of chromium.

Chromium is poorly absorbed, only 2 to 10 percent of dietary intake being absorbed. Organic chromium, such as chromium picolinate (Chromax manufactured by Nutrition 21), and niacin-bound chromium (ChromeMate made by InterHealth Nutraceuticals) are absorbed more efficiently than inorganic chromium such as chromium chloride. Absorption of chromium may decline with age, and most absorbed chromium is eliminated through the kidneys. Antacids may also decrease

chromium absorption. The average adult body contains between 0.4 and 6 mg of chromium.

Chromium polynicotinate closely mimics the biologically active form of chromium found in nature. It has been shown to reduce the amount of insulin required by diabetic patients, increase glucose metabolism, increase fat loss while sparing muscle (lean body mass), and to lower serum cholesterol by an average of 14 percent and improve total cholesterol to HDL ratios by 17 percent.

### **Diabetes**

Chromium functions primarily by regulating the action of insulin, the hormone that transports glucose from the bloodstream into cells. Optimal chromium intake appears to decrease the amount of insulin required to maintain normal blood sugar. Insulin not only helps control blood sugar levels, but also helps regulate the metabolism of fats.

Chromium supplements have been successfully used to treat diabetes. In one study, chromium picolinate was found to improve glucose tolerance in Chinese people with Type II (non-insulin-dependent) diabetes. This study was carried out by the United States Department of Agriculture on 180 Chinese subjects with non-insulin-dependent diabetes mellitus (NIDDM) who were divided into three groups of 60 subjects each and supplemented with placebo, 100 or 500 mcg of chromium picolinate two times per day for four months. Improvements in the glucose/insulin system were highly significant in the 500 mcg chromium group, while less or no significant improvements were seen in both the placebo and 100 mcg chromium group.

Plasma total cholesterol also decreased after four months in the subjects receiving 500 mcg chromium picolinate. These results indicate that the beneficial effects of chromium in individuals with diabetes are observed at levels higher than the upper limit of the Estimated Safe and Adequate Daily Dietary Intake.

Chromium supplements have also been shown to improve the symptoms of hypoglycemia in some people. Researchers at the University of Vermont also reported that a combination of chromium picolinate (Chromax, Nutrition 21) plus biotin work synergistically to decrease elevated blood sugar levels, to improve lipid profiles (significantly increasing HDL cholesterol levels, and decreasing total cholesterol levels), and to enhance glucose metabolism in human skeletal muscle cells.

### **Weight Management**

The prevalence of obesity is increasing rapidly in the U.S., and occurs when energy intake exceeds energy expenditure. Obesity contributes to many adverse health conditions, including non-insulin dependent (type II) diabetes, and cardiovascular diseases.

Research suggests that chromium supplements may cause weight loss, reduce fat and increase muscle mass. Researchers in Austria assessed the effects of chromium yeast and chromium picolinate on body composition in 36 obese and non-diabetic patients (average age 45 years) during (eight weeks) and after (18 weeks) weight reduction with a very low calorie diet. Patients were randomly assigned to either placebo or chromium yeast (200 mcg per day) or chromium picolinate (200 mcg per day) in a double-blind fashion. After the treatment period, the chromium picolinate-group showed increased lean body mass, whereas the other treatment groups still had reduced lean body mass.

The combination of chromium nicotinate supplementation with exercise training was examined on obese young women by researchers at the University of Texas. The researchers found that exercise training combined with chromium supplementation resulted in significant weight loss and lowered the insulin response to an oral glucose load. The study suggested that exercise training combined with chromium supplementation might be more beneficial than exercise alone for reducing certain coronary artery disease and diabetes risk factors.

Niacin-bound chromium given to moderately dieting and exercising African American women caused a significant loss of fat and sparing of muscle compared to those taking a placebo. Researchers at the University of Texas, Austin showed that young obese women taking 600 mcg of chromium (as niacin-bound chromium) daily for two months, with a moderate diet and exercise regimen, resulted in significant weight loss and lowered insulin response to an oral glucose load.

Chromium supplementation amplifies insulin receptor tyrosine kinase activity, which explains the relationship between chromium and its effects in diabetes.

### **Cardiovascular Protection**

Chromium has been shown to help prevent the buildup of plaque in arteries, the leading cause of atherosclerosis, by lowering harmful low-density lipoprotein (LDL) cholesterol and increasing beneficial high density lipoprotein (HDL) cholesterol. A double blind study involving 34 young male adults (athletes)

found that supplementation with 200 mcg chromium (ChromeMate, niacin-chromium complex) resulted in a significant decrease in serum cholesterol, an average of 14 percent. The study attributed this effect to a strong synergistic relationship between chromium and niacin.

A study involving 14 healthy adults and five adults with diabetes mellitus showed that daily supplementation with 200 mcg of chromium and nicotinic acid lowered total and LDL cholesterol, triglycerides, and glucose concentrations in patients with Type II diabetes. An earlier double-blind crossover study also showed the ability of chromium picolinate (200 mcg daily for six months) to lower blood lipids in humans. These studies suggest that chromium supplementation can lower total cholesterol and improve blood lipid profiles.

### **Dosage**

The Estimated Safe and Adequate Daily Dietary Intakes for adults are between 50 to 200 mcg per day. The average dietary intakes in the U.S. are 30 mcg/day.

### **Toxicity/Safety**

Both solubility and oxidation affects the potential for toxicity; furthermore, the type of complex may impact toxicity. Hexavalent chromium is much more toxic than is the trivalent form. The hexavalent chromium compounds may be carcinogenic. The acidity of the stomach promotes reduction of hexavalent chromium to the trivalent form. Most of the chromium absorbed from the gastrointestinal tract is trivalent.

A test-tube experiment found that chromium picolinate caused severe damage to Chinese hamster ovary cells grown in the laboratory. However, in recent studies chromium picolinate failed to induce mutations in the standard mutagenicity test known as the AMES test.

### **Cautions**

Chromium supplements may decrease insulin requirements in diabetics. Labels and/or product literature should warn consumers, "If you have diabetes, you should consult with your health care provider before taking chromium supplements, since chromium may cause your blood sugar level to drop and reduce your need for insulin."

### **Summary**

Chromium supplementation has been shown to improve glucose tolerance and lower insulin levels in Type II diabetics, to lower cholesterol, and may help in weight loss programs. Research also suggests that chromium supplementation may indeed help build lean tissue and reduce fat in adults who

exercise. SIE

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