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Essentiality of Chromium for Human Health And Dietary Nutrition

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ABSTRACT

The aim of this paper is to current knowledge about the essentiality of trivalent chromium for organisms and human dietary nutrition and biological function with special reference to role in dietary intake and recommendations. Trivalent Cr is the most stable form in biological systems it does not penetrate biological membranes easily and it appears that the transport of specific Cr compounds is strictly regulated by the organism. Chromium is a naturally occurring element found in rocks, soil, plants and animals in volcanic dust and gases. Animal studies suggest that the chromium may help improve blood pressure. Chromium has demonstrated the ability to low density lipoprotein (LDL or bad) cholesterol levels and raise high density lipoprotein (HDL or good) cholesterol levels in the blood, particularly in people having with high cholesterol. Animal studies show that Chromium bound to niacin or vitamin B3 protects the heart and increases energy levels. Chromium is commercially available in several forms, including Chromium nicotinate, Chromium histidine, Chromium picolinate, Chromium-enriched yeast, Chromium chloride and Glucose Tolerance Factor of chromium (GTF). Chromium is available as a part of many multivitamins or alone in tablet and capsule forms.

Keywords: Chromium, Administration, biological system, GTF, LDL, HDL, health, multivitamins, nutrition, yeast

INTRODUCTION

In the USA, greater than 50,000 mg of Chromium is used every year and 4500 kg/d of Chromium is released into the environment. USA regulations say Chromium that could be present in drinking water is 0.1 mg/1.

EPA maximum level of Chromium (III) and Chromium (VI) in drinking water: 100 micrograms/lit. Occupational Safety and Health Administration (OSHA) limit for an 8-hour work day, for metallic chromium (0) insoluble in state. National Institute for Occupational Safety and Health (NIOSH) exposure limit: 500 micrograms/m^3 for chromium (0), chromium (II), and chromium (III) for a 10- hour work day. NIOSH considers all chromium (VI) compounds to be potential occupational carcinogens and recommends an exposure limit of 1 microgram/m3 for a 10 - hour workday. National Research Council (NRC) dietary intake of chromium (III) limit: 50-200 micrograms/day. In the US, severe deficiency is rare, marginal deficiency may be more common. Chromium (III) helps insulin maintain normal glucose levels.

Very small amounts of trivalent chromium (III) are in everyday foods. All forms of chromium can be toxic at high levels, but hexavalent chromium (VI) is more toxic than trivalent chromium (III). Acute toxic effects occur when breathing very high levels of hexavalent chromium (VI) in the air that can damage and irritate the nose, lungs, stomach and intestine. Hexavalent chromium (VI) causes damage to the nose (bleeding, itching, sores), lungs and can increase the risk of non - cancerous lung diseases. Ingesting very large amounts of chromium can cause stomach upsets and ulcers, convulsions, kidney and liver damage.

The Department of Health and Human Services (DHHS) has determined that certain hexavalent chromium (VI) compounds are known carcinogens. Animal studies also indicate chromium (VI) is a carcinogen. Chromium can be measured in the hair, urine, serum, red blood cells and whole blood. Tests are more useful for high- level exposed people. Exact levels of exposure or how these levels will affect health cannot be inferred from tests. Chromium allergy may be detected by skin patch test.

MANIFESTATIONS

Chromium may improve lean body mass (muscle) and reduce body fat. However, despite the popularity of Chromium (especially Chromium picolinate) for weight loss, the effects are small compared to those of exercise and a well-balanced diet.

1. The benefit of Chromium supplements for diabetes Pregnancy induced and steroid –induced diabetes may benefit from Chromium as well. Chromium was found to decrease the insulin resistance problems seen in individuals who smoke cigarettes. Chromium is an antioxidant, which helps protect the body against free radical damage. Because of the popularity of taking Chromium supplements for blood sugar regulation, the U.S. Food and Drug Administration (FDA) relationship between chromium picolinate intake and insulin resistance is highly uncertain (Campbell W.W *etal*., 1999; Anderson R.A.2001, 2000, 1997; Anderson *et al*., 2001;Cheng *et al*., 2004, Balk *et al*., 2007) [5, 2, 6, 4].

Animal studies suggest that the chromium may help improve blood pressure. Chromium has demonstrated the ability to lower total and low density (LDL or bad) cholesterol levels and raise high density lipoprotein (HDL or good) cholesterol levels in the blood, particularly in people with high cholesterol. Animal studies show that Chromium bound to niacin or vitamin B3 protects the heart and increases energy levels.

Preliminary clinical studies the chromium picolinate improves symptoms of depression in people with a typical depression (Bahadori *et al*., 1997; Broadhurst *et al*., 2006; Campbell *et al*., 1999; Vincent, 2000) [5, 10].

2. Dietary sources & Guidelines

Dietary sources of chromium include brewer's yeast, cheese, pork kidney, whole grain breads and cereals, molasses, spices and some bran cereals.

Dosage of Chromium is based on the dietary Guidelines for Institute of Medicine, 2004 and Americans 2005 U.S Department of Health and Human Services and U.S Department of Agriculture. The Recommended Dietary Allowances (RDAs) of chromium.

3. Pediatric

1. For infant's birth - 6 months: The RDA for Chromium is 0.2 mg daily.
2. For infants 7-12 months: the RDA for Chromium is 5.5mg daily.
3. For children 1-3 years: The RDA for Chromium is 11mgdaily.
4. For children 4-8 years: The RDA for Chromium is 15 mgdaily.
5. For male children 9-13 years: The RDA for Chromium is25 mg daily.
6. For female children 9-13 years: The RDA for Chromiumis 21 mg daily.
7. For male children 14-18 years: The RDA for Chromium is35 mg daily.
8. For female children 14-18 years: The RDA for Chromiumis 24 mg daily.
9. For pregnant females 14-18 years: The RDA forChromium is 29 mg daily.
10. For breast feeding females 14-18 years: The RDA forChromium is 44 mg daily.

4. Adults

1. For adult males 19-50 years: The RDA for Chromium is35 mg daily.
2. For adult males 51 years and older: The RDA forChromium is 30 mg daily.
3. For adult females 19-50 years: The RDA for Chromium is25 mg daily.
4. For adult females 50 years and older: The RDA forChromium is 20 mg daily.
5. For pregnant females 19 years and older: The RDA forChromium is 30 mg daily.
6. For breast feeding females 19 years and older: The RDAfor Chromium is 30 mg daily.

Heavy metal contamination may have effects on the ecological balance of the recipient environment and a biodiversity of aquatic organisms (Farombi, *et al.*, 2007) [7].

Fishes are widely used to evaluate the health of aquatic ecosystems because pollutants build up in the food chain and are responsible for adverse effects and death in the aquatic systems. The toxic effects of heavy metals have been reviewed, including bioaccumulation. The organisms developed a protective defense against the deleterious effects of essential and inessential heavy metals and other xenobiotics that produce degenerative changes like oxidative stress in the body. The natural of aquatic systems contaminated with heavy metals released from domestic, industrial and other man made activities.

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