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Cobalt in Food (February 2006)

This is a short article on the occurrence of cobalt in food. It aims to present the variety of cobalt concentrations in different food groups.

Why is Cobalt found in food?

Cobalt (Co) is a natural element that is essential for the healthy functioning of many plants and animals and it is often found in the food that we eat.

What foods in Cobalt found in?

Research suggests that the top three food groups for Co in the human diet are: milk and dairy products, which account for approximately 32% of the total Co intake; fish and crustaceans, which account for approximately 20%, and condiments, sugar and oils, which account for about 16%. One investigation of specific foods (Leblanc *et al.*, 2004) found that chocolate contains the highest level of Co, with molluscs and crustaceans, and dried fruit and nuts also containing the high levels in comparison to other foods. Other studies show different Co levels for the same products in neighbouring countries (e.g. coffee levels as reported by Ostapczuk *et al.* 1987), and even within the same food type in a single country (Nigerian tea as reported by Onianwa *et al.* 1999; Chinese tea as reported by Qiu-e *et al.* 1999). For example, an American study found less than 0.05 mg/L of Co in white bread, pancakes, cheddar cheese and spaghetti with meatballs (Dolan and Capar, 1999). The Agency for Toxic Substances and Disease Registry (ATSDR) website contains a profile for Co, including its presence in a number of different foodstuffs, and references to various studies (e.g., 20 brands of beer as reported by Camean *et al.* 1998).

How much Cobalt is in an average diet?

One study used the figures in the accompanying Table and calculated Co levels in a typical diet (Leblanc *et al.* 2004). It was found that adults (over 15 years old) ingested around 7.5µg of Co per day (µg = microgram = 1 x 10⁻⁶ grams) and children (aged 3 to 14 years) ingested approximately 7.3µg of Co per day. Another study found that the average Canadian male (40-65 years) had a 'mean daily dietary intake' of 12µg of Co per day, and that women of the same age group averaged 9µg of Co per day, with the differing levels mainly due to differences in diet between the sexes. (Dabeka and McKenzie 1995)

Food Group	Concentration (mg/kg)
Bread	0.006
Breakfast Cereals	0.008
Rice	0.010

Other Cereals	0.001
Milk	0.001
Cheese	0.018
Eggs and derivatives	0.005
Butter	0.018
Oils	0.018
Meats	0.008
Poultry and game	0.002
Offal	0.033
Fish	0.007
Crustaceans and molluscs	0.046
Vegetables (excluding potatoes)	0.006
Pulses	0.008
Fruits	0.009
Dried fruits and nuts	0.041
Chocolate	0.050
Sugar and derivatives	0.021
Soups	0.006
Ready meals	0.008

Cobalt contents in various foodstuffs (Le Blanc *et al*, 2004)

What is Vitamin B12?

Cobalt in the form of vitamin B12 (cyanocobalamin) is essential for human health. The molecular formula for Vitamin B12 is $C_{63}H_{88}CoN_{14}O_{14}P$ which means that only 4.34% of the molecule by weight is cobalt. It is a coenzyme in a number of cellular processes including the oxidation of fatty acids and the synthesis of DNA. It also works with folic acid in the synthesis of certain amino acids, and is required for the normal production of red blood cells. Vitamin B12 is also essential for the nervous system.

International organizations responsible for setting standard levels of vitamin intake, the FAO (Food and Agricultural Organisation of the United Nations) and WHO (World Health Organisation) recommend a 2.4µg/day of vitamin B12 (equivalent to 0.1 µg/day of cobalt) in the adult diet.

(<ftp://ftp.fao.org/es/esn/nutrition/Vitnri/pdf/TOTAL.pdf>)

References and further reading

ATSDR ToxFAQ's for Cobalt: <http://www.atsdr.cdc.gov/tfacts33.html>

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