

CADMIUM - TRACE ELEMENT

Introduction

Atomic mass 112. Found in association with zinc ores and as a sulphide and carbonate. The metal is used in alloys, pigments and batteries. Cadmium is present as a contaminant in some fertilisers. The metal and its soluble compounds are toxic.

Exposure

Normal exposure to cadmium and its compounds is through air and food. Local environments may become contaminated with cadmium compounds through fertiliser use and fall-out of airborne emissions. The smelting of ores that contain cadmium compounds can result in significant cadmium fume causing an occupational hazard. The release of such fumes can also compromise the surrounding environment. Levels in foods such as liver and kidney from mature mammals, and oysters can be high. Cigarettes contain significant amounts of cadmium that is available for absorption.

Absorption

Absorption of cadmium is dependent upon the particle size and water solubility of the compound. Absorption may be increased in iron deficiency.

Distribution

Absorbed cadmium is carried to the liver as an albumin complex. In the liver the cadmium induces the production of metallothioneine. The kidneys absorb the cadmium-metallothioneine complex after it is released from the liver and account for up to half the body burden of cadmium.

Excretion

The majority of cadmium is excreted through urine or via the loss of cadmium containing intestinal mucosal cells. Cadmium accumulates continuously throughout an individual's life.

Pathology

Acute inhalation of cadmium fume results in pneumonitis. Acute exposure through food or drink may result in vomiting and diarrhoea. Chronic exposure to fume may result in emphysema. Long term exposure can result in renal dysfunction. Cadmium may be carcinogenic and teratogenic.

Monitoring

Blood cadmium can be used as an indicator of recent exposure and in cases of chronic exposure to the metal. Blood cadmium is also used as an indicator of body burden from a previous single episode of exposure. Smokers may have blood cadmium concentrations of up to 70 nmol/L.

Urine cadmium is primarily an indicator of cadmium body burden, reflecting the amount of the metal deposited in the kidney. The cadmium content of urine is therefore age dependent.

Analysis

Cadmium in various matrices can be determined by graphite furnace atomic absorption spectrometry. PaLMS Trace Elements Service determines cadmium using inductively coupled plasma mass spectrometry.

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