

PaLMS (PATHOLOGY NORTH) TRACE ELEMENTS FACT SHEET

ALUMINIUM

Introduction

Atomic mass 27. An abundant light metal with no known biological function. Tends to form very stable oxides.

Exposure

Human exposure resulting in pathology has been reported for aluminium containing dusts, domestic water supplies and medications. Aluminium toxicity in chronic renal failure, associated with exposure to the metal's compounds during treatment, is the most commonly reported incident.

Absorption

Aluminium is absorbed from the upper small intestine possibly in association with iron. The redox chemistry of aluminium is complex and the degree of absorption is strongly related to chemical conditions in the gut. For example, the presence of citrate in association with aluminium is known to enhance absorption.

Distribution

Once absorbed aluminium is bound to transferrin and distributed widely throughout the body. Important target organs for pathology are bone and brain. Accumulations may also be found in lungs, bone and muscle.

Excretion

The predominant excretory pathway is the kidney.

Pathology

The use of aluminium containing phosphate binders for chronic renal failure, contaminated water in renal dialysis and the use of antacids (in patients with poor renal function) have been associated with elevated aluminium burden and pathology. A progressive, fatal neurological syndrome, dialysis dementia, has been recognised as a cause of death in dialysis centres. Also common in dialysis centres is a progressive metabolic bone disease, dialysis osteodystrophy. A variant of this disease, also caused by elevated aluminium burden, includes the symptom myopathy and is resistant to treatment with vitamin D. The disease presents with bone pain and fractures, and aluminium can be demonstrated at the osteoid interface with the calcified matrix. Microcytic hypochromic anaemia has been associated with an increased body burden of aluminium. Suggestions have been made that aluminium intoxication is associated with amyotrophic lateral sclerosis and Alzheimer's Disease.

Monitoring

Water supplies and prepared dialysate fluids are monitored to limit exposure to the metal locally on a monthly basis. The Trace Element Department has noted that the concentration of aluminium in the domestic water supply has fallen dramatically. Patients with exposure to aluminium compounds and compromised renal function should be monitored at two to three monthly intervals.

Treatment

Chelation with desferrioxamine is able to reduce body burden of aluminium and may produce symptomatic relief in osteomalacia and encephalopathy. Dialysis utilising aluminium poor solutions may extract some aluminium from the circulation.

Analysis

Trace Elements analyses aluminium using inductively coupled plasma mass spectrometry.

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