VDH VIRGINIA DEPARTMENT OF HEALTH

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Bureau of Toxic Substances

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FACT SHEET ON LITHIUM

GENERAL INFORMATION

Lithium (L1) belongs to sodium and potassium group of elements and, accordingly, has similar physical, chemical, and some biological properties. Lithium is an element of the alkale-metal group with atomic number 3 audiatomic weight 6.94. It is widely distributed throughout the world in a variety of minerals. Natural waters may contain significant concentration of lithium (11 ppm in sea water and 1 ppm in certain mineral waters). Lithium is commonly found in many plants and animals tissues. Daily human intake is about 2 milligrams (mg) from some food sources.

USES

Lithium and its compounds are widely used in a variety of industries including metalargy, ceramics, air conditioning, chemical and pharmaceutical manufacture, and for lubrication grease.

HEALTH EFFECTS

There is ample evidence that lithium at low levels causes no serious adverse health effects. Because lithium is routinely used as a drug for the treatment of clinical depression, there is a large body of data on the human health effects of lithium exposure. Lithium is readily absorbed from the gastrointestinal tract. Distribution in the human organs is almost uniform. Excretion is chiefly through the kidneys, but some is eliminated in the feces. In general the body distribution of lithium is quite similar to that of sodium, and potassium and it may be competing with sodium and potassium at the renal tubular level.

Lithium is administered therapeutically as the carbonate salt (Lithium carbonate) in daily oral doses of 900-1800 mg/day for the treatment of manic and endogenous depression. The optimum maintenance dosage is often determined by monitoring the serum concentration. Good correlation exists between the symptomology of lithium poisoning and the serum lithium concentration. No toxic effects occur at serum lithium level below 1.5 milliequivalent/l (MeQ/L). Mild toxicity can occur at levels from 1.5 to 2.5 MEQ/l. Levels in excess of 3.5 MEQ/l are potentially fatal. The therapeutic use of lithium carbonate may produce unusual toxic responses. These include neuromuscular changes (tremor, muscle hyperirritability, and ataxia), central nervous system changes (blackout spells, epileptic seizures, slurred speech, coma, psychosomatic retardation, and increased thirst), cardiovascular changes (cardiac arrhythmia, hypertension, and circulatory collapse), gastrointestinal changes (anorexia, nausea, and vomiting), and renal damage (albuminuria and glycosuria). These changes appear to be more frequent when the serum levels increase above 1.5 milliequalent/liter (MEQ/l).

Lithium treatment is not recommended to patients with significant renal or cardiovascular disease, severe debilition or dehydration, or sodium depilation and to patients receiving other medications (eg. diuretics), because of the risk of lithium toxicity is high in such patients. Lithium carbonate may cause fetal harm

when administered to a pregnant woman. Data from Lithium birth registries suggest an increase in cardiac and other anomalies. If this drug is used in women of childbearing potential, or during pregnancy or if a patient becomes pregnant while taking this drug, the patient should be appraised of the potential hazard to the fetus. Lithium is excreted in human milk. Nursing should not be undertaken during lithium therapy except in rare and unusual circumstances where the potential benefits to mother outweigh possible hazards to the child.

Animal studies have shown lithium carbonate is a weak teratogen (causes birth defects). Increased frequency of cleft palate and fetal loss have been observed among the offspring of mice treated chronically during pregnancy with lithium carbonate. However, studies in rats, rabbits, and monkeys have no evidence of lithium induced birth defects.

STANDARDS AND GUIDELINES

There is no current federal standards for lithium in drinking water. The Environmental Protection Agency (EPA) has recently derived a provisional chronic oral reference dose (RfD) for lithium of 20 ug/kg/day. This reference dose is based on a Lowest Observable Adverse Effect Level (LOAEL) of 20 mg/kg/day for nephrotoxicity in humans receiving long-term lithium therapy for the treatment of manic depressive disorders. These studies examined 21 cases of intoxication in patients receiving daily doses of lithium for months or years. Also, to protect human health, EPA estimated that a lithium concentration in a potable water supply should not exceed 700 µg/l.

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