

Use

Iodine is an essential trace element. Larger doses of potassium iodate can be used, in an emergency, to block the uptake of radioactive iodine by the thyroid and thus reduce the later risk of thyroid cancer.

Nutritional factors

Iodine is necessary for thyroid hormone formation, and is an essential trace element. Maternal goitre is common in areas of the world where the diet is deficient, perinatal mortality is increased and cretinism (a syndrome characterised by spasticity, deaf mutism, intellectual deficit and variable hypothyroidism) is common. Problems can be prevented by the routine addition of 10–80 parts per million of potassium iodate (or potassium iodide) to all cooking salt, but many countries have still not taken this step: a quarter of a billion of the world's children are iodine deficient by WHO standards. Adequate intake is particularly critical during pregnancy, lactation and early childhood. A single prophylactic 500 mg injection of iodised poppy seed oil (containing ~38% w/w iodine) can be used in pregnancy in areas where cretinism is endemic. Subclinical deficiency can also occur in babies on parenteral nutrition on standard doses of Peditrace®.

Pharmacology

The UK Departments of Health issued guidance on the use of iodine prophylaxis in the unlikely event of a nuclear accident causing radiation "fallout" five years after the Chernobyl nuclear disaster in 1991. Similar, updated and more detailed advice was issued by the FDA in America in late 2001 (see www.fda.gov/cder/guidance/index.htm). The use of a stable iodine preparation can block further inhaled radioactive iodine uptake by the thyroid, reducing the subsequent risk of thyroid cancer (oral intake being minimised by appropriate restrictions on the use of contaminated food). Fresh meat and dairy products pose a particular problem if pasture is affected. Young children are at particular risk. Treatment cannot, of course, reduce the radiation dose from external radiation or from other radionuclides. Two 85 mg tablets of potassium iodate (containing the equivalent of 100 mg of stable iodine) will reduce exposure by half, even if this is only taken 5 hours after exposure to radioiodine.

Iodine inhibits the extrathyroidal conversion of thyroxine (T_4) to triiodothyronine (T_3), and inhibits the thyroidal excretion of these two hormones. It is used for this purpose (as Lugol's iodine) in the management of neonatal thyrotoxicosis (as outlined in the monograph on propranolol).

Radiation hazard prophylaxis

Adults in the vicinity of any incident (including pregnant and lactating women) in the UK are advised to take two 85 mg tablets of potassium iodate *immediately* any nuclear emergency is notified. This dose may need to be repeated daily if the hazard persists, but repeated dosing should be avoided in those who are pregnant or breast feeding where possible.

Babies can, most conveniently, be given 0.1 ml of Lugol's iodine (see below) where this is available. Otherwise, in an emergency, they may be given half an adult tablet of potassium iodate crushed in a teaspoon of jam or dissolved in a small quantity of milk or juice. Repeated doses should not, in general, be given in very young babies because there is some risk that this will cause hypothyroidism.

Contra-indications

The only contra-indications to such prophylaxis is a known allergy to iodine, and patients with hypocomplementaemic vasculitis or dermatitis herpetiformis.

Subsequent management

Neonates given iodine will need to have their thyroid stimulating hormone (TSH) levels monitored and, if these are raised, their T_4 levels checked, and appropriate replacement thyroxine offered as appropriate. Babies of mothers given iodine in the last trimester of pregnancy should have a cord blood sample taken at birth so that the TSH and T_4 levels can be measured.

Supply

Potassium iodate tablets are held in a range of specifically approved locations in the UK (such as schools and police stations) in all areas close to a nuclear installation. Hospital pharmacies have been advised to maintain a stock of potassium iodate crystals. These can be freshly dissolved when required to give the necessary 12.5 mg dose (since no pre-prepared liquid preparation of the iodate is indefinitely stable). Lugol's iodine (a solution of 5% iodine and 10% potassium iodide) which contains 130 mg/ml of iodine is a more readily available liquid formulation of very comparable efficacy (100 ml costs £1.85).

Reference

See also Cochrane reviews of nutritional issues ©

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