Iodine

Physiological Functions

The only function of iodine involves the synthesis of thyroid hormone. Approximately 60% of the total body pool of iodine is stored in the thyroid gland. The remainder is found in the blood, ovary, and muscle. Thyroid hormone is necessary for regulation of human growth and development.

Factors Affecting Availability

Iodine is absorbed intestinally from dietary sources or dermally from topical iodine applications or from iodine vapors produced as byproducts of industrial activity. Iodine vapor is also emitted from cleansing agents used commercially in sterilization processes and from fossil fuel combustion such as occurs in automobile engines. Currently, the most common source of exposure to iodine is from automobile exhaust. In the 1970's, the amount of iodine measured in the environment reached levels that were a cause for concern prompting the dairy industry to discontinue use of iodine-containing agents in sterilization of milking equipment to reduce the iodine content of milk.

Deficiency

Iodine deficiency was frequently observed in landlocked regions of the US at the beginning of the 20^{th} century necessitating iodine fortification of salt, an inexpensive and widely used seasoning. The development of iodine deficiency is no longer a problem, since landlocked regions receive produce grown in coastal areas where soil is rich in iodine. Signs of iodine deficiency include hypothyroidism, lethargy, and weight gain. The clinical presentation of iodine deficiency is goiter. Goiter can also develop from high intakes of **goitrogens,** naturally occurring substances in foods which decrease iodine availability or interfere with its tissue utilization. Dietary sources of goitrogens include cabbage, turnips, rapeseeds (canola oil), peanuts, cassava, and soybeans. Goitrogens are inactivated by heating, roasting or cooking.

Cretinism is a condition which develops in the fetus from iodine deficiency during pregnancy. This condition is characterized by mental retardation and dwarfism. Neonates are routinely screened for adequate thyroid hormone levels in developed countries and is being adopted in developing countries.

Toxicity

Chronic excessive intakes of iodine may compromise thyroid function and also contribute to development of goiter and hypothyroidism due to feedback inhibition of thyroid hormone synthesis. Grave's disease develops in response to an overactive thyroid and is not a condition associated with iodine toxicity.

- *The upper limit of safety established for iodine by the Food and Nutrition Board of the Institute of Medicine is approximately 1,100 mg daily for adults. See table below for age- and gender specific guidelines.*

Iodine Tolerable Upper Intake Levels	
Life Stage	Iodine mcg/d
Infants	
0-6 mo	N/A
7-12 mo	N/A
Children	
1-3 y	200
4-8 y	300
Males, Females	
9-13 y	600
14-18 y	900
19-70 y	1100
≥70 y	1100
Pregnancy	
≤ 18 y	900
19-50 y	1100
Lactation	
≤ 18 y	900
19-50 y	1100

Requirements

The Daily Reference Intakes (DRI) for iodine are shown in the table below.

Calcium Requirements Daily Reference Intakes	
Life Stage	**Iodine** mcg
Infants	
0-6 mo	110
7-12 mo	130
Children	
1-3 y	90
4-8 y	90
Males	
9-13 y	120
14-18 y	150
19-30 y	150
31-50 y	150
51-70 y	150
≥70 y	150
Females	
9-13 y	120
14-18 y	150
19-30 y	150
31-50 y	150
51-70 y	150
≥70	150
Pregnancy	
≤18 y	220
19-30 y	220
31-50 y	220
Lactation	
≤18 y	290
19-30 y	290
31-50 y	290

Dietary Sources

Although most foods do not contain iodine, one teaspoon of iodized salt consumed daily is more than sufficient to satisfy physiological requirements for this nutrient. Other dietary sources of iodine include drinking water, seafood (clams, lobster, oysters, sardines and ocean fish) and dairy products from feed additives as well as from disinfectants used on dairy farms. The iodine content of fruits and vegetables is dependent upon soil content. More detailed information on food sources of iodine is provided below.

Iodine Content of Food	
Food	**Iodine** (mcg)
Salt, iodized, 1 tsp.	400
Bread (made with iodized dough), 1 slice	142
Haddock, 3 oz.	104 - 145
Bread,, regular process, 1 slice	35
Cheese, cottage, 2% fat, _ cup	26 - 71
Shrimp, 3 oz.	21 - 37
Egg, 1	18 - 26
Cheese, cheddar, 1 oz.	5 - 23
Ground beef, 3 oz, cooked	8