

Manganese

Physiological Functions

Manganese is a cofactor for enzymes involved in hydrolysis, phosphorylation, decarboxylation, and transamination. It also promotes activities of transferases such as glycosyltransferase, and of glutamine synthetase and superoxide dismutase.

Deficiency

Manganese deficiency in humans has not been documented, but has been induced experimentally in animals. Poor growth and abnormal reproduction have been observed in rats and mice.

Toxicity

No reported cases of manganese toxicity resulting from dietary intake have been reported. Manganese toxicity has been observed from inhalation manganese-containing dust by workers in mines and steel mills. manifested by adverse effects on the central nervous system.

- ❖ *The upper limit of safety for manganese established by the Food and Nutrition Board of the Institute of Medicine is approximately 11 mg daily for adults. See table below for more age- and gender specific guidelines.*

Manganese Tolerable Upper Intake Levels	
Life Stage	Manganese (mg/day)
Infants	
0-6 mo	N/A
7-12 mo	N/A
Children	
1-3 y	2
4-8 y	3
Males, Females	
9-13 y	6
14-18 y	9
19-70 y	11

70 y	11
Pregnancy	
≤ 18 y	9
19-50 y	11
Lactation	
≤ 18 y	9
19-50 y	11

Dietary Requirements

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

Manganese Requirements Daily Reference Intakes	
Life Stage	Manganese mg
Infants	
0-6 mo	0.003
7-12 mo	0.6
Children	
1-3 y	1.2
4-8 y	1.5
Males	
9-13 y	1.9
14-18 y	2.2
19-30 y	2.3
31-50 y	2.3
51-70 y	2.3
70 y	2.3
Females	
9-13 y	1.6
14-18 y	1.6
19-30 y	1.8
31-50 y	1.8
51-70 y	1.8
70	1.8
Pregnancy	
18 y	2.0
19-30 y	2.0
31-50 y	2.0
Lactation	
18 y	2.6
19-30 y	2.6
31-50 y	2.6

Dietary Sources

Wheat germ, nuts, seeds, whole grains, oysters, sweet potatoes, tofu, chocolate, brewed tea and dark molasses are good sources of manganese. Fruits and vegetables such as pineapple, grape juice and tomato juice provide moderate levels of manganese. Dairy products and meat provide little manganese.

Manganese Content of Food	
Food	Manganese (mg)
Wheat germ, 2 Tbl	2.8
Pecans, 1/4 cup	2.7
Whole wheat pasta, 1 cup	1.9
Soynuts, 1/4 cup	.85
Pumpkin seeds, 1/4 cup	1.7
Cooked oatmeal, 1 cup	1.4
Sweet potatoes, 1/2 cup	1.3
Pineapple, fresh, 1/2 cup	1.3
Pineapple juice, 1/2 cup	1.2
Oysters, 3.5 oz cooked	1.2
Blackstrap molasses, 2 Tbl	1.1
Tomato juice, 1 cup	1.0
Blackberries, 1/2 cup	0.9
Grape juice, 1 cup	0.9
Spinach, 1/2 cup	0.9
Brown rice, 1/2 cooked	0.9
Soynuts, 1/4 cup	0.9
Almonds, 1/4 cup	0.8
Tofu, 1/2 cup	0.8
Sunflower seeds, 1/4 cup	0.7