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**Mn**

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54.938

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### Essential Mineral Functions

Manganese is an important mineral cofactor for a number of key metabolic enzymes, most notably for superoxide dismutase (MnSOD), a critical antioxidant enzyme within mitochondria. Manganese is also important for wound healing, bone formation and glucose metabolism.

### Intake Guidelines

#### Recommended Dietary Allowances (RDAs) for Manganese

Age	Males (mg / day)	Females (mg / day)	Pregnancy	Lactation
0-6 months	0.003	0.003		
7-12 months	0.6	0.6		
1-3 years	1.2	1.2		
4-8 years	1.5	1.5		
9-13 years	1.9	1.6		
14-18 years	2.2	1.6		
Adults 19+	2.3	1.8		
All ages			2.0	2.6

\* The IOM based the AI on average dietary intakes of manganese determined by the Total Diet Study, an annual survey of the mineral content of representative American diets.

### General Levels of Deficiencies in the U.S.

Frank manganese deficiency has not been documented in humans eating natural diets. Both mechanistic and human data suggest diabetic and osteoporotic subjects may have lower manganese levels compared to control populations. Supplementing these subjects within the AI range may be warranted, but there is limited data to suggest manganese supplementation will change clinical outcomes in these subjects.

### Natural and Supplemental Forms

Food sources of manganese include whole grains, nuts, leafy vegetables and teas. Supplemental sources (and percent Mn) include: manganese sulfate (36%), manganese gluconate (11%), manganese ascorbate (20%), manganese oxide (72%) and amino acid chelate (glycinate -16%) forms. Some studies suggest that manganese bioavailability can be reduced when consumed with iron, calcium and magnesium supplements; though bioavailability of different forms of manganese has not been well studied in human subjects.

### Potential for Toxicity

The majority of incidence of manganese toxicity is related to inhalation of manganese dust (welders, smelters) and unrelated to ingesting manganese in foods or supplements. Some cases of toxicity in children have been traced to high manganese levels in drinking water. We do not suggest clinicians recommend supplementing manganese above the tolerable upper limit (11 mg/day) unless they are following a protocol known to be safe and effective.

### References:

- Manganese Page of Linus Pauling Institute Website: <http://lpi.oregonstate.edu/infocenter/minerals/manganese>.
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- Greger JL. Dietary standards for manganese: overlap between nutritional and toxicological studies. *J Nutr*. 1998 Feb;128(2 Suppl):368S-371S.