Manganese

What is manganese?

- Manganese is a naturally occurring element found in many types of rocks.
- Manganese is an essential nutrient and small amounts are necessary for good health.

What are the uses of manganese?

- Manganese is used principally in steel production to improve hardness.
- Manganese occurs naturally in most foods and may be added to nutritional supplements.
- Manganese is used in a wide variety of products including fireworks, dry-cell batteries, fertilizers, paints, cosmetics, and as a medical imaging agent.
- Manganese has been added to gasoline to improve its octane rating.

Is manganese present in the environment?

- Manganese occurs naturally and is found in soils, sediments, water, and air.
- Manganese-containing dust can be released into the air when fossil fuels such as coal and oil are burned.
- Manganese can also become airborne during certain industrial manufacturing processes.
- In water most of the manganese tends to attach to particles in the water or settle into the sediment.
- Manganese does not breakdown in the environment.

How are people exposed to manganese?

- The primary way people are exposed to manganese is by eating foods rich in the substance or by using manganese-containing nutritional supplements.
- Exposure to manganese can occur when ground water containing it is used for drinking and food preparation.
- Workplace exposure to manganese in air can occur in occupations such as welding, mining, or working in a factory where steel is made.
• Swimming or bathing in water containing manganese may also result in the skin being exposed to manganese.

• Smoking cigarettes exposes the smoker and those nearby to manganese in the tobacco smoke.

How does manganese enter and leave the body?

• Manganese in food or water enters the body through the gut.

• Small amounts of manganese will enter the body through the lungs.

• Only very small amounts of manganese will enter the body through the skin.

• Manganese does not breakdown and most of it leaves the body in the feces within a few days.

• A limited amount of manganese is also able to cross the placenta during pregnancy, enabling it to reach the fetus.

How harmful is exposure to manganese?

• Exposure to large amounts of manganese can harm the nervous system. This may result in behavioral changes or cause slow and clumsy body movements.

• Breathing large amounts of manganese can result in lung irritation which may lead to a chemical pneumonia.

• Loss of sex drive and sperm damage has been observed following workplace exposures.

• Although manganese crosses the placenta, studies in humans have not found increases in birth defects or low birth weight babies.

• Manganese has been observed in animals to cause kidney inflammation and kidney stones.

Can exposure to manganese cause cancer?

• The U.S. Environmental Protection Agency (EPA) concluded that existing scientific information cannot determine whether or not excess manganese can cause cancer.

Is there a medical test to show whether I’ve been exposed to manganese?

• There are tests that measure the amount of manganese in blood, urine, hair, or feces. Because manganese is normally present in the body, some is always found in these samples.

• Past exposure to manganese is difficult to detect since it is rapidly removed from the body.
Magnetic resonance imaging, or MRI, can detect the presence of manganese in the brain. However, this type of test cannot determine if health effects have or will occur.

Normal ranges of manganese are 4 – 15 micrograms per liter (µg/L) in blood, 1 – 8 µg/L in urine, and 0.4 – 0.85 µg/L in serum.

**What is the treatment for manganese poisoning?**

- Emergency medical care should be sought in cases of suspected manganese poisoning.
- Manganese poisoning is treated by removing the person from the source and then with supportive medical care in a hospital setting.
- No specific antidote exists for manganese poisoning.

**Are there recommendations to protect public health?**

- EPA – Exposure to manganese in drinking water at concentrations of 1 milligram per liter (mg/L) or 1000 parts per billion (ppb) for up to 10 days is not expected to cause any adverse effects in a child.
- EPA – Lifetime exposure to 0.3 mg/L (300 ppb) of manganese is not expected to cause any adverse effects.
- Food and Drug Administration (FDA) – Manganese in bottled water should not exceed 0.05 mg/L.
- Occupational Safety and Health Administration (OSHA) – Legal limit of 5 milligrams per cubic meter (mg/m³) manganese in air averaged over an 8-hour work day.
- National Academies of Science, Institute of Medicine, Food and Nutrition Board – Dietary Reference Intakes (estimated average daily requirement) for manganese are 2 – 3 milligrams per day (mg/d) for ages 1- 8 and 6 – 11 mg/d for ages 9 and above.
- EPA – Secondary Maximum Contaminant Level for manganese in public water supplies is 50 ppb (0.05 mg/L). However, this is based on aesthetics (odor, taste, color, & clarity) and not health.

**What can I do to prevent exposure to manganese?**

- Identify and limit sources of harmful exposures.
- Wear appropriate protective gear when welding and limit or prevent exposure to welding fumes.
- While tap and bottled water generally contain safe levels of manganese, well water may sometimes be contaminated with sufficiently high levels of manganese to create a potential health hazard. If drinking water is obtained from a well, it may be wise
to have the water checked for manganese to ensure the level is below the current
guideline established by the EPA.

- Cease smoking cigarettes and avoid exposure to tobacco smoke.

**What should I do if I believe I am ill as a result of exposure to manganese?**

- If you experience symptoms that you think may be related to manganese exposure,
you should consult your physician.

**Where can I get more information?**

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology,
P.O. Box 90, Harrisburg, Pennsylvania, 17108. Telephone number: 717-787-1708 or visit
the following websites:

The U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic
Substance and Disease Registry’s Information Center. Telephone number: 800-232-4636.

**References**

(1) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic

(2) Food and Nutrition Board, Institute of Medicine, National Academies; Dietary Reference
Intakes (DRIs): Tolerable Upper Intake Levels, Elements searched 7/21/11 at

(3) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic
Substances and Disease Registry, Division of Toxicology and Environmental Medicine,
ToxFAQs™; Manganese, September 2008.