NUTRITION ✓ Evidence Based

10 Evidence-Based Benefits of Manganese

By Amy Goodson, MS, RD, CSSD, LD — Updated on August 31, 2018

Your body needs manganese, but only in small amounts. Manganese may be good for treating inflammatory disorders, regulating blood sugar, and decreasing risk for health conditions like stroke.

It's required for the normal functioning of your brain, nervous system and many of your body's enzyme systems.

While your body stores up to about 20 mg of manganese in your kidneys, liver, pancreas and bones, you also need to get it from your diet.

Manganese is considered an essential nutrient and can be found especially in seeds and whole grains, as well as in smaller amounts in legumes, beans, nuts, leafy green vegetables and tea.

Here are 10 evidence-based benefits of manganese.

1. May Improve Bone Health in Combination With Other Nutrients

Manganese is essential for bone health, including bone development and maintenance.

When combined with the nutrients calcium, zinc and copper, manganese supports bone mineral density. This is particularly important in older adults.

Studies have shown that about 50% of postmenopausal women and 25%

Research suggests that taking manganese with calcium, zinc and copper may help reduce spinal bone loss in older women (2).

In addition, a one-year study in women with weak bones found that taking a supplement with these nutrients, as well as vitamin D, magnesium and boron may improve bone mass (3).

However, other studies suggest that supplements containing only calcium and vitamin D have similar effects. Thus, the role of manganese in bone health is still being researched (4, 5).

> **Summary** Manganese
> may play a positive role in bone health by working in concert with other
> vitamins and minerals to improve bone mineral density.

2. Strong Antioxidant Properties May Reduce Disease Risk

Manganese is a part of the antioxidant enzyme superoxide dismutase (SOD), which is arguably one of the most important antioxidants in your body (6).

Antioxidants help protect against free radicals, which are molecules that can cause damage to cells in your body. Free radicals are believed to contribute to aging, heart disease and some cancers (7).

SOD specifically helps combat the negative effects of free radicals by converting superoxide — one of the most dangerous free radicals — into smaller molecules that won't damage your cells (8).

In one study in 42 men, researchers concluded that low levels of SOD and

Another study showed that SOD was less active in people with rheumatoid arthritis, compared to individuals without this condition (10).

Therefore, researchers proposed that proper intake of antioxidant nutrients may reduce free radical generation and improve antioxidant status in those with the disease (10).

As manganese plays a role in SOD activity, consuming the mineral may help reduce disease risk (11, 12).

Summary Manganese
is important in the formation and functioning of the superoxide dismutase (SOD)
antioxidant, which can help reduce damage to your cells.

3. Helps Reduce Inflammation, Particularly in Combination With Glucosamine and Chondroitin

Due to its role as part of the powerful antioxidant superoxide dismutase (SOD), manganese may reduce inflammation.

Evidence supports that combining manganese with glucosamine and chondroitin can reduce osteoarthritis pain.

Osteoarthritis is considered a wear-and-tear disease leading to the loss of cartilage and joint pain. Synovitis, which is inflammation of the membrane inside the joints, is a critical driver of osteoarthritis (14).

In one study in 93 people with osteoarthritis, 52% reported symptom improvements after 4 and 6 months of taking a manganese, glucosamine and chondroitin supplement (15).

However, it seems that only those with minor osteoarthritis benefit from the supplement. Those with a severe condition did not report the same improvement (15).

Another 16-week study in men with chronic pain and degenerative joint disease found that taking the supplement helped decrease inflammation specifically in the knees (16).

> **Summary** It appears that manganese may contribute to decreasing inflammation and pain associated with inflammatory diseases.

4. Plays a Role in Blood Sugar Regulation

Manganese appears to play a role in regulating blood sugar.

In some animal species, manganese deficiency can lead to glucose intolerance similar to diabetes. However, results from human studies are mixed.

Multiple studies have shown that people with diabetes have lower

Researchers are still trying to determine if low levels of manganese contribute to developing diabetes, or if a diabetic state causes manganese levels to drop.

Additionally, manganese is heavily concentrated in the pancreas. It's involved in the production of insulin, which removes sugar from your blood. Thus, manganese may contribute to the proper secretion of insulin and help stabilize blood sugar (19, 20).

Other research has shown that individuals with diabetes have lower levels of the antioxidant enzyme manganese superoxide dismutase (MnSOD), which further links low blood levels of manganese with blood sugar issues (21).

Summary Manganese has a variety of functions that can help regulate blood sugar levels in your body. Low levels of this trace mineral may negatively affect blood sugar control.

Stroke is the leading cause of epilepsy in adults over 35. They're caused by decreased blood flow to your brain (22).

Manganese is a known vasodilator, which means it helps enlarge veins to efficiently carry blood to tissues like the brain. Adequate manganese levels in your body may help increase blood flow and decrease your risk of some health conditions like strokes.

In addition, part of your body's manganese content is found in the brain. Several studies suggest that manganese levels may be lower in individuals with seizure disorders (23).

However, it's unclear whether seizures reduce levels of manganese in your body, or if low levels cause individuals to be more susceptible to convulsions (24).

> **Summary** Low levels of manganese in the body appear to be linked to an increased risk of epileptic seizures, though the relationship between the trace mineral and seizures is not yet fully understood.

6. Plays a Role in the Metabolism of Nutrients

Manganese helps activate many enzymes in metabolism and plays a role in a variety of chemical processes in your body.

It helps with protein and amino acid digestion and utilization, as well as the metabolism of cholesterol and carbohydrates (25).

Manganese helps your body utilize a number of vitamins, such as choline,

Additionally, it works as a cofactor, or helper, in development, reproduction, energy production, immune response and the regulation of brain activity (25).

Summary Manganese plays a vital role in the metabolism of nutrients by serving as a cofactor in a variety of chemical processes in your body.

7. May Reduce PMS Symptoms in Combination with Calcium

Many women suffer from a variety of symptoms at certain times in their menstrual cycle. These may include anxiety, cramping, pain, mood swings and even depression.

Early research shows that taking manganese and calcium in combination may help improve premenstrual (PMS) symptoms.

One small study in 10 women showed that those with low blood levels of manganese experienced more pain and mood-related symptoms during pre-menstruation no matter how much calcium was provided (26).

However, the results are inconclusive as to whether this effect is from manganese, calcium or the combination of the two.

Summary When combined with calcium, manganese may act as a natural remedy for decreasing PMS symptoms.

8. May Protect Your Brain Against Free Radicals and Improve Brain Function

Manganese is essential for healthy brain function and often used to help treat specific nervous disorders.

One way it does this is through its antioxidant properties, particularly its role in the function of the powerful antioxidant superoxide dismutase (SOD), which can help protect against free radicals that could otherwise damage brain cells in the neural pathway.

Additionally, manganese can bind to neurotransmitters and stimulate faster or more efficient movement of electrical impulses throughout your body. As a result, brain function may be improved (27).

While adequate manganese levels are necessary for your brain's functioning, it's important to note that too much of the mineral can have negative effects on the brain.

You may obtain too much manganese by consuming more than the Tolerable Upper Intake Limit (UL) of 11 mg per day or by inhaling too much from the environment. This may result in Parkinson's-disease-like symptoms, such as tremors (28, 29, 30).

> **Summary** Manganese may help with brain function by protecting this organ from damage caused by free radicals and by improving cognitive function.

9. Contributes to Good Thyroid Health

Manganese is an essential cofactor for various enzymes, meaning that it helps these enzymes function and work properly in your body.

It also plays a role in the production of thyroxine.

Thyroxine is a vital hormone, important for the normal function of your thyroid gland, which helps you maintain a proper appetite, metabolism, weight and organ efficiency (31).

As a result, a manganese deficiency could cause or contribute to a hypothyroid condition, which may contribute to weight gain and hormone imbalances (31).

> **Summary** Manganese is essential for thyroxine production and proper thyroid health and functioning.

10. May Aid Wound Healing by Playing a Role in Collagen Production

Trace minerals, such as manganese, are important in the healing process of wounds.

Manganese is needed for producing the amino acid proline, which is essential for collagen formation and wound healing in human skin cells.

Early research shows that applying manganese, calcium and zinc to chronic wounds for 12 weeks may improve healing (32).

That being said, more studies are needed on the effect of manganese on wound healing before drawing any conclusions on the topic.

> **Summary** Manganese may help with wound healing by playing a role in collagen formation in skin cells, but more studies are needed.

Dosage and Sources

While there is no Recommended Dietary Allowance (RDA) for manganese, the Adequate Intake (AI) recommendation is 1.8–2.3 mg per day. The AI for children differs depending on age (30).

The Tolerable Upper Intake Level (UL) is 11 mg per day for adults 19 and older. Like zinc, copper, selenium and iron, manganese is considered a heavy metal, and consuming too much can be dangerous.

Manganese is used therapeutically to correct deficiencies and to balance zinc and copper. It's typically taken orally but can be given intravenously (IV) for those who are deficient.

Many foods are high in manganese. It can be found in the greatest concentrations in seeds and whole grains, as well as in smaller amounts in legumes, beans, nuts, leafy green vegetables and tea.

Summary Adequate manganese intake is important for overall health, but it's not recommended to take more than needed, as it's considered a heavy metal, and excess consumption may prove dangerous.

Side Effects and Dangers

It appears to be safe for adults to consume up to 11 mg of manganese per day (30).

The safe amount for adolescents 19 or younger is 9 mg per day or less.

A healthy person with functioning liver and kidneys should be able to excrete excess dietary manganese. However, those with liver or kidney disease need to be cautious.

What's more, research has found that those with iron deficiency anemia may absorb more manganese. Therefore, individuals with this condition should watch their consumption of the mineral (33).

In addition, consuming excess manganese by inhaling it, which may happen when welding, provides health risks. In this case, manganese bypasses the body's normal defense mechanisms (29, 34, 35).

An accumulation can cause damage to the lungs, liver, kidneys and central nervous system.

Prolonged exposure may cause Parkinson's-disease-like symptoms, such as tremors, slowness of movement, muscle rigidity and poor balance — this is called manganism (28).

Summary While
manganese is safe in adequate amounts, those with iron deficiency anemia and
liver or kidney disease, as well as those who inhale the mineral should be
cautious.

The Bottom Line

Without adequate dietary manganese, many chemical processes in your body may not function properly.

The mineral plays a variety of roles, such as aiding metabolism, helping regulate blood sugar, contributing to decreased inflammation, reducing premenstrual cramps and more.

To get the biggest health boost, make sure to consume a variety of manganese-rich foods, such as whole grains and seeds. If you're considering a supplement, talk to your doctor first.

goals

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Manganese Deficiency

Medically reviewed by Natalie Olsen, R.D., L.D., ACSM EP-C — By Jill Seladi-Schulman, Ph.D. — Updated on August 16, 2018

What is manganese?

Manganese is a naturally occurring element and an essential mineral nutrient. It's important for maintaining good health, though manganese can be toxic at high levels.

Manganese deficiency is rare but can happen, especially with certain medical conditions. Read on to learn what manganese does and what it means if you have a deficiency.

What does manganese do?

Manganese is important for several functions in your body.

Metabolism

Your body contains numerous proteins called enzymes. Enzymes help to speed up chemical reactions. Manganese is a necessary component of several important enzymes in your body that work to process carbohydrates, amino acids, and cholesterol.

Antioxidant properties

An antioxidant stops harmful free radicals from damaging your cells. A manganese-containing enzyme present in your cells is the main detoxifier of free radicals.

Bone health and development

Manganese is essential for enzymes that help form bone and cartilage.

Manganese is present in an enzyme that provides an amino acid called proline. Proline is necessary for the production of collagen in your skin cells. Collagen formation is essential to wound healing.

What are the symptoms of a deficiency?

Since manganese is found in many foods within our daily diets, reports of manganese deficiency are rare.

A person that does have a deficiency in manganese could experience the following symptoms:

- poor bone growth or skeletal defects
- slow or impaired growth
- low fertility
- impaired glucose tolerance, a state between normal glucose maintenance and diabetes
- abnormal metabolism of carbohydrate and fat

Common causes

Manganese deficiency could be caused by not having enough manganese in your diet. However, according to the Institute of Medicine's review of dietary micronutrients, a clinical deficiency in manganese due to diet has not been observed in otherwise healthy people.

People with the following conditions could be at risk of lower-than-ideal manganese levels:

- epilepsy
- osteoporosis
- diabetes
- exocrine pancreatic insufficiency (an inability to digest food due to a deficiency of digestive enzymes produced by the pancreas)

- children with Perthes disease (a rare condition where blood flow to the thighbone is disrupted)
- children with phenylketonuria (an inherited disorder in which blood levels of phenylalanine are elevated)

How it's diagnosed

Manganese levels in your blood can be evaluated using a simple blood test. In order to perform the test, your doctor will need to obtain a blood sample from a vein in your arm.

According to Mayo Clinic Laboratories, the normal reference range for manganese in adults is between 4.7 and 18.3 nanograms per milliliter (ng/mL). You should always use the reference ranges that are provided with your laboratory report when interpreting your results. Consult with your doctor if you have questions.

How it's treated

In manganese depletion studies, symptoms subsided when subjects were given manganese supplementation.

If you have a manganese deficiency, your doctor will likely prescribe manganese supplementation. They'll also suggest that you try to include

According to the Linus Pauling Institute, the adequate daily intake for manganese is 2.3 milligrams per day in adult men and 1.8 milligrams per day in adult women.

What are the complications?

The effects of manganese deficiency have not been well studied in humans.

However, manganese deficiency in animals has been found to cause skeletal defects such as:

- curved spine
- shorter and thicker limbs
- enlarged joints

Additionally, pregnant animals that were deficient in manganese gave birth to offspring that had significant movement issues. These included a lack of coordination and stability.

What foods are rich in manganese?

Some examples of foods that are good sources of manganese include:

- nuts, such as almonds and pecans
- beans and legumes, such as lima and pinto beans
- oatmeal and bran cereals
- whole wheat bread
- brown rice
- leafy green vegetables, such as spinach
- fruits, such as pineapple and acai
- dark chocolate

of manganese, but at a lower amount compared with iron.

Dangers of too much manganese

Despite being essential for many important bodily functions, manganese can be toxic in large amounts.

Inhaled manganese toxicity is an occupational hazard for some workers. This is especially true for welders and smelters who are exposed to dusts or aerosols that contain manganese.

Inhaled manganese can cause inflammation of the lungs. Symptoms might include cough and bronchitis. People have also experienced a toxic effect of manganese when levels in drinking water are too high.

Manganese can also have a neurotoxic effect in large amounts. Symptoms include psychological disturbances and a reduction in motor function.

The takeaway

Manganese is an essential nutrient necessary for many important bodily functions. Generally, most people are able to consume enough manganese through their regular diet.

talk with your doctor about your concerns.

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