***Nonessential elements***

**Fluoride (F-)**

It is a nonessential trace element.

Recommended daily allowance is 3-4 mg

Sources: drinking water

Function:

It is added to water in many parts of the world. Why?

1. It reduces the incidence of dental caries. It replaces the hydroxyl group of hydroxylapatite, forming fluoroapatite that is more resistant to the enamel-dissolving acid produced by mouth bacteria.
2. NaF inhibits enolase enzyme acting in the glycolytic pathway). So NaF is used in measuring glucose concentrations in plasma samples.

Toxicity

1. Dental flurrosis: a condition that results in white or brown speckles on teeth.
2. Skeletal fluorosis :  [bone](https://en.wikipedia.org/wiki/Bone) disease caused by excessive accumulation of [fluoride](https://en.wikipedia.org/wiki/Fluoride) leading to weakened bones.

Products: Toothpaste, mouth rinses, topical fluoride preparations applied by dentists.

**Bromide**

It is a nonessential trace element. Early interest in the biochemistry of bromide (Br -) stemmed from the use of bromides as sedatives and anticonvulsants, a use introduced in 1857.

Function

* A study shows that peroxidasin requires ionic bromide as a co-factor. Peroxidasin is an enzyme that plays a key role in the stabilization of glumerular basement membrane. It promotes the formation of sulfilimine crosslink within the collagen IV network of basement membrane.
* It plays a role in defense mechanisms. Bromide is a cofactor for [eosinophil](https://www.sciencedirect.com/topics/immunology-and-microbiology/eosinophil-granulocyte) peroxidase by which eosinophils kill multicellular [parasites](https://en.wikipedia.org/wiki/Parasitism) and some [bacteria](https://en.wikipedia.org/wiki/Bacteria).

**Clinical Implications of Bromide Deficiency**

Bromide deficiency may have implications in human health and disease. Patients receiving total parenteral nutrition (TPN) are reported to have low plasma Br− levels due to lower dietary Br consumption, and end-stage renal disease patients have enhanced Br− losses as a consequence of dialysis.

Because Br has not been considered an essential trace element, systematic investigations on Br− replacement have not been pursued in these disease states.

Toxicity

The bromide anion is not very toxic: a normal daily intake is 2 to 8 milligrams. However, high levels of bromide chronically impair the membrane of neurons, which progressively impairs neuronal transmission, leading to toxicity, known as [bromism](https://en.wikipedia.org/wiki/Bromism). Bromide has an [elimination half-life](https://en.wikipedia.org/wiki/Elimination_half-life) of 9 to 12 days, which can lead to excessive accumulation.

Doses of 0.5 to 1 gram per day of bromide can lead to bromism. Historically, the therapeutic dose of bromide is about 3 to 5 grams of bromide, thus explaining why chronic toxicity (bromism) was once so common.

**Bromism** is the syndrome which results from the long-term consumption of [bromine](https://en.wikipedia.org/wiki/Bromine), usually through bromine-based sedatives such as [potassium bromide](https://en.wikipedia.org/wiki/Potassium_bromide) and [lithium bromide](https://en.wikipedia.org/wiki/Lithium_bromide). Bromism was once a very common disorder, being responsible for 5 to 10% of psychiatric hospital admissions, but is now uncommon since bromide was withdrawn from clinical use in many countries and was severely restricted in others.

Uses

Bromine is usually used as an antiseptic and disinfectant. Bromine tablets are very effective at killing bacteria in hot tubs

**Lithium**

**Lithium** is a rare element found primarily in molten rock and saltwater in very small amounts. It is understood to be non-vital in human biological processes, although it is used in many drug treatments due to its positive effects on the human brain.

Uses

Lithium salts (lithium carbonates and lithium citrate) are used in the treatment and prophylaxis of mania, bipolar disorder, depression and self-harming behavior.

It may take several weeks to months for lithium to start working. At first you may need to be on other medicines at the same time.

Toxicity

Most cases of lithium intoxication occur as a complication of long term therapy and are caused by reduced excretion of the drug because of a variety of factors including dehydration, deterioration of renal function, infections.

**Gold (Au)**

Although living things have a natural requirement for some metal ions, gold, as far as we know, is not one of them. The required ions activate particular biological pathways, for example: iron for haemoglobin (transportation of O2)' zinc for carbonic anhydrase (catalyses CO2 hydrolysis), copper for cytochrome oxidase (generates metabolic energy), and so on.

Uses

It was Koch's discovery in 1890 that gold cyanide was lethal to the micro-organism responsible for tuberculosis (mycobacterium tuberculosis).

After that, gold has been used in rheumatoid arthritis since it was thought that arthritis is a typical form of tuberculosis.

Today, Gold, given as sodium aurothiomalate, is licensed for active progressive rheumatoid arthritis~~;~~

Toxicity

Gold Toxicity is caused by the administration of gold-based therapy as part of treatment for rheumatoid arthritis, juvenile rheumatoid arthritis, or psoriatic arthritis, usually for several years.

It has recently been determined that gold plays a role in both the health and maintenance of the joints, as well as being a key element in the transmittal of electrical signals throughout the body.

**Silver**

Sources

* The natural wearing down of silver-bearing rocks and soil by the wind and rain releases large amounts of silver into the environment.
* Photographic materials are the major source of the silver that is released into the environment.
* Mines that produce silver and other metals.
* Medicines, and in activities such as jewelry-making and soldering.
* Most people are exposed daily to very low levels of silver mainly in food and drinking water, and less in air. The silver in these sources is at least partially due to naturally occurring silver in water and soil. Skin contact and breathing in air containing silver compounds also occurs in the workplace. Generally, much less silver will enter the body through the skin than through the lungs or stomach.
* Exposure from everyday use, such as wearing jewelry or eating with silver-coated flatware, is not expected to result in silver being taken into the body.

Toxicity

* Silver compounds can cause some areas of the skin and other body tissues to turn gray or blue-gray. This condition is called "argyria." Argyria is rare and occurs in people who eat or breathe in silver compounds over a long period (several months to many years). Once you have argyria, it is permanent. However, the condition is thought to be only a "cosmetic" problem (no health effect).
* Exposure to dust containing relatively high levels of silver compounds such as silver nitrate or silver oxide may cause breathing problems, lung and throat irritation and stomach pain. These effects have been seen in workers in chemical manufacturing facilities that make silver nitrate and silver oxide.
* Skin contact with silver compounds has been found to cause mild allergic reactions, such as rash, swelling, and inflammation, in some people.

Uses

* Antibacterial sliver sulfadiazine cream for the treatment of infected burn wounds, finer-tip injuries, infections in skin graft donor sites and extensive abrasions and infections in leg ulcers.
* Antimicrobial Silver sulfadiazine dressing of wound exudates.
* Antiseptic and disinfectant sliver nitrate pencil tip in common warts, verrucas and umbilical granulomas.