

# No moly – no life!

**Molybdenum is vital for keeping organisms fit and healthy. In fact, molybdenum is an ‘essential trace element’, which means human, animal and plant life could not survive without it. Its bio-essentiality derives from molybdenum-dependent enzymes that are required not only for human health, but also for the health of the ecosystem as a whole.**

IMOA’s website offers a comprehensive account of why molybdenum is essential for life. For example, the *Molybdenum Essentiality* video on IMOA’s You Tube channel explains that “molybdenum is required for several important chemical reactions in humans and animals, including the metabolism of nitrogen and sulfur compounds as well as nitrogen fixation in plants. However, the body cannot make molybdenum compounds, so they have to come from external sources, including food”.

## Rich and varied sources of molybdenum

Molybdenum is found in combination with sulfur in the mineral molybdenite and with oxygen in naturally occurring

molybdate in oceans, rivers, and soils. It is present in a range of everyday foods including cows’ milk, lentils, nuts, whole grains, meat (particularly offal) and vegetables such as spinach, cauliflower and kale. Many over-the-counter multi-vitamin and mineral dietary supplements also contain molybdenum, typically providing around 50 micrograms per dosage.

50 micrograms are about what the human body needs every day to remain healthy. Molybdenum intake varies around the world and depends in part on the soil in which vegetables and other plants grow. It typically ranges from 20 micrograms per day in areas of poor diet or soil quality, up to 560 micrograms. For instance, an average daily diet in the USA contains roughly 90 micrograms.

Excessive intake is highly unlikely in a person with a reasonably healthy lifestyle. Using homeostatic mechanisms, human bodies self-regulate the level of molybdenum and other essential elements to keep them within optimal ranges, excreting any excess.

Because it is normally sufficiently present in the diet, clinical molybdenum deficiency is extremely rare. One case in existing literature describes how a patient on an artificial diet, where calories and nutrients were delivered into a vein, received no molybdenum at all for 18 months. The patient developed symptoms of molybdenum deficiency, that were reversed by adding ammonium molybdate to the artificial diet.

## Molybdenum’s role in human metabolism

In humans, molybdenum is an essential constituent of enzymes that help to digest food, produce energy and eliminate waste products. However, scientific research into the function and properties of molybdenum did not begin with its role in humans. Rather, molybdenum was first found to be essential for plants in the early 1930s, and subsequently in the 1940s and 1950s for bacteria, animals and humans. Over time, studies of the role of molybdenum have shown that it is required for the formation and activity of several enzymes in human bodies, with various vital body functions being reliant on these enzymes.

Molybdenum has an essential role in enabling the human body to use biological sulfur compounds. They are crucial for the structure of connective **>**



Molybdenum is found in several foods, including cauliflower and walnuts.



Molybdenum is essential for healthy humans, animals and plants. © iStockphoto.com/vitranc

tissue. Optimal performance of the connective tissue relies on molybdenum, because it is indispensable in the activity of the sulfite oxidase enzyme. This enzyme converts toxic sulfite into sulfate, a stage in enabling the sulfur in the body to carry out its function by a reaction called sulfation. Furthermore, human livers cannot function properly if there is an excessive build-up of sulfites and an insufficient supply of sulfates. So, molybdenum supports liver detoxification, promotes connective tissue development, and contributes to the sulfur balance throughout the human body.

Molybdenum is likewise required in the functioning of the enzyme xanthine oxidase, which converts hypoxanthine and xanthine to uric acid. The latter

contributes to plasma antioxidant capacity within the bloodstream. Finally, molybdenum also plays a role as a cofactor for the enzyme aldehyde oxidase, present at high levels in the liver and lung, and implicated in the detoxification of environmental pollutants and xenobiotics, such as drugs and food additives.

### Continuing the learning process

Molybdenum is a crucial mineral nutrient, found in a wide range of foods, without which humans, animals and plants would not survive. Ongoing research continues to explore the full extent of molybdenum's role in the human body, especially in protecting the organism against neurological and other

diseases, including cancer. However, it is clear that life on earth would not be possible without this life sustaining, bio-essential element.

For further information, explore the Health, Safety and Environment and Molybdenum for Life sections of the IMOA website at [www.imoa.info](http://www.imoa.info) and watch Dr Philip Mitchell on the essentiality of molybdenum on IMOA's YouTube channel. IMOA's regularly updated database *Database of Molybdenum in Human Health and the Environment* ([https://www.imoa.info/HSE/environmental\\_data/database.php](https://www.imoa.info/HSE/environmental_data/database.php)) is a searchable source of information on all aspects of molybdenum in biology and the environment. (Michael Bold)