

### ***Selenium, An Elemental Illness Shield***

Dirt is dirt, or so they say. When you examine earth, on a microscopic level, it becomes obvious that not all dirt was created equal. Some regions are dry, while some are marsh. Some are rock, and some are sand. Much of earth is barren, lifeless desert, but there are also dense jungles exploding with life, and then there are the places in between.

This diversity of soil quality can also be evidence of soil nutrient variation. The balance and combination of various trace elements and substances in the soil of one region are typically different than those of another. As obvious as this sounds, most people are under the delusional philosophy that all plants of the same type contain the same nutrient value regardless of the region it grew in.

Some of the greatest farming and livestock raising mysteries were rooted in major variations in soil nutrient content, even within the same country. Crop infections and animal diseases of a particular sort were a common recurring problem in one area, but non-existent in another.

The modern solution to the problem of soil quality variations and depletions has been to grow only one type of crop and make it of a species that is virtually indestructible and will grow anywhere, at the cost of nutrient value, hence iceberg lettuce and beefsteak tomatoes, but I digress.

Selenium, in particular, is an essential nutrient for the health of man and animals. Plants, interestingly, rarely have a biological need for it, and when they do it is a function that both sulfur and selenium would serve and so it is truly rare the plant that actually requires only selenium for its survival.

There are, however, various species of plants that absorb selenium from the soil *if* it is present in abundance in the soil. These species of plants are an important for the proper diet of grazing livestock, which are the primary source of our dietary selenium.

Ranchers have known about the importance of selenium in the soil and animal diets for well over a hundred years, if not further, whether advertently or inadvertently. South Dakota and Ohio had different issues and required an interesting solution. The soil of South Dakota is super abundant in selenium while Ohio's soil is practically devoid of it. The livestock in Ohio, if fed only on feedstock grown in Ohio will be at greater risk of developing muscle deformities, heart problems, and even cancer.

One would expect to hear the opposite from those in South Dakota, but it isn't. Livestock fed only on local vegetation (this is from back in the days before commercially manufactured feedstock) the livestock would also develop problems. They would suffer from hair loss, brittle hooves, and would develop illness.

Eventually, it was discovered that South Dakota livestock were becoming poisoned by selenium, while Ohio's livestock were dying without it. The solution: South Dakota shipped its feedstock to Ohio and Ohio shipped theirs to South Dakota. The two were mixed together and a healthy balance was reached and the problems nearly vanished.

Soil selenium is not just an animal problem, though; it is also a man problem. For years, it has been observed that the regions of earth that have the lowest selenium soil content also have some of the most severe medical conditions. Finland has consistently led the world in rates of heart attacks and

strokes. Finland, to no surprise, also has one of the lowest soil concentrations of selenium on the planet. Similarly, New Zealanders often suffer from muscle pain and spasms, as well as heart conditions at a rate well above the average of Western countries. The dietary intake of selenium is also well below the standard.

It is for these reasons that many of the major studies on the role of selenium in human nutrition have been conducted on segments of the populations in these two countries. In fact, it was the successes of several medical practitioners who gave selenium supplements to their patients with muscle pains and aches, that helped spark the desire for more aggressive research into the biological role of selenium.

For a very long time, the selenium community was divided between those who considered selenium toxic and those who knew it was an essential nutrient that man cannot live without. The brave people were mainly farmers who saw that their livestock would improve if given the right amount of selenium and realized that it might also help their health. Decades later, along with millions of dollars in randomized controlled trials, it is hard to believe that debate is still continuing. The debate, though, has shifted from toxic or not, to how much is needed, how healthy it is, and exactly what roles it plays in the body.

It may sound as if we know very little about this wonderful element, but that's not true. We just don't know everything which I expect will be the permanent state of mankind so there's nothing to worry about. We know plenty about selenium to understand why it is crucial in preventing heart disease, muscle pain, infection, disease, and even cancer.

Selenium is an important building block in a number of enzymes. Among the most critical enzymes are the enzymes of the Glutathione Peroxidase family. Of the eight so far known, five require selenium as a critical component for function. These enzymes produce and use anti-oxidants to prevent free radicals from damaging cells and reduce oxidative stress on the body. Glutathione peroxidase also prevents damage to cellular DNA from oxidative stress molecules, which has been linked to increased risk of cancer mutation.

There have been, literally, hundreds of studies conducted on both humans and animals, both blind and open, controlled and uncontrolled, on the effects of selenium supplementation and deficiency on the preventative properties of selenium against various types of cancer. The studies have included cancers that were already developed in patients, chemically-induced in animals, and "naturally occurring". They have been conducted in a dozen countries, both Western and developing. I would love to say that mainstream science has concluded that selenium prevents all cancer. I can't. What I can say is that in the majority of these studies, selenium has been shown to reduce the risk of various cancers and reduce the risk of tumor development and slow growth rates. The results, however, are as varied as the diets, cultures and environments of the people studied. There has also been inconsistent study on the dosages of selenium, but upper limits have been identified in humans and a minimum dose has been established. How much selenium it takes to prevent colon or prostate cancer is a hotly debated topic.

The current adult RDA for selenium is 55 micrograms which is one thousandth of a milligram. Toxicity has occurred in dosages

of milligrams. The average dose in studies on cancer risk analysis is 200 micrograms (mcg) and has been used in dosages up to 750 mcg with little to no adverse effects.

Another area that selenium is important is in the prevention of viral infection. In fact, one theory regarding the prevalence of HIV/AIDS infection in lower Africa is believed to correlate with low selenium levels in the soil of that region.

Where this is most apparent is in certain regions of China where the link between a childhood heart disease called Keshan's Disease and low selenium levels is very strong. Selenium supplementation has been shown to reduce the incidence of this disease in several controlled studies. In an eight year controlled study on several rural Chinese villages showed a strong protective correlation between selenium supplementation and reduced incidences of Keshan's disease.

The current understanding of the mechanism behind this protective effect again returns to the glutathione peroxidases, as well as the role selenium plays in regulating cytokines, which are signaling molecules that rally the immune cell troops.

In one study, mice were injected with a harmless virus strain. In those with selenium deficiency, the virus actually mutated into a more aggressive form that created heart problems. The mutation occurred because of the oxidative damage to the DNA of the virus because of the selenium deficiency, and it is also hypothesized that this could have also occurred, or been exacerbated by, the fact that selenium deficient individuals have a weaker immune response and are also at greater risk of viral mutations and aggressive infections.

It's important to note that selenium has not been shown to be effective in curing conditions that have already developed. It does, however, have very strong protective and preventative benefits to the human body. It has been shown to prevent tumor development, slow tumor growth, boost the immune system, inhibit viral infection, reduce cancer promoting oxidative stress molecules, and improve muscle and joint health, and other benefits yet to be discovered.

While the RDA seems to be set at an arbitrarily and conservatively low rate, that health benefits seen even at the reasonable dosage of 200 mcg are enough to warrant supplementation to reduce the risk of many serious health conditions. But the right dosage for each person may be different and that's why it is vitally important that you consult with a qualified medical professional before taking selenium supplements or incorporating selenium rich foods, like seafood, organ meats, and animal meats. Grains, vegetables, and fruit are not a particularly good source of selenium since their values differ greatly depending on where they were grown.



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