**THE TOXICITY VALUES AND DEFICIENCY MANIFESTATIONS OF THE FOLLOWING MINERALS**

1. **POTASSIUM**

Potassium is a mineral found in cells of all living organisms, including those of plants, animals and humans. This mineral is an essential part of electrical and cellular functions within the body’s tissues and organs and plays an important role in metabolism. The heart, kidneys, digestive system, muscles and nerves all rely on potassium to function properly.

Potassium found in the blood and other body fluids is, along with calcium, chloride, magnesium, phosphorus, sodium and sulfur, commonly known as electrolyte. Electrolytes keep bodily fluid levels in balance and help maintain the integrity of the cells. In addition, they generate electrical impulses that enable cells to communicate with each other.

Each of the electrolytes has a specific role in the body with potassium being the major positive ion within the cells. The potassium concentration is balanced against that of another positively charged ion – sodium. The balance between these two electrolytes helps maintain the electric charge of the cell membrane that allows for communication between the nerves and the muscles. Potassium also plays a key part in the process of moving nutrients into cells and waste products out of cells.

Certain health conditions and lifestyle factors can alter the levels of potassium outside the cells. This can result in changing the activity of nerves and muscles, particularly the heart muscle. Low levels cause increased activity, while higher levels cause decreased activity. Thus, abnormally low or high potassium levels can lead to heart-rhythm disturbances or respiratory failure.

**TOXICITY**

The steroid hormone aldosterone controls potassium levels. As a result, excessive amounts of potassium are normally excreted from the body so that it does not cause any harm. However, when kidney problems or other illness cause excess potassium to build up, then a condition known as hyperkalemia occurs. Overuse of potassium supplements or consuming energy-fitness drinks when a person becomes dehydrated can also lead to potassium toxicity. Other possible causes of high potassium include:

* Abnormal breakdown of body proteins
* Adrenal gland failure (Addison’s disease)
* Destruction of red blood cells following severe burns or injury
* Muscle breakdown resulting from exercise, heat or medications
* Severe infection
* Use of certain hypertensives, such as ACE inhibitors

Hyperkalemia can cause heart problems and in its most severe form it can be deadly

**Potassium Deficiency**

Potassium deficiency, known as hypokalemia, is a rare condition and typically occurs because of excessive losses of potassium from the body rather than from inadequate potassium intake. Hypokalemia appears to be the most common source of electrolyte imbalance.

The major cause of low potassium is the use of diuretics. Prolonged use of laxatives and steroid medications may also lead to potassium deficiency. In addition, diarrhea, vomiting and severe dehydration often cause a rapid loss of potassium. Other conditions associated with potassium deficiency include eating disorders, low-calorie diets, kidney disorders, alcoholism, diabetic acidosis and colon polyps.

Symptoms of low potassium usually include fatigue, appetite loss, nausea, muscle cramps and muscle weakness, and irregular heartbeats or decreased heart rate. The most severe cases of hypokalemia can be fatal.

1. **CALCIUM**

Besides your teeth, there's no harder structure in your body than your bones. Your bones form the sturdy framework of your body, just like the boards in the walls of your home make up the sturdy framework of your house. But what makes your bones so hard?

Well, your bones are hardened by minerals. Minerals are inorganic compounds needed by your body to regulate chemical reactions and maintain structures. There are many different minerals needed for optimum health, but when we're talking about bone strength, calcium is at the top of the list. You get calcium into your body through food sources such as dairy products, legumes, almonds and some dark green vegetables. In this lesson, you will learn more about calcium and what happens when you have too little or too much of this mineral in your body

**Deficiency**

If you were to look inside your body, you would see that 99% of calcium is found in your bones and teeth. The amount that's left over might be small, but that doesn't mean it's unimportant. Calcium is a mineral needed not only for strengthening bones and teeth, but also for proper muscle contractions, the transmission of nervous system messages, and other important functions dealing with the regulation of heart function and blood clotting.

It's hard to believe that your body only requires 1% of the available calcium to carry out all of these important non-bone-related functions. Yet this system works because your body uses your bones as somewhat of a storage locker for calcium. You see, the level of calcium floating around in your blood is very closely monitored by your body.

If you're consuming too little calcium or calcium is not making it into your body due to a problem with calcium absorption, your blood calcium level drops, alerting your body to the calcium deficiency. When your body detects this, it allows bone resorption, which is the process of breaking down bone to release minerals. So if the blood needs more calcium, it goes to the bone storage locker and reabsorbs as much as it needs. If this process continues over time, the prolonged deficiency of calcium can lead to the reduced bone mass associated with osteoporosis. We learned that calcium has many functions in your body, so a calcium deficiency will not only affect your bones. For example, we know that calcium helps with your muscles and nervous system function, so it's easy to see that a deficiency would affect these systems and show up as symptoms of muscle cramps, numbness or tingling in the hands and feet, and mental confusion. If these symptoms show up, it's likely a good indication that you should get some more calcium into your body.

1. **Magnesium**

Did you ever get one of those eyebrow twitches where your eyebrow or eyelid will not stop moving? This can be very distracting and so annoying that it drives you to the point where you would pull out your hair if it would just make it stop! So, what causes your eyebrow to twitch like that? Well, one possible culprit is a magnesium deficiency. Magnesium is a major mineral that helps with many processes in your body, including nerve function, energy production, bone strength and normal muscle contraction. When your body is low, or deficient, in magnesium, it can disrupt the ion balance in your muscles and nerves and leave you feeling twitchy. In this lesson, we will learn more about magnesium and the factors that contribute to magnesium deficiency. We will also consider any effects that can arise if your body has too much magnesium.

**Sources**

It's not hard to find sources of magnesium since it's found in a variety of foods. A good way to remember magnesium food sources is to think of foods that are high in fiber. Fiber is part of plants, so plant-based foods, such as green leafy vegetables, beans, nuts and seeds, are good sources. There are also some animal products that contain magnesium, such as milk, yogurt and eggs, and magnesium is often added to breakfast cereals to boost their nutrient content.

**Deficiency**

With all these sources to choose from you would think that magnesium deficiency would be rare. While this is true in an otherwise healthy individual, there are some conditions and circumstances that can rob your body of proper magnesium levels. These factors that lead to deficiency include a prolonged low intake of magnesium due to a poor diet, digestive disorders that interfere with magnesium absorption, chronic stress and diuretic use. Diuretics are substances that make you have to urinate more often, such as caffeine, alcohol and blood pressure medication. Their use can cause you to lose magnesium through urine when you visit the restroom. These factors either directly lower your level of magnesium or they interfere with your body's ability to absorb or retain enough magnesium. Now, if you think back to our definition of magnesium, we see that it helps out with many functions in your body. So, it stands to reason that if you don't have the magnesium needed to carry out these functions, you would develop related symptoms. For example, we learned that magnesium helps with nerve function and energy production, so a deficiency could show up as depression, fatigue or numbness and tingling. We also know that magnesium is linked to bone strength as it is one of the minerals that your body utilizes to harden bones. Low magnesium, therefore, can lead to bone loss. We also learned at the beginning of our lesson that magnesium is needed for proper muscle contractions, so a deficiency will lead to muscle twitches.

1. **CHLORIDE**

Deficiency of chloride, or when blood levels of it drop too low, is known as hypochloremia. It is rare, as chloride is part of table salt which is present in most foods. In fact, people are prone to consuming more chloride than is really needed, due to salt-laden diets

Hypochloremia can occur however, for a variety of reasons that include :

•heavy sweating, as large amounts of sodium and chloride can be lost in perspiration

•excessive fluid loss due to prolonged diarrhea or vomiting, or overuse of coffee or laxatives or diuretics

•over-hydration

•burns

•congestive heart failure

•certain kidney disorders

•Addison’s disease

•most often seen in infants on chloride-deficient formulae

In the unlikely event that it occurs, a few chloride deficiency symptoms can be identified.

:: Chloride Deficiency Symptoms

1. loss of appetite

2. muscle weakness

3. lethargy

4. dehydration

5. deficiency leads to alkalosis, a condition in which body fluids have excess base (alkali), that can result in dangerously high blood pH and excessive loss of potassium in urine (which in turn causes hypokalemic metabolic alkalosis with symptoms that include loss of control of muscle function which might lead to breathing and swallowing difficulties)

**Chloride Overdose Symptoms, Toxicity Level & Side Effects**

A higher-than-normal level of chloride in blood is known as hyperchloremia. It is normally not a concern as excess chloride is excreted by the body.However very high intakes of more than 15 g a day for instance, usually in the form of salt, may lead to symptoms such as acid-base (pH) imbalance, fluid retention, and high blood pressure. (Although the problems can be attributed more to the excessive sodium than the chloride.)

Hyperchloremia may therefore be due to :

•excessively high intake of sodium chloride (table salt) or potassium chloride

•reduced urinary excretion in certain cases of cancer, gastritis, and kidney disease

•dehydration

•intake of certain drugs

The Food and Nutrition Board of the Institute of Medicine has set Tolerable Upper Intake Levels (UL) for chloride. These are levels above which there is risk of chloride toxicity, especially when taken over a long time.

1. **IRON**

**Iron toxicity:**

The body normally absorbs less iron if its stores are full, but some individuals are poorly defended against iron toxicity. Once considered rare, iron overload has emerged as an important disorder of iron metabolism.

Iron overload is known as hemochromatosis and usually is caused by a gene that enhances iron absorption. Other causes of iron overload include repeated blood transfusions, massive doses of dietary iron and rare metabolic disorders. Additionally, long-term overconsumption of iron may cause hemosiderosis, a condition characterized by large deposits of the iron storage protein hemosiderin in the liver and other tissues.

Iron overload is most often diagnosed when tissue damage occurs, especially in iron-storing organs such as the liver. Infections are likely to develop because bacteria thrive on iron-rich blood. Ironically, some of the signs of iron overload are analogous to those of iron deficiency: fatigue, headache, irritability and lowered work performance. Therefore, taking supplements before measuring iron status is clearly unwise.

Other common symptoms of iron overload include enlarged liver, skin pigmentation, lethargy, joint diseases, loss of body hair, amenorrhea and impotence. Untreated hemochromatosis aggravates the risks of diabetes, liver cancer, heart disease and arthritis.

In the United States, an estimated 10 percent of the population is in positive iron balance, with 1 percent having iron overload. Iron overload is more common in men than women and is twice as prevalent in men as iron deficiency. Some researchers have expressed concern about the widespread iron fortification of foods. Such fortification does make it hard for people with hemochromatosis to follow a low-iron diet but equal dangers lie in indiscriminate use of iron supplements.

Blood letting is the best treatment for hemochromatosis along with following a low-iron diet designed by a certified nutritionist containing substances that interfere with iron absorption. Some examples of substances that block iron absorption in such a diet include black tea, phytic acid found in whole grains, taking calcium with meals containing iron, and reducing vitamin C intake.

**Iron deficiency:**

If absorption cannot compensate for losses or low dietary intakes, and body stores are used up, then iron deficiency sets in. Because so much of the body’s iron is in the blood, iron losses are greatest whenever blood is lost. Bleeding from any site incurs iron losses. Active bleeding ulcers, menstruation and injury result in iron losses.Women are especially prone to iron deficiency during their reproductive years because of repeated blood losses during menstruation. Pregnancy places iron demands on women as well because iron is needed to support the added blood volume, the growth of the fetus and blood loss during childbirth. Infants and young children receive little iron from their high milk diets, yet extra iron is needed to support their rapid growth. The rapid growth of adolescence, especially for males, and the menstrual losses of teen females demand extra iron that a typical teen diet may not provide.