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JOHN'S CORNER:

MINERALS - The Elements and What They Do (Part 4)

by John Ferguson

9) Fluorine (Fl) - Fluorine is the 13th most abundant element in the earth's crust. Fluorine is found in igneous rocks at 625 ppm, shale at 740 ppm, sandstone at 270 ppm and fresh water at 0.09 ppm, seawater at 1.3 ppm and soils at 200 ppm. Land plants contain from 0.5 to 40 ppm, marine plants at 4.5 ppm, marine animals at 2.0 ppm, and land animals at 150-500 ppm for the soft tissue and 1,500 ppm in bones and teeth. Fluoride is an essential element for animals and humans.

Fluorine is the most reactive of all the elements and is a pale yellow gas under normal conditions. Many people are confused by the terms fluorine and fluoride. Simply put fluorine is the element and fluoride is the negative ion of the element fluorine (F^-) which is the form in which it combines with other elements. If calcium combines with fluorine, we call it calcium fluoride (CaF_2) and it is the soft colorful mineral we find nature that we call fluorite.

Fluoride is a component of many products and used in manufacturing to produce other products. Fluorine was used to separate uranium isotopes to make atomic bombs and the Nazi's used chlorine tri-fluoride (ClF_3) as an incendiary agent in flame-throwers.

Fluorine (C_8F_{17}) is used to make water repellent coatings for fabrics to anti-stick products like Teflon, which contains perfluorooctanoic acid (PFOA) where the "F" stands for fluorine.

Even though fluorine is useful, both fluorine and fluoride are dangerous. Fluorine gas is extremely toxic and breathing it in concentrations as low as 0.1 % for only a few minutes will kill. Fluoride itself is less toxic although it too is highly poisonous. It is so poisonous it is used as an effective insecticide for cockroaches and ants. Over 150 pesticides contain fluoride due to its extreme toxicity. Fluoride is listed as a major chemical warfare agent by the USA military due to its extreme toxicity.

Even though fluorine is an essential element for animals and humans, it cannot be too much or too little, and it must be in balance with other nutrients. For example, studies have shown that too little



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fluoride or too much increases the risk of hip fractures. Clinical toxicity is observed as dental fluorosis at 8-20 ppm and chronic systemic toxicity appears when fluoride levels reach 20-80 mg per day over several years. A 1977 study found that there were 10,000 excess cancer deaths per year caused by fluoridation of some water systems. In 1990, a animal study on fluoride found an increase in precancerous lesions in mucus membrane cells, an increase in cancers of oral mucus membranes at double the rate for males compared to females, an increase in thyroid follicular cell tumors and liver cancer.

Fluoride has powerful effects on required enzymes, effectively blocking their activity. Over 72 enzymes are inactivated or destroyed by fluorinated water. Due to its toxic nature, fluoride is often used in drugs and pharmaceuticals. Fluoride is used in many antidepressants of the Selective Serotonin Reuptake Inhibitors (SSRI) type (ex. Prozac or Zoloft). Increased aluminum (Al) levels in our bodies have been associated with Alzheimer's disease; fluoride helps the body absorb aluminum. A recent study in Ireland found that there was a link of fluorosis and cardiovascular disease ("Dental Fluorosis is a biomarker for coronary heart disease (CHD)", 2013, Takamori). Professor Takamori's research team observed that children with dental fluorosis have a higher incidence of heart damage and an increase in abnormal heart rhythm than those without fluorosis.

If one looks at the periodic table of the elements presented in part one of this series, you will notice that Fluorine is in the same column (2nd from the right) as Iodine (I) which means it has very similar chemical properties. Hence, fluorine competes with and replaces iodine, especially in the thyroid gland, which is a contributing factor to thyroid cancer.

Fluoridation of water increases human and animal absorption of lead, which is associated with many physical and mental problems. Elevated fluorine levels are associated with increased risk of several types of cancer. The National Toxicology Program has concluded based on "the preponderance of evidence" that fluoride chemicals are mutagenic meaning they inflict genetic damage that can trigger cancer.

Landscaping Problems Associated with Fluorine (Fluoride)



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Fluoride may be tightly bound to some types of clays and accumulate over time. Too much fluoride retards the growth of plants and reduces crop yields. Corn, maize and apricots are very sensitive to fluoride while asparagus, beans, cabbage, carrots are resistant. In some fluoride rich soils, the grass grown on them is toxic to livestock.

Fluorine affects plant metabolism in many ways: reduces oxygen uptake, causes respiratory disorders, assimilation decreases, reduction in chlorophyll content, inhibits starch synthesis, inhibits pyrophosphatase function (prevents plants from utilizing phosphate properly), alters metabolism of cell organelles, injures cell membranes, disturbs DNA and RNA, causes synthesis of fluoroacetate (a extremely toxic compound).

High levels of fluorine destroy soil organic matter and humic mineral complexes, destroy many enzymatic activities of microbes, and prevent nitrogen fixation by microbes. As little as 0.5 ppm will suppress the natural immune system of plants.

Fluoride is an ion and generally remains in solution and plants are exposed to this chemical by water, air and soil. Fluoride is a poison that accumulates in plant foliage and often leads to toxicity symptoms on sensitive plants. Additionally, it strongly inhibits photosynthesis and other processes in the plant. It is absorbed by the roots (or stomata) and moves through the plant accumulating in the leaf margins. As we continue to water our landscapes with municipal water this poisoning slowly happens over time thus we may not realize why are plants are getting sick and declining or just die suddenly. In previous issues of the newsletter, there are several additional and more detailed articles on fluoride and plant health (10/31/14, 6/19/15, and 8/25/15).

We now know that the studies showing fluoride to prevent cavities were falsified by the companies wanting to get rid of an industrial hazardous wastes resulting from the manufacture of aluminum and phosphate fertilizer production saving them billions of dollars in disposal costs of a hazardous waste.

Sources: tooth paste, sewage sludge, bone meal (up to 1,000 ppm of fluoride), some super phosphate fertilizers, burning coal is a airborne source of fluoride contamination of our soils, water from municipal water supplies



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10) Neon (N) - Most people associate neon with the colorful neon lights used in advertising signs or the orange cast of some types of streetlights. Neon is the least reactive of all the elements. Pure neon is a colorless, odorless, invisible gas and is the 5th most abundant element in the universe.

Since it does not react with anything, it is a member of the group of elements called Noble gases on the far right side of the periodic table. These include helium, neon, argon, krypton, xenon, radon, and Ununoctium, element #118, which is predicted to be a noble gas as it was created in a particle accelerator and only a few atoms there has not been enough to test.

Neon is found in igneous rocks at 0.005 ppm and seawater at 0.00014 ppm. It's primary usage is in scientific applications.

Due to its inability to react with anything neon is a harmless gas with no biological role for microbes, plants, or animals.