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Significance of inorganic chemicals in drinking water

chloride: The secondary drinking water standard for chloride is 250 mg/L, because some people can detect a salty taste when chloride exceeds 250 mg/L. Chloride itself has no health effect. However, the amount of chloride can be directly tied to the amount of sodium in the water. To find the sodium level of this sample, multiply the chloride level by 1.6. Those individuals who have high blood pressure and monitor their salt intake, may want to let their physician know if the level is over 250 mg/L.

flouride: The primary drinking water standard for fluoride is 4 mg/L, and the secondary standard is 2 mg/L. A fluoride concentration of approximately 1.0 mg/L help prevent dental cavities and osteoporosis. At concentrations above 2.0 mg/L, fluoride may cause mottling of enamel of permanent teeth (most common in children up to age 10 while teeth are forming). Bone changes can occur if drinking water contains more than 4 mg/L fluoride, and if fluoride exceeds 20 mg/L, crippling fluorosis can occur after long term consumption.

iron: Iron is objectionable due to taste, red staining of porcelain fixtures and laundry, and deposition in plumbing. The secondary drinking water standard for iron is 0.3 mg/L. Iron is an essential nutrient and produces no significant health effects. Water supplies with high iron readings frequently also have iron bacteria. These bacteria use iron as their energy source and produces masses that can plug well screens, pumps, and pipelines. It also can produce rust-colored, jelly like masses, which break loose and get into the plumbing. Iron bacteria coats everything and can be easily detected in toilet tanks, pipes and storage tanks. Decaying bacteria give a bad taste to water and leaves stains, but do not product any health effects. The bacteria can sometimes be cleared up by super chlorination.

lead: Exposure to lead, even for a short time and in relatively small amounts, can create serious health problems. Lead accumulates in bones and shows up as elevated levels in blood. Low levels of exposure produce minor biochemical changes, while at higher levels of exposure, severe neurological and toxic effects and even death can occur. Low levels for prolonged periods produce (especially in infants and children) reduced mental capacity, interfere with kidney and neurological functions and produce hearing loss. Lead in Kansas water supplies will be less likely from soil and rock, and more likely from lead pipes, lead solder, and other appurtenances which contain lead (usually in older homes). It may also come from underground contamination of water sources by leaded gasoline (old underground storage tanks), landfills, and hazardous waste sites. More commonly lead is found in above ground sources such as smelter emissions, paint, lead-acid batteries, and being near heavily trafficked area where leaded gasoline was used. Recently EPA lowered the acceptable levels of lead in water from 0.05 mg/L to 0.015 mg/L.

manganese: The secondary drinking water for manganese is 0.05 mg/L. Manganese above this level is objectionable due to unpleasant taste (especially in tea, coffee, and other beverages), black staining of porcelain fixtures and laundry, and deposition in plumbing with occasionally sloughs off. Manganese produces no significant health effects.

nitrates: The primary drinking water standard for nitrate (as N) is 10 mg/L. Excessive nitrate consumption by infants less than one year of age may result in “blue baby” syndrome, also known as methemoglobinemia. Nitrate replaces the oxygen in red blood cells causing an oxygen deficiency in the infants. At the extreme, it can be fatal. High nitrates also effect ruminants (sheep, cattle, etc.) Which are sensitive to nitrates. Elevated nitrates are thought to not pose a direct health threat to children over the age of one or adults

pH: The pH scale extends from 0 (which is very acidic) to 14 (which is very alkaline), with 7 being neutral. Drinking water should ideally range from 6.6 to 8.5. Lower pH tends to make metals and hardness minerals more soluble, possible allowing unwanted heavy metals into a water supply. PH levels below 6.0 or above 10.0 could also indicate the presence of a contamination source.

specific conductance: Conductance is a numerical expression of the ability of water to conduct an electric current. Because the number, which is expressed as micromhos per centimeter, depends on the concentration of the dissolved minerals, conductance indicates the degree of mineralization in the water. A conductance greater than 1500 is considered excessive.

sulfate: The secondary drinking water standard for sulfate is 250 mg/L. Above that water has a bitter taste and laxative effect for people who are not accustomed to high amounts of sulfate in water, usually at the 750 mg/L level. Those who drink it regularly may be able to adjust to it but occasional visitors may be effected. Sulfate also accelerates corrosion of the metal and forms hard scales in boilers and heat exchangers.

total dissolved solids (TDS): TDS is a measure of all dissolved inorganic material in water. TDS over 1,000 mg/L is objectionable because of the mineral taste. Harm to humans has not been proven. However high TDS (over 400 mg/L) does shorten the lives of water heaters. Concentrations more than 1,000 mg/L can accelerate corrosion in general.

total hardness: Also called “hardness as Calcium Carbonate.” Calcium and magnesium are the principle minerals contributing to Total hardness, coming from soil and rocks in Kansas Where water readily dissolves them. Iron and manganese can also contribute to the Total Hardness. Water with less than 50 mg/L is considered soft. Although hard water requires more soap and detergent for laundering and deposits scale on fixtures, soft water may be corrosive. Hard water may also possibly aid in the prevention of heart and arterial diseases. Even so, a Total Hardness greater than 400 mg/L is considered excessive

hardness as calcium: Hardness as Calcium is usually compared to Total Hardness. When the amount of Hardness as Calcium is subtracted from the Total Hardness reading, the difference is the amount of magnesium in the water. Calcium is usually more prevalent than magnesium. Excessive calcium has been implicated in formation of kidney or bladder stones, while high levels of magnesium may have a laxative effect on these not used to high levels.

Explanation of baterial analysis

bacteria: When testing for bacteria two results are given – total coliform and E.coli. The first, total coliform, is a test for coliform bacteria which are distributed widely in the environment. They are on animals, plants, and in the solid, but are in large numbers in the feces of warm-blooded animals. When a reading, is positive for total coliform bacteria it means that the water supply has been affected by the environment, and disease-causing organism may or may not be present. However, it is cause for concern and corrective action, such as well chlorination, should be taken. E.coli is a species of bacteria found in the intestinal tract of warm-blooded animals. When a sample is positive for E.coli, it means there is fecal contamination in the well water. This could be human or animal, but its implications are more serious than total coliform. The well’s construction should be reviewed and the well chlorinated, with a follow-up test done 10 days after chlorination. A negative reading means none of the above bacteria were found in the sample.