Fluoride

Fluorine is the 13th most common element in the earth's crust. In the form of fluoride, it is found in varying amounts in all natural waters. High fluoride concentrations are not usually found in surface waters, such as lakes and streams. However, they can occur in groundwater supplies. In many communities, fluoride is added to water to help prevent dental cavities.

The U. S. Environmental Protection Agency has established a twofold limit for fluoride in drinking water: A limit of 2.0 milligrams per liter to avoid the dental fluorosis associated with long term exposure to excessive fluoride; and a maximum allowable level of 4.0 mg/l. While the EPA does regulate the amount of fluoride in drinking water, it also strongly supports water fluoridation at optimum levels to aid in preventing dental cavities.

CAUSE:

Fluoride is dissolved into water from fluoride bearing minerals that occur naturally in the earth. In the United States, these minerals occur only in a few regions of the country. In South Carolina, fluoride is more common toward the coastal region.

EFFECTS:

Fluoride is a normal part of the human diet. At an optimum concentration of 1.0 mg/l in drinking water, fluoride produces no ill effects. Children who have received optimally fluoridated water from birth have shown as much as a 65 percent reduction in the occurrence of cavities when compared to areas with little or no fluoride. The beneficial effect of fluoride diminishes greatly as the fluoride concentrations decrease below 0.7 mg/l.

Children exposed to excessive amounts of fluoride while their teeth are developing can develop dental fluorosis. Dental fluorosis appears as whitish or brown spots on the teeth. The occurrence of dental fluorosis increases as the fluoride concentration increases. At fluoride levels below 2.0 mg/l, dental fluorosis is rare. At 3.0 mg/l, brown stains can be found in a small percentage of the population. In the United States, dental fluorosis is the only adverse health effect observed from long term exposure to excessive fluoride in drinking water.

TREATMENT:

Excessive fluoride is a concern only in the small amount of water used for cooking and drinking. Other household uses of the water are not affected by excessive amounts of fluoride. Removal of fluoride from the entire household water supply is expensive and generally unnecessary. For the small amount of water used in cooking and drinking, point-of-use treatment devices are a more reasonable solution.

Point-of-use devices are small treatment units that produce up to 15 gallons of water per day for drinking and cooking. The device is usually located near the kitchen sink. All of the methods described below are available as point-of-use devices.

1. **Reverse Osmosis (RO):** RO units remove dissolved minerals by forcing the water, under pressure, through a synthetic membrane. The membrane contains microscopic pores that will allow only molecules of a certain size to pass through. Since the molecules of dissolved minerals are large in comparison to water molecules, the water will squeeze through the membrane leaving the minerals behind. A properly operated RO unit is capable of removing about 90 percent of the dissolved minerals from a water supply.

2. **Distillation:** Distillation units are better known as “stills.” They are made of either heat-resistant glass or stainless steel. Stills work by heating small amounts (less than 2 gallons) of water to produce steam. The steam is then collected and condensed back into water. The dissolved minerals will not vaporize and are left behind in the heating chamber.

   Stills require frequent, rigorous cleaning to remove the baked-on mineral salts. The “flat” taste from boiling the water can be reduced by pouring the water back and forth between two containers to aerate it.

3. **Deionization (DI):** Deionization units are available as small, wall-mounted cartridges containing ion exchange resins. When water passes through the cartridge, the dissolved minerals are retained in the resin, producing a mineral-free water. The DI cartridges usually show a color change in the resin to indicate when they should be replaced.

4. **Combination point-of-Use Devices**: These are multi-step systems which use a pre-

filter, RO membrane or DI cartridge, and a carbon polishing filter. They treat up to 15 gallons of water per day. The treated water is stored in a small pressure tank and piped to a special faucet on the kitchen sink.

Where treatment is not desirable or practical, bottled water may be used as an alternative source of drinking water. A chemical analysis of the water (including fluoride) will sometimes be listed on the label.