33 Whittemore Farm Rd., Swanzey, NH 03446
Phone: (603) 357-2577 / Toll Free: (800) 760-4246
Fax: (603) 352-3899
Email: chem@eai-labs.com

Hydrogen Sulfide in Drinking Water[1]

Hydrogen sulfide (H_2S) occurs at objectionable levels in approximately 5-10 percent of water supply wells in New Hampshire. DES believes that bedrock wells experience the problem more than dug wells.

CHEMICAL/ BIOLOGICAL ORIGINS OF H_2S

H_2S can be formed naturally as a by-product of the decomposition of organic material possibly aided by the presence of sulfur reducing bacteria. These bacteria are not hazardous to human health. Organic material is often prevalent in swampy areas and when dissolved in water, breaks down to form many byproducts including H_2S. H_2S can also be produced by chemical reactions of soil and bedrock minerals containing sulfur.

There are many possible by-products of these chemical reactions. Where there is sufficient oxygen available, these by-products include water and sulfate; when there is not sufficient oxygen, then different by-products are produced often having unpleasant taste and odor characteristics. If the water that recharges your bedrock or dug well has little dissolved oxygen, taste or odor problems are possible. A lack of oxygen is called an anaerobic condition.

HOT WATER TANKS: CORROSION PROTECTION RODS

It has also been reported that H_2S can be produced within a hot water tank by complex chemical/ biological reactions that are related to the use of anticorrosion rods made of magnesium. These rods are used to prolong the life of the steel liner in a hot water tank. This possible explanation of the origin of H_2S can be evaluated by comparing the odor level in the hot water to that found in the cold water. If there is **no** odor in the cold water, these corrosion protection rods could support the production of the H_2S odor. To be very sure there is no odor from the cold water, you may need to agitate and slightly warm the "cold" water in a large flat bottom pan, since at higher temperatures, taste and odor characteristics are much more observable.

HEALTH SIGNIFICANCE

H_2S gas, at the concentrations found in drinking water, is not hazardous to health. Odor identification is imprecise and thus it is difficult to accurately and consistently characterize all the odor factors in water. Other odor characterizations (such as medicine, sweet) may indicate other types of chemical contaminants in the water that may poses a health risk.

1. The material contained in this fact sheet was excerpted from the New Hampshire Department of Environmental Services web site (http://www.des.state.nh.us/ws.htm).

TREATMENT OPTIONS

H_2S can be easily removed from drinking water. The most common approaches are listed below.

Replacement of Anti-Corrosion Rods: If the odor is only from the hot water system (the odor is not in the cold water taken directly from the well) and if there are magnesium corrosion protection rods, then an easy solution to the H_2S may be possible. If the water is not corrosive, these rods may be removed permanently. Where the water is corrosive DES suggests substituting aluminum protective rods for the magnesium. Replacement or removal of these rods however, may void the tank warrantee. Check with your hot water tank dealer.

Aeration: In this process, large volumes of air are blown through the water. The H_2S volatilizes into the air bubbles. The "used" air is then vented outside the home. The principal disadvantage of this method is possible bacterial growth in the treated water caused by the use of dirty air. Aeration is also beneficial in removing radon gas and in raising the water's pH by allowing the "off-gassing" of excess carbon dioxide (CO_2). Off-gassing of the H_2S will be less complete where the pH of the water is high.

Oxidation: In this method an oxygen-like chemical (potassium permanganate, chlorine or ozone) is added to the water. The oxygen-like compounds chemically react with the odor compounds so as to destroy the odor. One relatively low cost variation on this process uses a venturi nozzle to add small amounts of air to the water. Air contains approximately 20 percent oxygen. The water then proceeds to a detention tank that provides both reaction time and also allows for air release for the unused air.

Adsorption: In this process water is passed through granular activated carbon (AC). The taste and odor components adsorb (stick) to the interior surfaces of the carbon particles as the water passes through the treatment device. If intending to use AC, also test the water for radionuclides.

HAZARDOUS CONTAMINANTS

Occasionally taste or odors can be caused by more serious contamination. This contamination could be from industrial solvents or inappropriate waste disposal. Very expensive laboratory testing is typically required to determine the presence of these contaminants. Whether there is sufficient justification for such testing would require a site-specific evaluation focusing on nearby and uphill land uses.

TESTING YOUR WATER

EAI Analytical Labs will provide you with your free water testing kit containing: sample bottles, detailed sampling instructions and a tracking form. Bacteria samples bottles are distributed pre-sterilized and all sample bottles contain their necessary preservatives. Kits are available for pickup or they can be mailed to you. If you are interested or have any questions regarding the analysis of your water, please give us a call.