



# FACT SHEET

OFFICE OF DRINKING WATER & MUNICIPAL ASSISTANCE – ENVIRONMENTAL ASSISTANCE CENTER 800-662-9278

## ELEVATED HYDROGEN SULFIDE CONCENTRATIONS IN GROUNDWATER

Hydrogen sulfide is a colorless, flammable gas. It smells like rotten eggs and is sometimes called hydrosulfuric acid, stink gas, or sewer gas. It is also commonly known by its chemical formula  $H_2S$ .

Natural processes in the soil subsurface, like bacterial anaerobic decay, produce  $H_2S$ .

### What happens to hydrogen sulfide when it is released from a groundwater well?

In the air  $H_2S$  can be detected by smell at concentrations as low as 0.5 parts per billion. Concentrations at 100 parts per million (ppm) or above in air cannot be detected by smell. At these higher concentrations the gas destroys the ability of the olfactory nerve to detect the gas. This makes the higher concentrations of  $H_2S$  even more dangerous to human exposure, especially in confined spaces.

### How can exposure to hydrogen sulfide in a confined space affect my health?

Inhalation of excessive levels of  $H_2S$  gas in a confined space can result in loss of consciousness, respiratory failure, and death. A major factor in its toxicity is its ability to fatigue the sense of smell.  $H_2S$  loses the typical rotten egg odor when the concentration rises, and exposed individuals may not be aware of increased gas concentrations. Inhalation of concentrations of 500-1000 ppm will cause rapid unconsciousness and death through respiratory paralysis and asphyxiation.

Because  $H_2S$  is heavier than air, it can accumulate in open trenches and other confined enclosures that are open at the top. Never enter a trench or confined space that has not been tested for breathable atmosphere.

### How might I be exposed to hydrogen sulfide?

Drinking water wells or groundwater sources in your area may naturally contain  $H_2S$  gas. Bathing or showering with water containing elevated  $H_2S$  levels may pose a significant health risk. Elevated  $H_2S$  gas concentrations, released into the air from the water from shower spray or bath water, can accumulate in an unventilated bathroom.

### Hydrogen sulfide incident in Monroe County

In 2001, a homeowner returned home to find about 4 inches of water in his basement. He went into the basement to find the source of the water and opened the door to the basement offset where the water pressure tank was located. When he opened the door he was overcome and passed out. His wife went into the basement to rescue him and also passed out. The fire department responded to the 911 call made by one of the children. The couple was transported to the hospital.

The fire department detected  $H_2S$  at a level of 132 ppm in the basement. Upon turning the electricity back on, they noted that water was spraying out of the pressure tank in the basement offset. Monroe County is noted for having  $H_2S$  in the groundwater. The water supply providing water for domestic and household purposes to the house was a hauled water system (water is hauled by truck to the residence). The on-site well was used for irrigation purposes only.

The Monroe County Health Department and the Environmental Protection Agency (EPA) investigated to determine the source of the  $H_2S$ . The EPA constructed a plastic tent over the pressure tank and turned on the pump, allowing the water to spray into the confined airspace. They monitored the  $H_2S$  level in the tent and within a short period of time, peaked out their equipment (>200 ppm). The permissible exposure limit is

20 ppm ceiling concentration and a peak exposure limit of 50 ppm for no more than 10 minutes if no other measurable exposure occurs.

### **How can I find out how much H<sub>2</sub>S is in my well water?**

H<sub>2</sub>S testing has never been included in a routine test conducted for water supply approval. It is recommended that property owners located in areas where groundwater is known to contain H<sub>2</sub>S, sample their drinking water wells as soon as possible. Samples should be collected at a time that reflects typical household water use. Avoid collecting water samples after extended lack of well water use, such as following a vacation, or after periods of heavy water use, like lawn watering or laundry. Have one or more additional water samples tested on different days to confirm the H<sub>2</sub>S level.

### **How can families reduce the risk of exposure to hydrogen sulfide?**

If the H<sub>2</sub>S water concentration exceeds 1.3 milligrams per liter, residents should try to follow these recommendations:

- ✓ Reduce the length of time for showering or bathing to 10 minutes or less.
- ✓ Reduce the water flow rate in the shower or the volume of water in the tub.
- ✓ Because higher water temperatures cause an increase in the amount of H<sub>2</sub>S released from water, reduce the water temperature at the water heater and in the tub or shower.
- ✓ And most importantly, ventilate the bathroom as much as possible by installing exhaust fans rated for maximum air exchange for the size of the bathroom, or by opening a window. If there are small children in the home, installation of a motion sensor or other type of sensor to activate exhaust fans should be considered.

### **How can hydrogen sulfide be treated?**

There are various methods. They should be chosen based on the level of hydrogen sulfide, the amount of water being treated, the levels of iron and manganese, and bacterial contamination. Hydrogen sulfide can be reduced or removed by activated carbon filtration, shock chlorination, oxidizing chemical injection, oxidizing filtration, or water heater modification.

### **How do I have my well water tested for H<sub>2</sub>S?**

H<sub>2</sub>S testing is not routinely performed on private wells. For a nominal fee, the DEQ, Drinking Water Laboratory at 517-335-8184, or a commercial laboratory, may be contacted to arrange for H<sub>2</sub>S testing of your water supply. For a listing of commercial analytical laboratories, you may contact the DEQ at the telephone number listed above. Your local health department can also help by providing you with a list of laboratories or by making arrangements for the water testing by the DEQ Laboratory.

*For information or assistance on this publication, please contact the Office of Drinking Water and Municipal Assistance, through the DEQ's Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request.*

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