ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Taste and Odor in Drinking Water

Taste and odor (T/O), at objectionable levels, occur in approximately 10-15 percent of water wells in New Hampshire. Hydrogen sulfide odor (rotten eggs) is reported most often. This fact sheet discusses taste and odor contaminants other than hydrogen sulfide. (For information on hydrogen sulfide, please read DES fact sheet WD-DWGB-3-16 Hydrogen Sulfide in Drinking Water at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm .)

In groundwater supplies, the origin of T/O contaminants generally cannot be determined. The principal causes of T/O are thought to include:

- Recharge of the well by water originating from wetlands.
- Chemical reactions involving various minerals in soil or rock, possibly enhanced by the actions of various naturally occurring non-hazardous bacteria in the soil.
- Manmade contaminants inadvertently entering the soil.

In surface water, T/O problems typically are attributed to algae, cyanobacteria, and dissolved organic matter. T/O problems in surface water in New Hampshire are generally rare. The most common T/O-causing compounds are 2-methylisoborneol and geosmin. The DES laboratory does not test for either of these chemicals. (Note: DES strongly cautions against the use of unfiltered**,** undisinfected surface water for drinking purposes.)

LABORATORY TESTING

The characterization of odor is often very difficult because T/O identification generally is very subjective. The DES laboratory does not generally characterize odors in drinking water samples. However, the laboratory can test for particular elements or compounds thought to cause a particular T/O condition.

If you desire to identify the compound(s) that are creating T/O, you should recognize that this will be a difficult process with a low likelihood of success (other than for the compound hydrogen sulfide). First, you will need to decide what contaminant(s) are believed to cause the T/O. Then have the laboratory test for that contaminant(s). If that factor is present at elevated levels, then that factor probably contributes to the overall problem. If it is not present at meaningful amounts, the hypothesis will need to be revised and laboratory tests processed for these new compounds. Review page 3 for some, but by no means all, T/O-causing compounds.

HUMAN CAUSES

Occasionally, T/O can indicate the presence of serious health-related contaminants such as those from industrial chemicals. These are often associated with land uses such as landfills and industrial areas. In years past, these chemicals were also associated with “midnight dumping” in rural areas. To determine the presence of these contaminants, very expensive laboratory testing is typically required. Whether there is sufficient justification for such testing would require an evaluation of the area nearby and uphill of your well.

HEALTH SIGNIFICANCE

Until the factor(s) creating the T/O is identified, an assessment of health significance of T/O cannot be made.

When a well shows a noticeable and rapid change in T/O characteristics, after a long history (at least two to three years) of stable quality, the safety of the water source should be questioned and laboratory testing performed. Some wells have seasonal variation in T/O characteristics. If occurring every year, these would likely imply a condition of natural origin with lower risk.

TREATMENT

T/O characteristics generally can be removed from drinking water. The most common treatment options are listed below.

Aeration: In this process, large volumes of air are blown through the water. The T/O factors volatilize into the air bubbles. This air is vented to the outside of your home similar to the way moist, lint-laden air vents from a clothes dryer.

An important requirement of this method is the need to have clean air, free of dust, mosquitoes, etc. The principal disadvantage of aeration is the possibility of creating bacterial growth in the treated water and the high cost of the aeration equipment; please see fact sheet WD-DWGB-2-23 "Suggested Installation Practices for Drinking Water Treatment Aerators" at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm . Aeration is also beneficial in removing radon gas and carbon dioxide (CO_2). CO_2 can make water acidic, thus dissolving lead and copper from your plumbing; refer to fact sheet WD-DWGB-3-4 "Corrosivity of Water Supplies."

Oxidation: In this method, an oxidizing chemical (such as oxygen, potassium permanganate, ozone or chlorine) is added to the water. The oxidizing chemical reacts with the odor compounds, which are chemically destroyed. One variation on this process uses a Venturi nozzle to add small amounts of ordinary air to the water. Oxygen in the air reacts with the contaminants and the remaining air is removed from the water by an air relief valve. This system generally offers good service at low cost.

Adsorption: In this process, the raw water is passed through activated carbon. The carbon can be granular or a "pressed block." The T/O components are taken up and held on the interior surfaces of the carbon particles as the water passes through. Activated carbon may not fully remove certain T/O factors. Further, where radionuclides are high, adsorption of radon, uranium, radium and others radionuclides may create a low-level radioactive waste and/or a source of radiation within the home.

CHOOSING THE TREATMENT PROCESS

T/O treatment can be somewhat experimental. Typically one method will be tried to see whether that method works for your particular T/O type. If not, another method from those above will be tried. Experienced water treatment professionals will know which option to try first.

Where the T/O characterization is unusual, a so-called "pilot-size treatment process" could be tried. This approach allows the treatability of the T/O to be determined easily on a small-scale device before major effort and expense is committed to installing the full-size treatment device.

Often the laboratory will not be able to identify any of the contaminant(s) that likely would cause T/O. In such cases a treatment device, often activated carbon, will be installed at least at the kitchen sink with the hope of lowering the concentration of the unknown contaminant. In such situations the water is not necessarily thought of as pure, but the treatment is seen as improving an unacceptable situation.

T/O REFERENCES

Listed below are common T/O characterizations and the contaminants that may cause them. The principal reference for this list is: Taste and Odor in Drinking Water, Awwa Research Foundation Report, ISN 0-89867-864-1, 1996.

ODOR OR TASTE CHARACTERIZATIONS AND POSSIBLE CAUSES

CHARACTERIZATION	POSSIBLE CAUSE	LABORATORY TESTS
Metallic Taste	Metals in soil or rock	Iron and manganese
Sour, salty	From corrosive water	Lead and copper
Rotten eggs	Hydrogen sulfide	Hydrogen sulfide (need special bottle)
Musty		2 Methylisoborneol, chloroanisole
Earthy	Organic material	Geosmin
Potato bin-musty		Isopropyl methoxy pyrazine
Woody-earthy		Cadinene-ol
Cucumber	Algae	Trans-2, cis-6 nonadienal
Fruity, fragrant	Ozone	Aldehydes (greater than C7)
Fishy	Algae, diatoms	n-hexanal; n-heptanal, Hepta- and decadienals
Cod liver oil		decadienals
Mothballs	Industrial solvents	Volatile organics
Salty	Sea water, road salt	Sodium/chloride
Earthy	Cyanobacteria (blue-green algae)	Geosmin
Medicinal	Reacted chlorination	
Chlorine	Chlorination	

FOR ADDITIONAL INFORMATION

Please contact the Drinking Water and Groundwater Bureau and the New Hampshire Water Well Board at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at http://www.des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at www.des.nh.gov/-organization/commissioner/pip/factsheets/dwgb/-index.htm.

Note: This fact sheet is accurate as of July 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.