

Common Drinking Water Contaminants

	Symptoms	Causes	Acceptable Test Results	Treatment Options
Bacteria	Bacterial symptoms include: intestinal or internal illnesses and other diseases; changes in water color, taste, or odor; tests showing bacterial contamination.	Bacteria can come from surface water or wastes seeping into groundwater, your well or plumbing defects. A poorly located or constructed well and poorly disinfected or non-filtered water can also cause problems.	Your sample should show zero coliform colonies per 100 milliliters (ml) of water (bacteria not present) If you have 1 or more coliform colonies per 100 milliliters of water, resample. If a second test shows coliform, take corrective action.	Make sure the well is properly installed and check for leaks. Repair or replace well. Chlorinate the well and household plumbing. Boil water before using. Use distillation, chlorination, ozone, or ultraviolet light to kill the bacteria.
Nitrate or nitrite	All infants under six months of age are at risk of nitrate poisoning, but some infants may be more sensitive than others. Infants who are fed water of formula made with water that is high in nitrate can develop a condition known as blue baby syndrome (methemoglobinemia). This color change is caused by a lack of oxygen in the blood.	The capacity of nitrate to enter well water depends on many factors, including the potential sources and amounts of nitrate present, the type of soil and bedrock, and the depth and construction of the well. Common sources of nitrate include fertilizers, animal wastes, septic systems, municipal and industrial sewage treatment systems, landfills, urban drainage, and decaying plant debris. In most cases, elevated nitrate levels indicate general contamination of the aquifer at that depth.	Labs report nitrate results as either nitrate-nitrogen or nitrate. When reported as nitrate-nitrogen (NO ₃ – N) or nitrate and nitrite nitrogen (NO ₃ + NO ₂ - N) the acceptable level is less than 10 ppm (less than 2 ppm is preferred). When reported simply as nitrate (NO ₃), the acceptable level is less than 45 ppm.	If you can identify the source of the nitrate (such as a nearby barnyard or septic system) the best solution might be to clean up or remove the contamination source. Additional options include water treatment with ion exchange, reverse osmosis, or distillation, buying water, and deepening or replacing the well (nitrate is more commonly found in shallow wells).
pH and alkalinity	The lower the pH and alkalinity, the more likely that the water is corrosive. Corrosion of household plumbing usually causes green residues or stains on faucets, pots, and sinks. Leaks in pipes are another sure indicator.	Low pH values are most often caused by lack of carbonate minerals, such as calcium and magnesium. Alkalinity is a measure of the water's ability to neutralize acids, and so is directly related to pH. Water with high alkalinity (greater than 150 ppm) may cause lime buildup in plumbing. It results primarily from carbonate minerals, such as those found in limestone, dissolving in the water.	There is no health standard for pH or alkalinity. Values from 6.5 to 8.5 pH units occur in most natural waters. Alkalinity values near 150 ppm are considered ideal if the corrosivity index is satisfactory.	If pH or alkalinity values are too low, you should consider deepening your well, increasing the hardness and /or alkalinity of the water with a treatment device. If the pH or alkalinity is too high, soften water (don't soften the cold water tap for drinking water).
Heavy metals	Corrosive water may also indicate metal contamination. It's nearly impossible to taste, see, or smell most heavy metals, and they can reach toxic concentrations before any symptoms are noticeable. Iron is one exception: rust-colored water and stained sinks are one clue.	Most toxic heavy metals are more soluble in acidic water than in neutral or alkaline water. Waste disposal, mining water and industrial spills can contaminate groundwater with copper, zinc, cadmium, lead, mercury, iron, or chromium. Acidic groundwater can corrode plumbing and release elevated concentrations of copper, zinc, lead, and iron.	Drinking water standards for several metals are: Cadmium, 5 ppb Chromium, 100 ppb The drinking water standard for iron is 0.3 ppm. It is based on aesthetics, as iron doesn't harm health and may even be beneficial.	It is advisable to run your water for several minutes before using it for drinking or cooking if you plumbing includes lead pipes or lead solder. Where the source of metals in water is corrosion of household plumbing, install neutralizers after the pump to raise the pH and alkalinity and protect the plumbing. If the groundwater contains metals, consider a reverse osmosis drinking water system.
Arsenic	Corrosive water may indicate arsenic contamination. It's nearly impossible to taste, see, or smell arsenic, and it can reach toxic concentrations before any symptoms are noticeable.	In many parts of Michigan arsenic is primarily from natural deposits in the soil. Arsenic is found in aquifers throughout the county, though concentrations are highest in the northern townships.	An arsenic test is available from the MDEQ. Contact the health division for more information on getting your water tested. The health standard for arsenic is 10 ppb.	Arsenic can be removed from water through ion-exchange or reverse osmosis filters. A new well may also access water with lower arsenic concentrations.

Lead	Lead is a toxic metal that can damage the brain, kidneys, nervous system, red blood cells and reproductive system. It is a greater hazard to young children, infants, and fetuses than to adults. Developmental and learning disabilities are possible in children, as well as low birth weight.	The highest levels of lead occur when very corrosive water stands motionless in lead or lead-soldered copper pipe for long periods of time. Homes constructed before 1985 of that have very soft water are more likely to have lead problems.	A lead test of the first draw water, which sat in the plumbing all night, can identify if there is a problem. Contact your local health department for interpretation of the results.	To reduce lead in drinking water, don't drink water that has been in contact with your house plumbing for more than 6 hours. Before using water for cooking or drinking, flush the cold-water faucet by allowing the water to run until it is as cold as it will get (usually 2-3 minutes). Also, do not use the water from the hot water tap for drinking or cooking. Hot water dissolves lead in the plumbing system more quickly than cold water. A long-term solution is to install a reverse osmosis drinking water system.
Atrazine and other pesticides	There are no specific symptoms for low levels of all pesticides. In high doses, some pesticides can cause liver, kidney, or nervous system damage, and cancer.	Most pesticide detections occur in rural areas, although properties where pesticides are stored and handled have also proven vulnerable to contamination. Leaks or spills around storage facilities may be primary causes of this problem. You may suspect this problem if pesticides are used or handled near your water supply.	Drinking water standards have been set for individual pesticides. For example: Atrazine, 3 ppb Alachlor, 2 ppb Aldicarb, 3 ppb Carbofuran, 40 ppb Chlordane, 2 ppb Simazine, 4 ppb	Treatment options include activated carbon filters in series and distillation. Pesticide applicators should rinse tanks and use the rinse water on farm fields.
Taste and odor	In general, there are three types of odor problems associated with drinking water quality. Symptoms of taste and odor problems usually fall into these categories: <ol style="list-style-type: none"> 1. The water smells like rotten eggs, 2. The water smells earthy or musty, 3. Or the water smells like gasoline or chemical solvents. 	Hydrogen sulfide gas gives water a rotten egg odor if the water is slightly acidic and lacking oxygen. The source may be natural if water has passed through organic soils or areas where organic waste leaches to groundwater, landfill sites, manured areas and septic systems on wet soils. Musty or earthy smelling water may result from compounds from decomposing natural organic matter entering the water supply. If water smells like gasoline or chemical solvent, volatile organic compounds, gasoline, solvents or cleaning agents in the water may be the reason. Chemical spills, pump oils, improper water disposal (septic systems, land spreading) leaking storage tanks and other sources of these chemicals may also cause this problem.	There are currently no drinking water standards for taste and odor. Have your water tested for volatile organic compounds if you have a gasoline or chemical solvent taste or odor. Health based drinking water levels for components of gasoline have been established (ex. Benzene 5 ppb).	Treatment for each of these problems is fairly similar and consists of using greensand iron or carbon filters in the case of the rotten egg smell problem, and chlorination or activated carbon filters in the case of other odor problems. If levels for volatile organic compounds are high you may need to get bottled water or a new well.

For more information about drinking water contaminants and water testing, contact your local health department or the Michigan Department of Environmental Quality, Drinking Water and Radiological Protection Division at (517) 335-8298.

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