

Bacteria & Virus Issues

Microbial and organic contaminants can't always be detected through sight, smell or taste. You might go years before realizing a problem exists.

Although some waterborne microbes can cause illness, many microbes are harmless or even beneficial. Very small levels of microbes are naturally present in many water supplies, but some are more dangerous than others. Some of the more dangerous microbial contaminants, such as *E. coli*, *Giardia*, and *Cryptosporidium*, can cause gastrointestinal problems and flu-like symptoms commonly attributed to undercooked or improperly stored food. They include:

Bacteria: Single-celled organisms lacking well-defined nuclear membranes and other specialized functional cell parts which reproduce by cell division or spores. Bacteria may be free-living organisms or parasites. Bacteria (along with fungi) are decomposers that break down the wastes and bodies of dead organisms, making their components available for reuse. Bacterial cells range from about 1 to 10 microns in length and from 0.2 to 1 micron in width. They exist almost everywhere on earth. Some bacteria are helpful to humans, while others are harmful.

Viruses: Parasitic infectious microbes, composed almost entirely of protein and nucleic acids, which can cause disease(s) in humans. Viruses can reproduce only within living cells. They are 0.004 to 0.1 microns in size, which is about 100 times smaller than bacteria.

Cysts: Capsules or protective sacs produced by many protozoans (as well as some bacteria and algae) as preparation for entering a resting or a specialized reproductive stage. Similar to spores, cysts tend to be more resistant to destruction by disinfection. Fortunately, protozoan cysts are typically 2 to 50 microns in diameter and can be removed from water by fine filtration.

There are both chemical and physical ways to disinfect water. Chemical disinfection often uses halogens such as chlorine, iodine, bromine, or ozone, while common physical choices are ultraviolet (UV) light, ultrafiltration, and distillation. These processes can eliminate 99.9 - 99.9999% of harmful microorganisms.

Water treatment can address pathogenic microbiologicals through the following techniques:

Chlorination

The treatment process in which chlorine gas or a chlorine solution is added to water for disinfection and control of microorganisms. Chlorination is also used in the oxidation of dissolved iron, manganese, and hydrogen sulfide impurities. This method of disinfection involves adding chlorine to water to make it safer to drink. It's common, cost-effective, and quick, killing many pathogenic microorganisms. It can even oxidize or break down iron, manganese, and hydrogen sulfide, which can result in water that is clearer and tastes better.

Some people find that chlorine gives water its own objectionable chemical taste and odor. It also can produce disinfection byproducts (which may cause health issues) by reacting with other substances in water when stored. These byproducts can often be filtered out with activated carbon.

Ultraviolet (UV) Light

The UV disinfection method, which does not involve chemicals, has long been popular for commercial use, but is becoming more common in homes. UV systems expose water to light at just the right wavelength for killing microbes. It's a way to kill bacteria, viruses, fungi, protozoans, and cysts that may be present in the water.

The effectiveness of UV treatment depends on the strength and intensity of the light, the amount of time the light shines through the water, and the quantity of particles present in the water. The light source must be kept clean and the UV lamp replaced periodically. UV light treatment can't remove gases, heavy metals, and particulates; for that reason higher-end systems may include additional filtration such as activated carbon.

Ozone

Ozone is produced when oxygen is exposed to high-voltage current. The use of ozone in water treatment can destroy viruses, bacteria, and other microorganisms, while also removing iron, sulfur and manganese. Ozone does its job quickly and then rapidly decomposes, cutting down on the introduction of harmful disinfection byproducts and foul tastes or odors associated with chlorination. This process tends to be more costly and energy-consuming and is typically used commercially or by large municipalities.