

# Drinking Water Purity

Fact Sheet



*In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists. – Eric Hoffer*



**Building Biology Institute**  
The science of healthy buildings

## Drinking Water Purity

Disease due to waterborne contaminants can be transmitted to humans in myriad ways, such as: eating foods that have been washed in tap water; breathing in water spray (such as in a shower or near a decorative fountain); or by direct consumption. Common contaminants found in the water supplied to indoor environments include, but are not limited to: Microbial, Inorganic (includes lead, asbestos), Organic (other than microbial), and Pesticides and Herbicides.

Microbial contaminants include living organisms, such as bacteria, parasites, and algae, as well as viruses (viruses are not considered to be alive because they cannot reproduce without a host cell – human cells, for example). While waterborne diseases are most prevalent in developing countries, the United States and Canada have been seeing a rise in the occurrence of waterborne disease specifically associated with viruses and parasites. One prominent example is the Legionella bacterium, which can cause a serious pneumonia-like infection. Reverse osmosis, ultra filtration-type membranes, and ceramic filters are the only home filter systems capable of filtering down to the viral size range. It should also be noted that activated carbon filters can become a breeding ground for bacteria and thus should never be used on a source of water that is not already bacteria-free.

Inorganic contaminants are elements not bound to carbon and hydrogen. The term inorganic includes metals and their alloys (like iron, copper, aluminum, brass, bronze); minerals (such as salt, asbestos, silicates, arsenic, fluoride); mineral-based chemicals; and non-metallic elements (like silicon, phosphorus, arsenic, lead, fluoride, and chlorine). Some metals are necessary trace nutrients for our metabolic biochemistry, but can become toxic in too high a dose, such as chromium, copper, and selenium. Other metals are directly toxic, such as lead, arsenic, beryllium, cadmium, thallium, and mercury, with no known safe levels in the body. Reverse osmosis is the best-known method to remove inorganic contaminants from water.

Organic contaminants are those which have a bond between a carbon atom and a hydrogen atom ( $\text{CH}$ ), and include microorganisms and man-made organic compounds. Many are naturally-occurring organic chemicals and are completely harmless. The class of organic chemicals that are considered water contaminants are man-made, synthetic chemicals, such as solvents, petroleum-based chemicals, pesticides, herbicides, and PCBs. Since the 1930's, the production of synthetic organic chemicals has increased almost exponentially, and only a relative handful of them are directly regulated via the 1974 *Safe Drinking Water Act*. The inception of industrial manufacturing precipitated the dumping of organic chemicals into our surface waters by industrial plants. This dumping, coupled with the constant runoff of agricultural chemicals into surface waterways, has led to our present environmental situation, in which almost all fresh water exhibits some signs of organic pollution. Activated charcoal is the sole answer for removing most synthetic organic chemicals from water. Probably the best overall methodology for protection is to install a large-capacity activated charcoal filter at the point of water entry into the house, with an additional stage of reverse osmosis for drinking and cooking water.

Pesticides and Herbicides are a subset of synthetic organic chemicals that deserve special attention as water contaminants. Mostly petroleum based, these chemicals started



finding widespread use in the 1940's. The first warning signs were not evident until the early 1960's when scientists began to realize that many of these chemicals had a long lifecycle in the environment, and could cause harm to wildlife well beyond their intended usage. Since these compounds can become concentrated in the fat cells of animals from their food sources, they can ultimately wind up in the human body through consumption of animal meat and byproducts. As a prime example: even though DDT has been banned for decades, it can still be found in the breast milk of new mothers. These chemicals get into our water from agricultural runoff, spraying on private residential lawns and golf courses, aerial spraying for bug control, and countless other means. The most effective means of removal for pesticides, herbicides, and other synthetic organic chemicals is reverse osmosis. Activated charcoal filters can also be very effective at removing pesticides, but they have limited capacity and need to be maintained diligently.

The World Health Organization states that 80% of infectious diseases worldwide are waterborne. If your tap water has not been filtered by these recommended processes, you are likely drinking, cooking, washing your food, and bathing with contaminated water. It is worth noting that viruses and single-celled parasites are resistant to extermination by chlorine (itself a contaminant) which is usually the first line of defense used in most parts of the United States against microbiological contaminants.