The Right KIND OF TEST

WATER CONTAMINANTS AND BOTTLED WATER TESTING

By Barbara L. Marteney

Drinking water purity is a subject that concerns everyone and is frequently under scrutiny. As water travels through the air, over the land, into streams, rivers, lakes, and through the earth, it comes into contact with many substances that can be absorbed into the water.

One of the benefits the earth provides to groundwater is a natural filtration process as it seeps through sand and various rock formations underground before finding its way into an underground aquifer. Contaminants can be removed or added as water goes through this natural cycle, but what are these contaminants?

Drinking Water Contaminants

A contaminant in drinking water can be defined as any substance other than pure H_2O. Some contaminants may be undesirable as they may pose a health risk or impart an undesirable taste, odor or color. Other contaminants are considered desirable in drinking water for the taste or health benefits they are believed to provide. These desirable or undesirable contaminants can be broken down into the following classifications:

Microbiological. Microscopic living organisms such as bacteria, viruses, mold, algae, etc.

Inorganic. Metals, minerals and chemical substances that do not contain hydrocarbons such as calcium, potassium, arsenic, iron, lead, nitrates, etc.

Organic. Compounds with a carbon-hydrogen structure that can be broken down into volatile organic chemicals such as cleaning solvents and petroleum by-products, or semi-volatile organic chemicals such as pesticides, herbicides and base/neutral acid extractable compounds.

Radiological. Elements that emit atomic energy, generally in the form of alpha and beta particles or gamma rays such as uranium, radon, radium, etc.

Regulation of Drinking Water for Contaminants

The U.S. Environmental Protection Agency (EPA) continually evaluates potential contaminants and determines which ones pose a real risk in drinking water and should be regulated. The EPA National Drinking Water Standards, established under the Safe Drinking Water Act (SDWA), categorize drinking water contaminants as either primary or secondary. Primary contaminants have been shown to pose a health risk in drinking water. Secondary contaminants have shown no potential health impact. They are regulated for aesthetic reasons such as taste, color, odor or potential plumbing nuisance.

The EPA establishes maximum contaminant levels (MCL) for regulated contaminants. An MCL is the practical and legally enforceable standard with which a public water supply must comply. These levels are usually based on individuals consuming eight 8-oz. servings of water contaminated at that level each day over the course of a lifetime, resulting in a less than one in 100,000 to one in one-million chance of adverse health effects.

Because bottled water is regulated as a food product, the Food and Drug Administration (FDA) establishes the list of contaminants and safe levels for which it must be tested based on those established by the EPA for public water supplies. These guidelines, which bottled water must meet, are the Standards of Quality (SOQ). By law, all bottled water in the U.S. must be in compliance with the FDA SOQ, ensuring that it is safe to drink.

Established MCLs are sometimes reevaluated. Based on new data, MCLs may be changed in order to be more protective of public health. One such case was with arsenic. On Oct. 31, 2001, the EPA announced it would implement a new standard for arsenic in drinking water. The new MCL was changing to 10 parts per billion (ppb) from the original 50 ppb. The EPA estimated that the new standard would affect about 3,000 community water supplies and about 1,100 nontransient, noncommunity water systems, which would have to install additional water treatment equipment to further reduce arsenic levels below the new limit. In order to allow time for systems to comply, the effective date of the new MCL was January 2006. This limit is also applicable to bottled waters.

Arsenic is a naturally occurring compound that poses a problem for drinking water in many areas across the U.S. In drinking water, it is commonly found in two forms: arsenite (+3) and arsenate (+5) (arsenic III & V), which call for different treatment methods.

Arsenite is more prevalent in groundwater, and arsenate is more common in surface water supplies. Other sources of arsenic contamination in drinking water include pesticides, industrial waste, smelting, old cemeteries and various manufacturing processes.

Because the EPA reduced the allowable level, arsenic has become a problem for some public water systems and bottled water companies who did not have an issue at the previous MCL, so there has been even more concern and speculation about treatment options. If a standard water analysis—which tests for total arsenic—indicates that there is arsenic in the water, a more specialized arsenic speciation test can be performed to determine the type of arsenic present. If arsenic III is found, it can be converted to arsenic V by some process of oxidation for efficient removal. Reverse osmosis can then be used to remove arsenic V.

With the ever-changing drinking water regulations, water systems and bottled water producers must be vigilant in the ongoing evaluation of their water quality. Producers need to be aware of how their water measures up to current regulations, as well as anticipating how regulatory changes could affect their business in the future.

An excellent way for bottlers to stay tuned in to regulations and other issues that could affect them is to be active in industry associations, such as the International Bottled Water Association or regional associations such as the Northeast Bottled Water Association, the Southeast Bottled Water Association or the Mid-Atlantic Bottled Water Association. These organizations support the industry in many ways, including monitoring of pending regulations. They advise members of upcoming issues, offer advice on steps to be taken to maintain compliance and provide educational opportunities.

Onsite Routine Monitoring

In addition to the testing that bottlers must routinely perform with a certified lab in order to comply with FDA and state regulations, they need to have an effective, consistent routine monitoring program in place with thorough documentation.

Determining what to test, where to sample from, the number of sampling points in the process and the frequency depends on the type of water being produced and the processes or equipment being used. A bottler's Hazard Analysis and Critical Control Points plan is an integral part of establishing the routine monitoring program. In general, a good guideline is at the beginning, middle and end of production runs. At a minimum, all onsite testing programs should include the following tests:

- Microbiological – At least daily or more frequently to bracket production runs throughout the day;
- Ozone residual – Recommended every half hour;
- Conductivity – Monitored frequently to confirm product consistency;
- pH – At start-up and regular intervals throughout production; and
- Fluoride (if applicable) – Fluoridated product waters are usually tested at startup and a couple of times per shift for consistency as water travels through the air or over the land.

The data accumulated from these routine quality control monitoring programs are an invaluable tool for detecting processing problems, troubleshooting, tracing potential sources of contamination and providing a first line of defense when dealing with quality complaints.

Determining what testing is appropriate for regulatory and quality control concerns can be complicated. Bottlers who do not have the resources to effectively manage this internally should consult their equipment suppliers, laboratory representative, regulators or a consultant experienced in the bottled water industry in order to determine what testing is appropriate for their facility. *wqp*

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