

First time  
in the history of Bottled  
Water industry

# AQUASIL

## KB-00

**A USFDA Approved and Patented Technology for the  
Safe Use on Bottled Drinking Water Disinfection\***

*The formulation when used on bottled drinking  
water has a myriad of advantages:*

- Nontoxic
- Noncarcinogenic
- Nonmutagenic
- Nonirritant to respiratory tracts, eyes, and skin
- Odorless
- Colorless
- Tasteless
- Nonfoaming
- Offers rapid and long-term disinfection
- Has a broad spectrum of germicidal activities
- Chlorine-free
- Ozone-free
- No formation of DBPs
- Short-and-long-term antimicrobial effects
- Practically 100% biodegradable
- Does not affect color and odor of drinking water



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People in industrialized and almost all developing countries suffer from the inadequacy or hazardous condition of public drinking water supplies. A wide variety of known waterborne diseases, including those associated with children's diarrhea, are rampant.

Chemical methods used for the disinfection of drinking waters depend mostly on selected chemicals with oxidizing and biocidal properties. Their practical applications range from removing undesirable constituents to disinfecting water supplies, wastewater treatment effluent, or industrial waters. The most commonly used chemicals for the treatment of drinking water including bottled drinking water are chlorine and ozone.

With the concomitant use of chlorine and ozone, disinfection-by-products (DBPs) with deleterious health effects, most notably carcinogenic compounds are produced. The most common DBPs associated with the use of chlorine are trihalomethanes (THMs), halogenetic acetic acids (HAAs) and chlorite, while with ozonation is mainly bromate.

Chlorinated water forms hazardous THMs when employed to treat drinking waters, resulting in the development of cancer and deleterious reproductive and developmental effects, including miscarriages. In addition, THMs are suspected to damage the liver, kidneys and central nervous system. Like THMs, HAAs are an important type of chlorinated DBPs, which are carcinogenic. Chlorite is also a chlorine-based DBPs and it is suspected to cause anemia in young children and can cause various nervous system disorders.

The most notable disinfection-by-product resulting from ozonation is bromate, which is a proven carcinogen. Ozone oxidizes bromide present in drinking waters, forming the carcinogen bromate.

Since the discovery of these harmful DBPs which are formed during the disinfection of drinking waters, disinfection by-products (DBPs) have been the subjects of extensive research. It is now clear that essentially all-chemical disinfection practices appear to produce DBPs. Among water utilities, the practical need to comply with existing and proposed regulatory limits for DBPs has spurred with considerable efforts to limit DPB formation. While health and ecological risks from DBPs in drinking and wastewater are not fully understood, control of DPB formation must be balanced with the need to destroy or inactivate waterborne pathogens in order to prevent infectious disease. More stringent requirement by the USEPA will require increased disinfection capability and lower DBPs in the near future.

The principal approaches used today to prevent DBPs from reaching drinking water are DBPs precursor removal and disinfection process control. However, both methods work against each other in that if DBPs are acceptably removed, then the disinfection level is jeopardized and vice versa. So, there must be a balance between these two factors. Other possibilities include the use of alternative disinfectants and/or physical disinfection processes, and the removal of DBPs from finished water. Alternative chemical disinfectants, e.g., chloramine, chlorine dioxide, iodine, titanium dioxide, and potassium permanganate, may have limitations that include poor antimicrobial properties, direct toxicity, and again the production of toxic DBPs. Physical processes such as UV radiation, ultrasonic treatment, and membrane filtration do not provide the residual effect necessary to maintain disinfection throughout the water distribution system and prevent bacterial re-growth, not to mention expensive equipment, high operating cost and maintenance, and large electricity requirements.

Although hydrogen peroxide has been known for its high oxidative and germicidal activity, its application as a water disinfectant has not gained wide acceptance because it decomposes readily to water and oxygen under the agency of ultraviolet light, and in the presence of copper and iron already present in drinking waters.

Accordingly, novel approaches for the treatment of drinking waters are mandatory and are in grave need.

Our newly and novel bottled drinking water formulation "AQUASIL KB-00" is the ideal formulation that is applicable to bottled drinking water and large-scale water disinfection, rendering drinking waters residual and continuing antimicrobial actions. The two active biocidal constituents of this product are hydrogen peroxide and silver both of which are stabilized using generally recognized as safe (GRAS) constituents as listed in the United States Food & Drug Administration (USFDA) code of federal regulation. AQUASIL-KB-00 can significantly reduce DBP concentrations that result from the application of chlorination and ozonation and other methods. The disinfectant, a silver-hydrogen peroxide ( $Ag^+/H_2O_2$ ) formulation with other stabilizers, is designed for use as a primary disinfectant in bottled drinking water in order to provide a safe and highly effective antimicrobial agent. Thus, the stabilized  $H_2O_2$  acts as a quenching agent for DBPs, in addition to its residual disinfectant properties in a synergistic fashion with stabilized  $Ag^+$ .

The formulation of AQUASIL KB-00 encompasses the following unique advantages:

- \* A very recently approved USFDA formulation to be used in bottled drinking water as a long-and-short-term disinfectant (21 CFR Part 172 [Docket No. FDA-2005-F-0505]; Published March 18, 2009). This is the first approval of its kind granted by the USFDA.
- Worldwide patented technology (US Patent Nos. 6,242,009, 6,630,172 and 6,939,566 B2; Canadian Patent No. 2,369,828; French Patent No. 1180936; Great Britain Patent No. 1180936; German Patent No. 60011613; European Patent No. EP-1180936 B1).