

## OurwaterQuality

# Chlorination, Part One: The Addition

“Chlorination” involves the addition of chlorine to water for the purpose of eliminating pathogenic (disease-causing) microorganisms. It also provides protection against disagreeable tastes and odors; eliminates slime bacteria, mold and algae; removes chemical compounds that inhibit disinfection; and helps remove iron and manganese from water.

In 1997, the editors of *Life* magazine stated that the filtration of drinking water plus the use of chlorine were probably the most significant public-health advances of the millennium. Prior to 1908 and the onset of widespread and routine treatment of drinking water with chlorine, waterborne diseases exacted a heavy toll in terms of illnesses and death in the United States. Today, most water-related disease outbreaks are associated with disinfection failure, water-main breaks, or natural catastrophes. How fortunate we are in this country. According to the World Health Organization, 1.8 billion of the earth's people lack access to safe drinking water, and some 3.4 million people (mostly children under five) die every year from water- and sanitation-related diseases.

Drinking-water pathogens can be classified in three broad categories: bacteria, viruses, and parasitic protozoa. Bacteria and viruses contaminate both surface water and ground water, and parasitic protozoa occur predominantly in surface water. Chlorination is very effective at eliminating microorganisms in general, but it is not a panacea: some emerging pathogens such as the protozoan parasites *Cryptosporidium* and *Giardia* are resistant to chlorination and must be removed by physical filtration.

Effective chlorine disinfection is a skillful balance of the overall water chemistry, the pH, and contact time. Water utilities must ensure that the water system has a suitable concentration of chlorine for the appropriate period of time. They need to diligently monitor chlorination to ensure that their equipment is working and that they are providing potable water to their customers. To ensure continued protection against harmful organisms, the EPA requires that residual chlorine remains in the transmission lines all the way to consumers' taps. This is particularly important for cities with aging water infrastructure.

The significance and success of chlorinating drinking water is unquestionable, but the story is not all good news. Some critics argue that we do not use chlorine because it is the

adverse effects on skin and hair. And the objectionable taste of chlorine is thought to be a factor for some people who choose to hydrate with less healthful beverages.

But perhaps the biggest concern about chlorination is that the process can result in the formation of a group of disinfection byproducts (DBPs) known as trihalomethanes (THMs) and haloacetic acids (HAAs), which are formed along with other disinfection byproducts when chlorine or other microbial disinfectants react with naturally occurring organic and inorganic matter in water. The number and nature of DBPs make it impossible to characterize fully all of the byproducts formed during the treatment of drinking water. In a study commissioned by the EPA, more than 500 disinfection byproducts were identified and a short list of 50 DBPs was created for future investigation as health risks. Currently,

DISEASE	CAUSATIVE ORGANISM	SOURCE OF ORGANISM IN WATER
<b>BACTERIA</b>		
Cholera	Vibrio cholerae	Human feces
E.coli	Echerichia coli	Ruminant and pig feces; birds
Salmonellosis	Salmonella species	Animal (incl. human) feces
Typhoid	Salmonella typhi	Human feces
<b>VIRUS</b>		
Infectious hepatitis	Hepatitis A (HAV)	Human feces
<b>PARASITES</b>		
Amoebic dysentery	Entamoeba histolytica	Human feces
Cryptosporidiosis	Cryptosporidium sp.	Animal (incl. human) feces
Giardiasis	Giardia lamblia	Animal (incl. human) feces

safest or even the most effective means of disinfection, but simply because it is the least-expensive alternative. There is also widespread concern about the risk of inhaling chlorine while showering and the

four disinfection byproducts are regulated by the EPA, under amendments to the Safe Drinking Water Act.

THMs and HAAs are potentially carcinogenic and have received



**STEPHEN WIMAN**

widespread attention. If organic materials are not removed from surface waters, the production of THMs is actually greater than with subsurface (aquifer) water because of the relative higher organic content of surface waters. Water utilities remove organic material from the source water before disinfection to minimize DBP formation as it is more cost-effective to reduce formation of DBPs than to remove them from the treated water.

The controversies involved with chlorination of drinking water are largely about managing the portfolio of risks of microbiological versus chemical contamination, but chlorination in some form to eliminate microbial threats is here to stay in municipal systems. The best health protection we can have is to consider the options for reducing chlorine within our homes. In future columns, we will explore the options for removing chlorine and the claims and the facts of what these methods will and will not remove in addition to chlorine.

*Stephen Wiman has a background in earth science (Ph.D. in geology) and is the owner of Good Water Company in Santa Fe. He may be reached at 505-471-9036 and [skwiman@](mailto:skwiman@)*

## Building permits

**Building permits issued by the CITY OF SANTA FE from mid-May to mid-June included the following:**

**Baylor Trapnell**, 2055 Cerros Altos. \$500,000.  
**Vistas Bonitas SD LLC**, 5309 Circita del Norte. \$116,750.  
**Mitch & Karen Koople**, 1236 Camino de Cruz Blanca. \$750,000.

**Centex Homes**, 4207 Vegas de Sueños. \$95,639.

— 4208 Vegas de Sueños. \$95,639.

**J&J Business**, 562 Valle Chamiso Ln. \$400,000.

**Rick & Beth Schnieder**, 717 Acequia Madre. \$800,000.

**SBS LLC**, 1551 Kokosori. \$209,859.

**Walton Chapman**, 2114 Plazuela Vista. \$375,428.

**SANTA FE COUNTY building permits issued from mid-May to mid-June included the following:**

**Richard & Jarete Macek**, 101 Rito uici. \$450,000.

**SunCor Construction**, 87 Calle Agua Clara. \$145,000.

**Douglas Kaye**, 15 Rabbit Brush. \$350,000

**Anthony Medina**, San Sebastian Subdiv. \$68,000.

**Jeffrey Averhoff**, Stanley. \$350,000.

**Hugo Ochoa**, 59-A South Fork. \$180,000.

**John & Margo Gomez**, Pojoaque. \$202,290.

— 215 E. Chili Line Rd. \$291,217.

— 79 Via Orilla Dorado. \$136,017.

— 67 Via Sagrada. \$78,500.

**22 Park Estates LLC**, 47 Via Pampa. \$625,000.

**Alan Pate**, Ojo de la Vaca. \$1,252,600.

**Jeff & Susan Segler**, Pojoaque. \$235,000.