Disinfection Byproducts

Southwest Hydrology
University of Arizona - SAHRA
P.O. Box 210158-B
Tucson, AZ
85721-0158
Address Service Requested

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Chemical disinfection of drinking water—commonly using chlorine, ozone, or chloramines—destroys disease-causing bacteria and viruses and improves the health of populations worldwide. But the process has a downside: residual disinfectants combine with naturally occurring organic matter in water to form disinfection byproducts (DBPs), including several that can be carcinogenic and hundreds of others whose toxicity is unknown.

Water providers must walk a fine line between providing sufficient disinfection and minimizing byproduct formation. Changing the type of disinfectant can reduce the formation of the nine federally regulated DBPs, but it also can increase production of others, some of which could be more toxic than the regulated ones. This issue’s feature articles address DBPs from a variety of angles, from how they are formed and how utilities can treat them to their fate in the subsurface.

Mark your calendars now for Aug. 29-Sept. 1, 2007 so you don’t miss the first-ever Southwest Hydrology symposium, sponsored jointly with the Arizona Hydrological Society. We’re planning a regional discussion about limits to our water resources and how they might be addressed in this era of rapid growth in the Southwest. If you have ideas, please send them to me, and check our website for updated information.

As always, we are grateful to all the contributors to this issue, and encourage you to patronize and thank our advertisers for their support of the magazine.

Betsy Woodhouse, Publisher

Cover concept by Mike Buffington. Photography by Kyle Carpenter.
Disinfection Byproducts

Chemical disinfection of drinking water is arguably one of the greatest advances in human health. However, nothing is perfect. The byproducts that form when disinfectants combine with otherwise harmless compounds in water warrant our attention. Although the carcinogenic nature of some disinfection byproducts (DBPs) was first shown in the 1970s, only a few of the hundreds that have been identified are regulated. What are DBPs? How and where do they form, and how do utilities manage them? How do recent stricter compliance standards affect utilities? What is known about other DBPs besides the few that are federally regulated? And what is the fate of DBPs in the subsurface when treated water is used as recharge water to replenish aquifers? This issue’s feature articles help answer such questions.

The ABCs of DBPs
Philip C. Singer
Disinfection of drinking water with chlorination, ozonation, or other chemical methods can cause the formation of DBPs, which have been associated with adverse health effects. What are the factors influencing their formation and how are they being sampled, measured, and regulated to protect human health?

A Utility’s-Eye View of Disinfection Byproducts Compliance
Suzanne Grendahl and Carie Wilson
Scottsdale, Arizona took a multi-phased and proactive approach to achieving compliance with DBP Stage 2 requirements, addressing water storage in the distribution system, developing an extensive monitoring program, creating a water quality model, and identifying capital improvements.

Chemistry and Treatment of Disinfection Byproducts in Drinking Water
Paul Westerhoff
When, where, what kind, and what quantity of disinfection byproducts develop depends on the water quality and type of treatment used. Most treatment plant operators opt to control DBP formation by reducing precursors or using alternative treatments rather than trying to remove them after they form.

A New Generation of Disinfection Byproducts
Using alternative disinfection methods to reduce the formation of regulated disinfection byproducts has produced a new generation of DBPs, of which little is known about their prevalence and characteristics. Summarized from a paper published in Environmental Science and Technology, this article sheds some light on the new priority DBPs.

Experimental Investigation to Limit Trihalomethane Production
J.F. Leising and Eric Dano
Faced with a tripling of total trihalomethane in the water during transit between its Lake Mead treatment facility and its aquifer storage wellhead, the Southern Nevada Water Authority evaluated methods to neutralize free chlorine in delivery system water.

Attenuation of Disinfection Byproducts During ASR Storage
R. David G. Pyne
To store water for long-term needs, large volumes of water are increasingly being artificially recharged to aquifers. Because the recharged water is typically treated, knowing the subsurface fate of DBPs is important. New research is helping determine the subsurface processes that favor DBP attenuation.

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