

## WATER SYSTEMS, DISINFECTION BYPRODUCTS, AND THE USE OF MONOCHLORAMINE

### 11) Other than chlorine and **monochloramine**, what options could water utilities consider to control the levels of **disinfection byproducts**?

***Water utilities have several options for reducing **disinfection byproducts** other than chlorine and **monochloramine**.***<sup>1</sup>

- One option for reducing disinfection byproducts is to reduce the amount of time water spends in pipes.<sup>2</sup>
- Another option for reducing disinfection byproducts is to use **ozone** or ultraviolet (UV) light.<sup>3</sup>
- A third option for reducing disinfection byproducts is improving filtration to reduce natural organic matter in water that react with disinfectants to form byproducts.<sup>4</sup>

***The options for reducing **disinfection byproducts** have disadvantages.***

- Better system management to reduce the amount of time water spends in pipes or improved filtration methods may still not be enough to reduce regulated byproduct levels.
- **Ozone**, UV and some improved filtration processes require a high level of sophistication, expertise, and management skills to operate successfully.
- One disadvantage of ozone and ultraviolet (UV) light is they often require the installation of new and expensive technology, making it impractical for many utilities.

***Utilities use chlorine or monochloramine to protect drinking water from harmful organisms in pipes.***

- The major disinfection alternatives to chlorine and monochloramine can reduce the formation of some disinfection byproducts but can increase the production of others.
- The major treatment alternatives for reducing disinfection byproducts do not by themselves provide adequate protection for drinking water as it moves through water pipes.
- EPA encourages water utilities to consider a full-range of alternative technologies and operational practices<sup>2</sup> for reducing disinfection byproducts.

*Additional Supporting Information:*

1. Guidance manuals are available at:

<http://www.epa.gov/safewater/disinfection/stage2/compliance.html>. Hard copies are available by ordering publications through EPA's Water Resource Center (phone: 202-566-1729).

2. Certain regulated disinfection byproducts may increase over time as water continues to react with natural organic matter. *Natural Organic Matter*: Complex organic compounds that are formed from decomposing plant, animal and microbial material in soil and water. They can react with disinfectants to form disinfection by products. Total organic carbon (TOC) is often measured as an indicator of natural organic matter. Operational practices for reducing water age include flushing programs and eliminating dead-end locations in pipes.

3. UV is effective at inactivating disease-causing protozoa such as *Cryptosporidium*.

4. In some cases, natural organic matter (precursors to DBP formation) can be removed. Removal technologies include nanofiltration, enhanced coagulation, granular activated carbon, enhanced coagulation, or ozone followed by biologically active filtration.