NATIONAL TOXICOLOGY PROGRAM
FACT SHEET
Headquartered at the National Institute of Environmental Health Sciences • NIH • DHHS

SAFE DRINKING WATER PROGRAM

Year 2006

The introduction of chlorination of drinking water supplies as a standard treatment has greatly decreased mortality from infectious disease and is a major public health advance in the 20th century. However, chemical contaminants, both those associated with the disinfection process (DBP or disinfection by-products) and those occurring naturally or by contamination in public water systems may still be present in finished water.

More than 200 million Americans use treated drinking water. Because of the public health benefits of water disinfection, a critical issue facing water utilities and the Environmental Protection Agency (EPA) is how to minimize the potential for chemical-related adverse health effects while still achieving effective control of waterborne microbial pathogens. Determining health risks from exposure to DBPs is a challenge, since different disinfection processes result in different DBPs and the source of water and time of year also influence the presence and relative concentrations of these chemicals. The National Institute of Environmental Health Sciences through the National Toxicology Program (NTP) is providing scientific data on those DBPs that are important for EPA's standard-setting process.

DPB Chemicals	Ongoing NTP Studies	Completed Study's Findings
Bromochloroacetic acid	•Chronic toxicity/carcinogenicity testing, neuro-toxicity, chemical disposition, reproduction studies •Toxicokinetic studies to characterize bio-chemical and physiological parameters, controlling absorption, distribution, metabolism and elimination	•Reduced implantations.
Bromodichloromethane (BDCM)	•Subchronic testing •Chronic testing in transgenic models**	•Carcinogenic in lab animals by gavage. •Not carcinogenic at lower doses in drinking water. •No effect on reproduction. ** No evidence of carcinogenic activity in p53 haploinsufficient mice.
Bromoform	Chronic toxicity/carcinogenicity testing	Carcinogenic in lab animals by gavage.
Chloramine	Immunotoxicity studies (see endnotes for suggested reading)	
Chloroform	•Chronic toxicity/carcinogenicity testing • Immunotoxicity studies	•Carcinogenic in lab animals by gavage. •No immunotoxic effects in drinking water.
Chlorodibromomethane	•Chronic toxicity/carcinogenicity testing •Reproduction studies	•Carcinogenic in lab by gavage. •No effect on reproduction.
Dibromoacetonitrile	Chronic toxicity/carcinogenicity testing, neurotoxicity chemical disposition	No effect on reproduction.
Dibromochloroacetic acid	Reproduction studies	Short-term reproductive toxicity studies in rats showed reduced sperm motility and/or density.

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Dibromoacetic acid**	•Subchronic testing •Immunotoxicity testing •Chronic toxicity/carcinogenicity testing** •Toxicokinetic studies to characterize biochemical and physiological parameters controlling absorption, distribution, metabolism and elimination	•In immunotoxicity screening studies in mice, caused suppression of antibody formation, but did not reduce host resistance to infection from a parasitic agent. •Neurotoxicity studies showed exposure in drinking water causes reduced grip strength, mild gait abnormalities, and degeneration of mylenated nerve fibers in the spinal cord. **Some evidence of carcinogenic activity in male & female F344/N rats and clear evidence of carcinogenic activity in male and female $B6C3F_1$ mice. Increased incidences in mononuclear cell leukemia in male rats may have been related to chemical exposure.
Dicholoracetic acid***	•Toxicokinetic studies to characterize biochemical and physiological parameters controlling absorption, distribution, metabolism and elimination •Immunotoxicity studies	•Neurotoxicity studies showed exposure to dichloroacetic acid or dibromoacetic acid caused reduced grip strength, mild gait abnormalities and degeneration of mylenated nerve fibers in the spinal cord. •In immunotoxicity screening studies in mice, dibromoacetic acid caused suppression of antibody formation; did not reduce host resistance to infection from a parasitic agent. **No evidence of carcinogenic activity in p53 haploinsufficient mice.
Sodium bromate	•Reproduction and development studies •Immunotoxicity studies	•Short-term reproductive toxicity studies found reduced sperm motility and/or density. •No immunotoxic effects in drinking water. **No evidence of carcinogenic activity in p53 haploinsufficient mice.
Sodium chlorate	Chronic toxicity/carcinogenicity testing	Carcinogenic to the thyroid gland in rats.
Tribromoacetic acid	Reproduction studies	No effect on reproduction.

**NIEHS supports mechanistic studies at four academic institutions on the effects of dibromoacetic acid administered by gavage or in drinking water on gene expression, cancer gene mutations, and DNA adducts in rats and mice.

Suggested Reading:

1. Dunnick JK and Melnick RL. *Assessment of the carcinogenic potential of chlorinated water: experimental studies of chlorine, chloramine, and trihalomethanes*. J Nat'l Cancer Inst. 85:817-822, 1993.
2. Melnick RL, Boorman GA, and Dellarco V. *Water chlorination, 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX), and potential cancer risk*. J Nat'l Cancer Inst. 89:832-833, 1997.
3. Boorman GA, Dellarco V, Dunnick JK, Chapin RE, Hunter S, Hauchman F, Gardner H, Cox M, and Sills RC. *Drinking water disinfection byproducts: review and approach to toxicity evaluation*. Environ Health Perspect. 107 Suppl 1:207-217, 1999

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