-
-
  example is Chloroform
  -
  -
-

-
  -
- no standards for showering/bathing
  -
  -
- no standards for showering/bathing
  -
  -
  -
- Given the compromised plumbing distribution system (including inside homes), is it possible that chemicals created (detected and undetected) are potentially impacting human health?

Roadmap for Interdisciplinary Research on Drinking Water Disinfection By-Products

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Office of Research & Development

EPA – Research "DBP's" – Susan Richardson -2009 Cont.

Exposure routes

Inhalation

(shower, swimming pool, etc.)

Volatile DBP e.g. THMs

Ingestion

(water, coffee, tea, water-based food and beverages)

All disinfection by-products

Dermal absorption

(swimming pool, bath, etc.)

Permeable DBPs e.g. THMs, haloketones, …

TOTAL INTERNAL DOSE

Slide courtesy of Manolis Kogevinas, Centre for Research in Environmental Epidemiology/IMIM, Barcelona

Route of exposure is important….

- Can get 2X exposure from 10 min shower compared to drinking 2L of tap water (inhalation)
- Some DBPs dermally absorbed
- Evidence of increased bladder cancer with swimming in indoor pools (inhalation, dermal): Villanueva et al., *Am. J. Epidemiol*. 2007, *165*, 148-156.

EPA – Research "DBP's" – Susan Richardson -2009 Cont.

Only 11 DBPs Regulated in U.S.

DBP	MCL (µg/L)
Total THMs	80
5 Haloacetic acids	60
Bromate	10
Chlorite	1000

There are still many gaps to fill!!

The Next Generation of Drinking Water Disinfection By-Products

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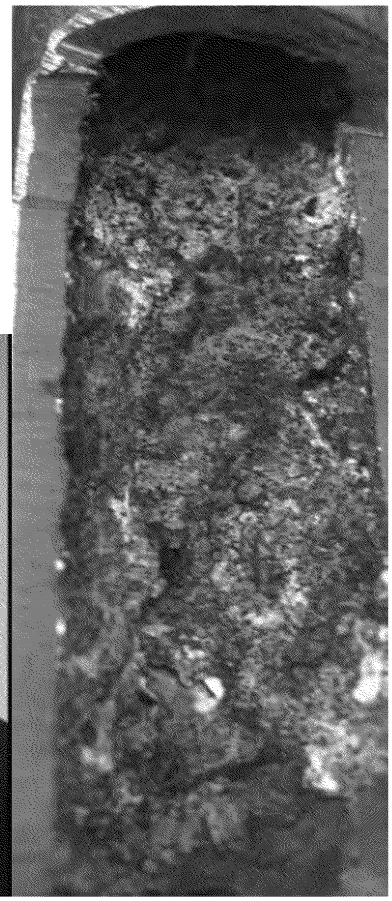
The disinfection of drinking water has been rightly hailed as a public health triumph of the 20th century. Millions of people worldwide receive quality drinking water every day from their public water systems. However, chemical disinfection has also produced an unintended health hazard: the potential for cancer and reproductive/developmental effects that are associated with chemical disinfection by-products (DBPs). Chemical disinfectants are effective for killing harmful pathogens in drinking water, but they are also powerful oxidants, oxidizing the organic matter, anthropogenic contaminants, and bromide/iodide naturally present in most source waters (rivers, lakes, and many groundwaters). Chlorine, ozone, chlorine dioxide, and chloramines are the most common disinfectants in use today, and each produces its own suite of DBPs in drinking water.

Of more than known 600 DBPs, only 11 are currently regulated in the United States. And, those that are regulated do not cause the primary type of cancer (bladder cancer) that is observed in the human epidemiologic studies. Recent research has identified 'emerging', unregulated DBPs that are more cytotoxic and genotoxic than those that are currently regulated, and the use of newer alternative disinfectants (chloramines, ozone, chlorine dioxide) can increase their formation. This is important because many drinking water utilities in the U.S. are changing from chlorine to alternative disinfectants to meet stricter regulations. Emerging DBPs include iodo-acids, iodo-trihalomethanes (Iodo-THMs), bromonitromethanes, haloamides, and nitrosamines (including nitrosodimethylamine, NDMA). New research on emerging DBPs will be presented, along with results from an occurrence study of iodo-acids and iodo-THMs and new research on the formation of iodo-DBPs from pharmaceuticals used for medical imaging (X-ray contrast media). Finally, results from an interdisciplinary EPA study (the Four Lab Study), which involves the chemical and toxicological evaluation of complex drinking water mixtures treated with chlorine and alternative disinfectants, will be briefly discussed, along with other important new health effects information.

Do Orthophosphate / Phosphoric Acid Prevent Particulate Lead from Entering the Water People Drink, Bathe in, Shower in, and Encounter every day?

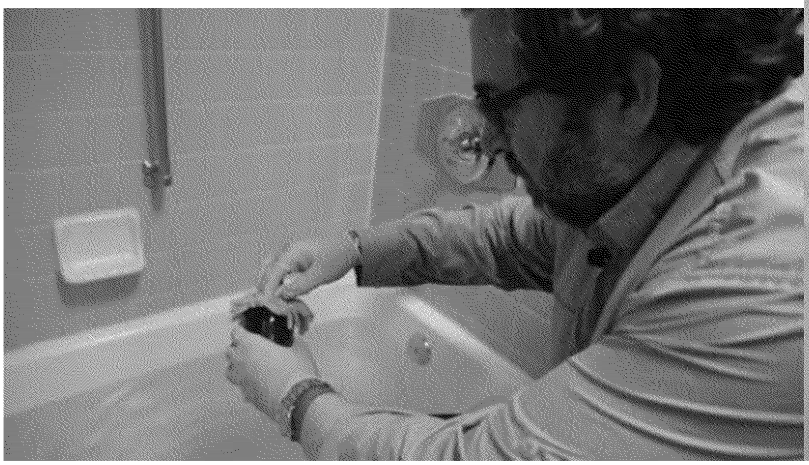


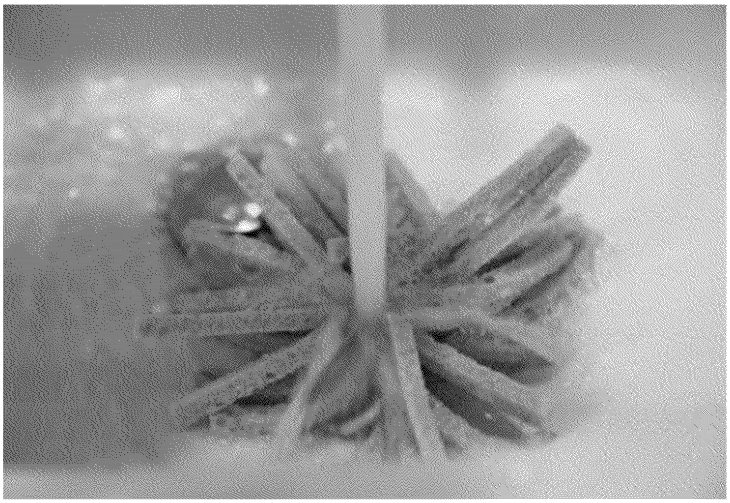
(picture of testing water at Harrington House entrance – 320 ppb of Lead along with Chloroform 8.7ppb)

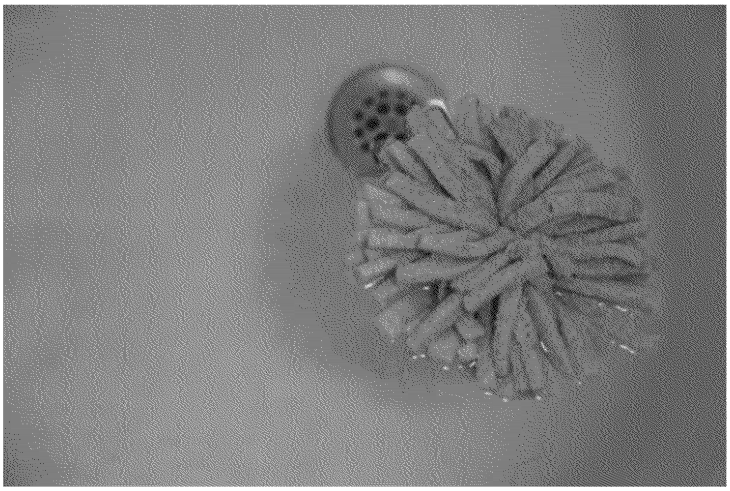
2. Lead 52ppb.

3. Chloroform 11ppb & Bromodichloromethane 5.7ppb.

(Sink -1,4 Dichlorobenzene 970 ppb / Bromodichloromethane 27ppb)
(Bathtub -1,4 Dichlorobenzene 610 ppb)







(Bathtub Results – Lead 16ppb & Chloroform 69 ppb & Bromodichloromethane 26ppb)
(Sink Results – Chloroform 32 ppb)

- Without standards and cause and effect relationships, it is difficult to draw definitive conclusions that it is either safe or not safe to bathe or shower in Flint water.