

## **Consider the Source**

### **Chlorination Byproducts in Maryland Tap Water**

#### **Summary**

Chlorinating tap water is a critical public health measure that saves thousands of lives each year by reducing the incidence of waterborne disease. But chlorination is no substitute for cleaning up America's waters.

By failing to clean up rivers and reservoirs that provide drinking water for hundreds of millions of Americans, EPA and the Congress have forced water utilities to chlorinate water that is contaminated with animal waste, sewage, fertilizer, algae, and sediment, in order to provide water free of disease-causing microorganisms. Chlorine, when combined with the organic matter in this pollution, produces harmful byproducts collectively referred to as chlorination byproducts (CBPs). In spite of the diligent efforts of the water utilities to filter and clean the water before they chlorinate, CBP levels remain high in the water consumed by millions of people each day. Approximately 240 million Americans drink tap water contaminated with some level of CBPs.

Industrial water pollution is not a major contributor to CBPs in tap water. Instead the main causes are sediments, nutrients, and pollution from agricultural and urban runoff, and in some small systems, inappropriate overuse of chlorine. Until Congress and the EPA act to limit pollution from farms and urban runoff so that water entering drinking water treatment plants is much cleaner than it is today, CBP levels will remain at unacceptably high levels.

This first ever national analysis of chlorination byproducts in tap water from both large and small cities, the Environmental Working Group (EWG) found that, although most water suppliers are in compliance with current and future drinking water standards:

- 135,000 pregnancies nationally and 14,177 pregnancies in Maryland are at increased risk of miscarriage and birth defects each year from exposure to CBPs in tap water. (See Table 1, Page 3)
- Since 1995, more than 16 million people in 1,200 communities across the nation have been served water contaminated with chlorination byproducts for 12 months in a row at levels above the legal limit going into effect in January 2002. (See Table 2, Page 4)

#### **Tap Water in Maryland**

Data on tap water contamination with trihalomethanes (THMs), one of the principle byproducts of chlorination, were obtained from Maryland Department of the Environment, Water Management Administration. The data represent THM levels in tap water from 34 systems serving 4,270,287 people from the years 1995 through 2001. Not all systems provided data for all years. The data analyzed here represent 0.80% of all small systems and 100% of large systems in Maryland.

The maps on the next page illustrate counties with potentially elevated risk of birth defects, miscarriages, and cancers from chlorinated tap water in Maryland. (See page 6 for a description of health risks associated with chlorination byproducts.)

# Maryland

Sanitizing tap water with chlorine forms hundreds of byproducts, including trihalomethanes (THMs) - a family of chemicals linked to cancers, birth defects, and miscarriages. People are exposed to THMs in contaminated water through drinking, bathing and showering.

Environmental Working Group has analyzed data from water utilities to highlight counties with increased risks to these health problems due to chlorination of drinking water supplies.

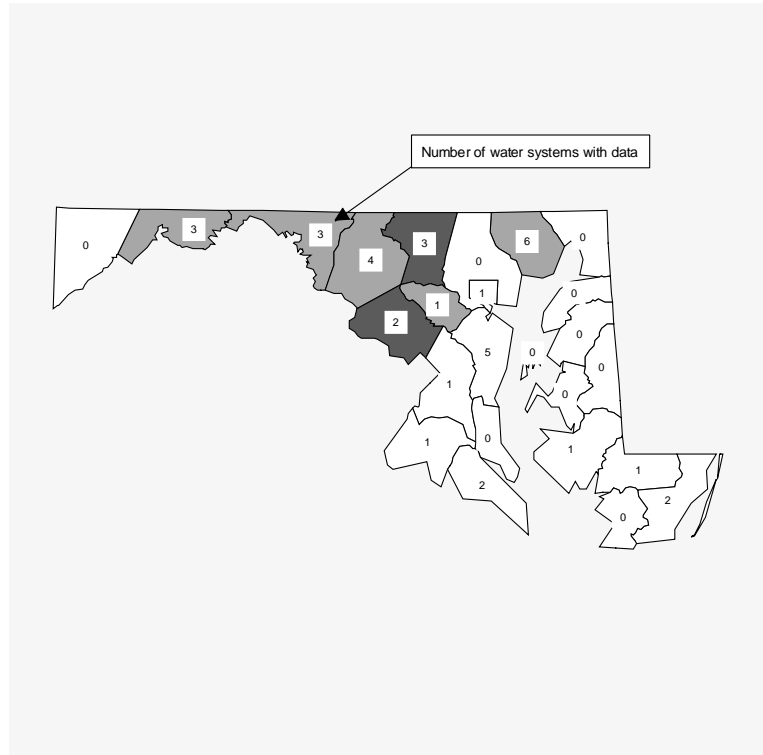
## Elevated Birth Defect and Miscarriages Risk from Chlorination of Tap Water

[Right] EWG has highlighted the counties with elevated risk of birth defects and miscarriages based on the chance that a woman would be exposed to high total THM levels (>80 parts per billion) for a full trimester. See the text or [www.ewg.org](http://www.ewg.org) for the worst systems in your state in violation of this measure.

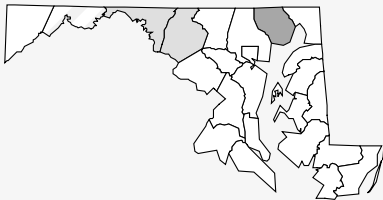
## Elevated Cancer Risk from Chlorination of Tap Water

[Below] Small, currently unregulated systems that obtain water from rivers and reservoirs often provide water with high total THM levels. See the text or [www.ewg.org](http://www.ewg.org) for the worst systems across the state.

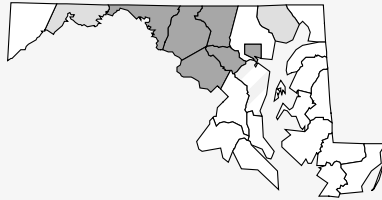
## Maryland Counties with Potentially Elevated Birth Defect and Miscarriage Risks from Chlorination Byproducts in Tap Water



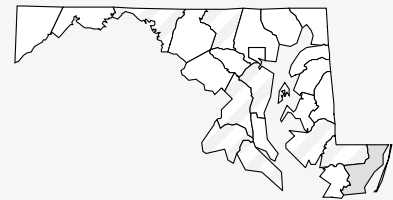
## Maryland Counties with Elevated Cancer Risk from Chlorination Byproducts in Tap Water



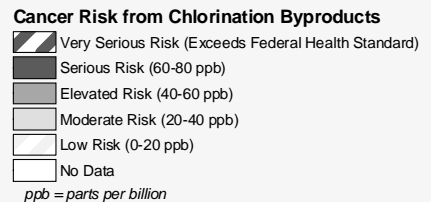
**Small Communities (<10,000 people) Drinking Water from Surface Water Public Supplies (Rivers, Lakes, and Reservoirs)**



**Large Communities (>10,000 people) Drinking Water from Surface Water Public Supplies (Rivers, Lakes, and Reservoirs)**



**Communities Drinking Water from Ground Water Public Supplies**



Notes:

<sup>1</sup> Large surface water systems use results from quarterly sampling to prove compliance with health standards. Small systems may test less frequently. These maps are based on this compliance testing data.

<sup>2</sup> The number of water suppliers in each county with available data is indicated on this map. In cases for which data for only one water supplier are presented, the county composite is based on data from only that single water supplier.

Source: Environmental Working Group analysis of US EPA tap water testing results and Maryland Department of the Environment, Water Management Administration.

In Maryland, 14,177 pregnancies face an elevated risk for birth defects and miscarriage from high levels of THMs\*. Washington Suburban Sanitary Commission, Howard County Water Distribution, and City of Rockville water systems top the list of communities most at risk (Table 1).

**Table 1: An estimated 14,177 Maryland pregnancies face an elevated risk of birth defects and miscarriages from high levels of chlorination byproducts in tap water.**

Communities listed below are ordered based on the number of pregnancies each year exposed to at least 80 ppb THMs\* for at least a trimester. These pregnancies are at an increased risk for birth defects and miscarriages.

Rank	Water System	Population Served	Estimated Number of Pregnant Women per Year with Elevated Risk of Birth Defects and Miscarriages	Chance that a Pregnancy may be Served Water for an Entire Trimester with THM* Levels Above 80 ppb	Maximum 3-Month THM* Average**
1	Washington Suburban Sanitary Commission in Montgomery County	1,500,000	12,081	58 %	139.6 ppb
2	Howard County Water Distribution in Columbia of Howard County	175,000	481	20 %	87.5 ppb
3	Rockville in Montgomery County	44,000	338	55 %	153.1 ppb
4	Hagerstown in Washington County	75,000	278	27 %	101.2 ppb
5	Westminster in Carroll County	29,974	213	51 %	111.4 ppb
6	Freedom District in Eldersburg of Carroll County	21,191	155	52 %	113 ppb
7	Frostburg in Allegany County	11,000	120	78 %	156.3 ppb
8	Havre De Grace in Harford County	10,400	110	76 %	135.2 ppb
9	Frederick in Frederick County	51,000	105	15 %	136.1 ppb
10	Lake Linganore in Frederick County	10,428	97	66 %	103.4 ppb
11	Aberdeen Proving Ground Chapel Hill in Aberdeen of Harford County	12,002	81	48 %	138.9 ppb
12	New Design Water in Tuscarora of Frederick County	12,577	55	31 %	114.1 ppb
13	Bel Air in Harford County	13,100	36	19 %	82 ppb
14	Edgewood in Harford County	5,398	28	37 %	96.5 ppb

Source: Environmental Working Group analysis of Maryland Department of the Environment, Water Management Administration tap water testing data.

\*Trihalomethanes (THMs) are four individual chemicals that together are the most abundant byproducts of tap water chlorination.

\*\*ppb = parts per billion

Lake Linganore, Frostburg, and Havre De Grace have the highest long-term average THM\* levels, at 74.9, 68.5, and 66.4 ppb, respectively, near the federal safety standard that goes into effect beginning in January 2002 (Table 2).

**Table 2: Maryland communities with elevated cancer risk from high levels of THMs\* in tap water.**

Communities listed below are ordered on the long-term average THM level, an indicator for lifetime cancer risk.

Rank	Water System	Population Served	Tap Water Testing Data Availability	Long Term Average THM* Levels in Tap Water**
1	Lake Linganore in Frederick County	10,428	6 tests from 09/08/98 to 03/28/01	74.9 ppb
2	Frostburg in Allegany County	11,000	34 tests from 07/18/95 to 02/20/01	68.5 ppb
3	Havre De Grace in Harford County	10,400	32 tests from 03/21/95 to 02/27/01	66.4 ppb
4	Rockville in Montgomery County	44,000	22 tests from 01/29/96 to 03/15/01	65.1 ppb
5	Westminster in Carroll County	29,974	40 tests from 01/24/96 to 03/13/01	57 ppb
6	Washington Suburban Sanitary Commission in Montgomery County	1,500,000	157 tests from 10/04/95 to 04/17/01	55.1 ppb
7	New Design Water in Tuscarora of Frederick County	12,577	24 tests from 07/16/96 to 03/28/01	54.1 ppb
8	Aberdeen Proving Ground Chapel Hill in Aberdeen of Harford County	12,002	42 tests from 02/07/96 to 03/27/01	52.9 ppb
9	Edgewood in Harford County	5,398	5 tests from 02/12/98 to 03/15/01	52.2 ppb
10	Freedom District in Eldersburg of Carroll County	21,191	25 tests from 01/24/96 to 12/07/00	51.6 ppb
11	Hagerstown in Washington County	75,000	33 tests from 02/21/96 to 04/03/01	47.3 ppb
12	Frederick in Frederick County	51,000	30 tests from 01/22/96 to 03/15/01	46.6 ppb
13	Howard County Water Distribution in Columbia of Howard County	175,000	28 tests from 02/06/96 to 03/22/01	46.2 ppb
14	Baltimore in Baltimore City County	1,600,000	77 tests from 01/07/96 to 12/07/00	44.6 ppb
15	MD American Water Co.-Bel Air in Harford County	13,100	28 tests from 03/21/96 to 01/24/01	43.1 ppb

Source: Environmental Working Group analysis of Maryland Department of the Environment, Water Management Administration tap water testing data.

\*Trihalomethanes (THMs) are four individual chemicals that together are the most abundant byproducts of tap water chlorination.

\*\*ppb = parts per billion

Washington Suburban Sanitary Commission, Frederick, and City of Rockville had the highest one-time peak measurements, at 253.0, 211.3, and 193.6 ppb, respectively, more than twice the average level allowed by the U.S. EPA over any consecutive 12 month period – 80 ppb beginning January 2002 (Table 3).

**Table 3: Highest recorded single sample spikes in THMs\* in Maryland**

Communities listed below are ordered on the highest recorded single THM level measured for that community’s water supplier.

Rank	Water System	Population Served	Maximum Spike in THMs**
1	Washington Suburban Sanitary Commission in Montgomery County	1,500,000	253.0 ppb on 08/17/99
2	Frederick in Frederick County	51,000	211.3 ppb on 06/14/00
3	Rockville in Montgomery County	44,000	193.6 ppb on 09/13/99
4	New Design Water in Tuscarora of Frederick County	12,577	185.5 ppb on 08/31/00
5	Aberdeen Proving Ground Chapel Hill in Aberdeen of Harford County	12,002	174.6 ppb on 07/25/96
6	Frostburg in Allegany County	11,000	156.3 ppb on 07/18/95
7	Havre De Grace in Harford County	10,400	139.2 ppb on 09/30/99
8	Lake Linganore in Frederick County	10,428	138.8 ppb on 08/31/00
9	Freedom District in Eldersburg of Carroll County	21,191	136.7 ppb on 07/08/98
10	Westminster in Carroll County	29,974	126.0 ppb on 07/01/97
11	Hagerstown in Washington County	75,000	123.4 ppb on 09/10/99
12	MD American Water Co.-Bel Air in Harford County	13,100	122.0 ppb on 08/25/99
13	Edgewood in Harford County	5,398	113.0 ppb on 06/28/00
14	Cumberland in Allegany County	23,600	107.8 ppb on 07/13/00
15	Baltimore in Baltimore City County	1,600,000	93.0 ppb on 09/15/99
16	Howard County Water Distribution in Columbia of Howard County	175,000	89.7 ppb on 09/29/00
17	Fort George G Meade in Anne Arundel County	50,001	86.0 ppb on 09/02/99
18	Aberdeen in Harford County	13,000	85.8 ppb on 09/28/99
19	Harford County Water in Perryman of Harford County	90,000	85.8 ppb on 07/20/99
20	Glen Burnie in Anne Arundel County	249,600	75.5 ppb on 09/06/96

Source: Environmental Working Group analysis of Maryland Department of the Environment, Water Management Administration tap water testing data.

\*Trihalomethanes (THMs) are four individual chemicals that together are the most abundant byproducts of tap water chlorination.

\*\*ppb = parts per billion

## Health Risk from Chlorination Byproducts

Chlorination byproducts are a complex mixture of more than 100 potentially toxic compounds. EPA estimates that 240 million people are exposed to these compounds in tap water in the United States. Only trihalomethanes (THMs), five haloacetic acids, bromate, and chlorite are currently monitored and regulated, or proposed for regulation. Several chlorination byproducts are classified by the agency as "likely" human carcinogens (bromodichloromethane, bromoform, and dichloroacetic acid), and CBPs as a whole have the clear potential to cause birth defects or reproductive damage.

A compelling body of scientific evidence – nearly 30 peer-reviewed epidemiological studies - links chlorination byproducts to increased risks of cancer. A growing body of science links CBPs to miscarriages and birth defects, including neural tube defects, low birth weight, and cleft palate. Epidemiological studies often find adverse effects at levels considered legal under federal drinking water law. The specifics of which byproduct causes which effect remains unknown, and indeed may never be known.

### *Cancer*

EPA estimates the maximum health benefit of the new THM standard (80 ppb, reduced from the current standard of 100 ppb) as a potential reduction of 2,332 cases of bladder cancer per year, out of their upper estimate of 9,300 annual cases currently caused by THMs. The Agency then notes that the bladder cancer risk "captures only a portion of the potential risk associated with CBPs in drinking water" (63 FR 69390-69476, Dec. 1998, vol. 63 no 241). In the exposure assessment presented in this report, estimates of the number of water systems and people at increased risk for cancer are based on systems for which the average THM level over any consecutive 12-month period was at least 80 parts per billion (ppb).

### *Miscarriages and Birth Defects*

At least ten major epidemiological studies of more than 287,000 pregnant women show elevated risks for neural tube defects, reduced growth rates in the womb, miscarriages, and other adverse effects for women drinking chlorinated tap water. Scientists have found elevated risks associated with THM levels as low as 10 ppb (Kramer et al 1992), and for exposures to high but legal levels of THMs (75 ppb) over a single trimester of pregnancy (Waller et al 1998). In the exposure assessment presented in this report, estimates of the number of pregnant women facing an elevated risk for birth defects and miscarriage are based on systems for which the average THM level over at least one consecutive three-month period was at least 80 ppb (see Methodology appendix in the national report for more detail).

## Recommendations

The public and policy makers have been led to believe that they must accept either water polluted with pathogens or water contaminated with high levels of chlorination byproducts. This is simply not true. Tap water in the United States can meet pathogen standards and be low in CBPs as well.

To achieve this goal and protect the public from potential hazards of chlorination byproducts, we recommend:

*The creation of a nationwide health-tracking network to track Americans' exposure to chlorination byproducts and also the occurrence of birth defects, miscarriages, and other potential health effects of drinking tap water contaminated with THMs and other chlorination byproducts.*

- A growing coalition of public health and environmental groups has requested that Congress appropriate money to the Centers for Disease Control and Prevention (CDC) to create a nationwide health tracking network (Trust for America's Health, 2001). A fully functioning network is estimated to cost \$275 million; at the time of printing, Congress appeared poised to appropriate \$20 million as an initial down payment to start planning and creating the network. Lawmakers in the U.S. Senate and House of Representatives expect to introduce legislation in 2002, and to request significantly increased appropriations for the health tracking network. Through these processes, members of Congress will have an opportunity to support a proposal that would begin to close gaps in scientists' and policymakers' knowledge of environmentally-linked diseases, and provide health officials and health care providers with tools to act proactively to prevent chronic disease.

*Adequate funding for water utilities to treatment system upgrades and programs to train plant operators in better disinfection (chlorination) techniques, particularly for small drinking water systems.*

- Operator education has the potential to reduce the highest CBP levels in smaller drinking water systems and should be aggressively pursued. By itself it will not bring all of these small systems into compliance with the law, and it will not guarantee safe water for the most contaminated systems, but it has the potential to reduce the very highest levels of CBPs.

*A major national effort to clean up source water for all surface-supplied drinking water systems in the country.*

- Cleaner source water is the critical step to reliably reducing CBP levels while at the same time guaranteeing water as free of pathogens as possible. By failing to clean up drinking water source water, the Congress, EPA, and polluters are forcing water with high levels of CBPs on millions of people. For the majority of the systems with elevated CBP levels (small rural systems), cleaner source water will require definitive action to reduce soil erosion, and nutrient and animal waste runoff from farms and feedlots. For large systems, runoff from suburban sprawl and upstream sewage discharges must also be controlled.