

Consider the Source

Chlorination Byproducts in New Jersey 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:

- 137,000 pregnancies nationally and 10,456 pregnancies in New Jersey 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 New Jersey

Data on tap water contamination with trihalomethanes (THMs), one of the principle byproducts of chlorination, were obtained from New Jersey Department of Environmental Protection, Bureau of Safe Drinking Water. The data represent THM levels in tap water from 526 systems serving 7,256,528 people from the years 1995 through 2001. Not all systems provided data for all years. The data analyzed here represent 86.50% of all small systems and 87.90% of large systems in New Jersey.

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

New Jersey

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.

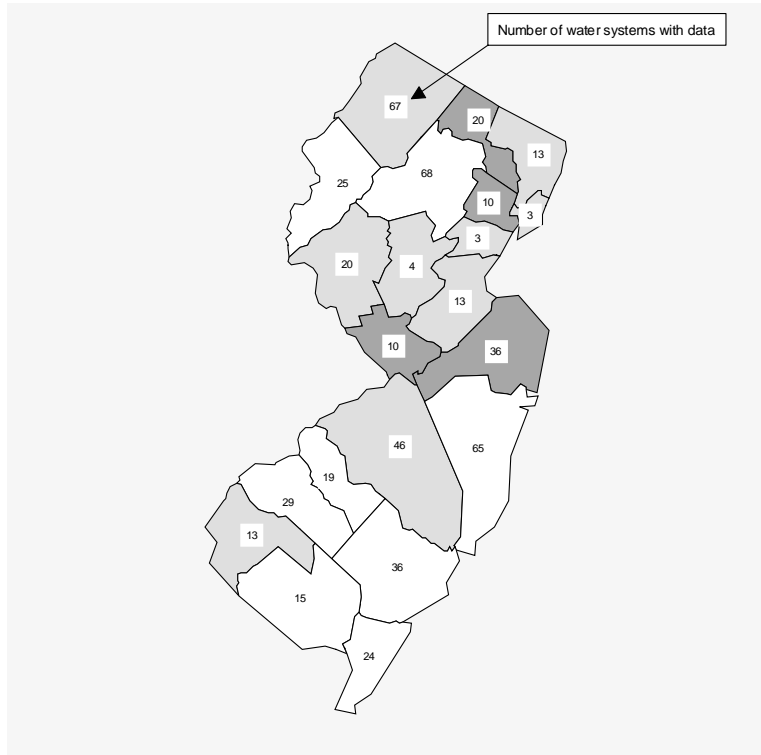
Elevated Birth Defect and Miscarriages Risk from Chlorination of Tap Water

[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 for the worst systems in your state in violation of this measure.

Elevated Cancer Risk from Chlorination of Tap Water

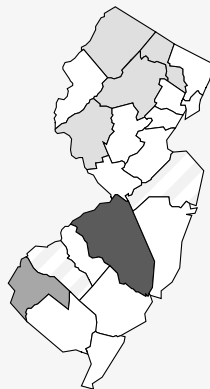
[Below] Small, currently unregulated systems that obtain water from rivers and reservoirs often provide water with high total THM levels. See the text or www.ewg.org for the worst systems across the state.

New Jersey Counties with Potentially Elevated Birth Defect and Miscarriage Risks from Chlorination Byproducts in Tap Water

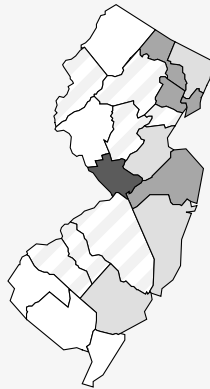


Percent of pregnancies exposed to high THMs for a full trimester
 Nearly all Up to 80% Up to 50% Up to 10% Almost none

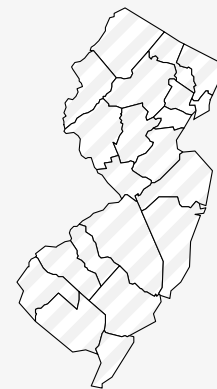
New Jersey Counties with Elevated Cancer Risk from Chlorination Byproducts in Tap Water



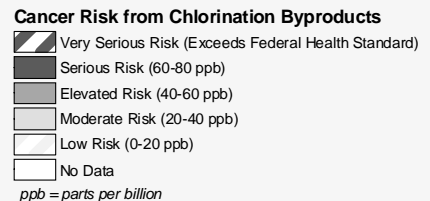
Small Communities (<10,000 people) Drinking Water from Surface Water Public Supplies (Rivers, Lakes, and Reservoirs)



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:

¹ 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.

² 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 New Jersey Department of Environmental Protection and US EPA tap water testing results.

In New Jersey, 10,456 pregnancies face an elevated risk for birth defects and miscarriage from high levels of THMs*. Newark, Passaic Valley Water, and NJ American Water Co.-Monmouth water systems top the list of communities most at risk (Table 1).

Table 1: An estimated 10,456 New Jersey 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	Newark in Essex County	275,221	2,847	74 %	160.7 ppb
2	Passaic Valley Water in Totowa Borough of Passaic County	275,000	2,191	57 %	129.9 ppb
3	NJ American Water Co.-Monmouth in Shrewsbury of Monmouth County	302,491	1,796	42 %	103.3 ppb
4	Trenton City in Mercer County	225,000	1,527	48 %	91.7 ppb
5	United Water-NJ in New Milford of Bergen County	713,737	793	7.9 %	92.2 ppb
6	Jersey City in Hudson County	238,000	358	11 %	88.2 ppb
7	Garfield in Bergen County	26,000	155	43 %	156.8 ppb
8	New Brunswick City in Middlesex County	50,000	126	18 %	87.6 ppb
9	East Orange in Essex County	73,552	108	11 %	124.1 ppb
10	Haledon Borough in Passaic County	12,500	96	55 %	150.4 ppb
11	Burlington City in Burlington County	9,835	96	70 %	136.1 ppb
12	Franklin Townshioip in Somerset County	44,000	58	9.5 %	82.5 ppb
13	East Brunswick Township in Middlesex County	47,000	57	8.7 %	86.2 ppb
14	Hoboken Water Services in Harrington Park of Hudson County	39,000	55	10 %	88.3 ppb
15	Rahway City in Union County	25,325	54	15 %	88.5 ppb
16	US Army Fort Dix in New Hanover Township of Burlington County	14,500	34	17 %	95.6 ppb
17	West Caldwell in Essex County	10,422	33	23 %	95.7 ppb
18	Salem City in Salem County	6,883	23	23 %	156.8 ppb
19	Keansburg in Monmouth County	11,200	17	11 %	110.6 ppb
20	Avon By the Sea in Monmouth County	2,500	11	31 %	129.8 ppb

Source: Environmental Working Group analysis of New Jersey Department of Environmental Protection, Bureau of Safe Drinking Water 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

Newark, Haledon Borough, and Burlington City have the highest long-term average THM* levels, at 75.4, 74.4, and 66.5 ppb, respectively, near the federal safety standard that goes into effect beginning in January 2002 (Table 2).

Table 2: New Jersey 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	Newark in Essex County	275,221	36 tests from 02/01/95 to 05/08/01	75.4 ppb
2	Haledon Borough in Passaic County	12,500	30 tests from 02/22/95 to 06/11/01	74.4 ppb
3	Burlington City in Burlington County	9,835	30 tests from 02/16/95 to 05/10/01	66.5 ppb
4	Passaic Valley Water in Totowa Borough of Passaic County	275,000	74 tests from 01/12/95 to 06/19/01	66.3 ppb
5	Trenton City in Mercer County	225,000	31 tests from 03/28/95 to 05/21/01	62.1 ppb
6	West Caldwell in Essex County	10,422	26 tests from 01/18/95 to 04/18/01	60.4 ppb
7	Garfield in Bergen County	26,000	35 tests from 03/17/95 to 04/17/01	59.2 ppb
8	NJ American Water Co.-Monmouth in Shrewsbury of Monmouth County	302,491	43 tests from 02/07/95 to 04/18/01	58 ppb
9	Bloomington in Passaic County	5,000	26 tests from 01/04/95 to 04/05/01	56.3 ppb
10	Bayonne in Hudson County	61,000	6 tests from 10/05/95 to 12/04/96	55.4 ppb
11	Hoboken Water Services in Harrington Park of Hudson County	39,000	35 tests from 01/24/95 to 06/25/01	53.1 ppb
12	Rahway City in Union County	25,325	37 tests from 01/18/95 to 06/28/01	53 ppb
13	Brick Township in Ocean County	75,561	37 tests from 03/25/95 to 06/07/01	50.8 ppb
14	East Brunswick Township in Middlesex County	47,000	31 tests from 02/24/95 to 04/09/01	48.7 ppb
15	Salem City in Salem County	6,883	31 tests from 01/25/95 to 04/12/01	46.5 ppb
16	New Brunswick City in Middlesex County	50,000	31 tests from 02/16/95 to 05/02/01	46.2 ppb
17	Jersey City in Hudson County	238,000	39 tests from 02/10/95 to 06/22/01	45.3 ppb
18	South Belmar in Monmouth County	1,500	4 tests from 03/29/95 to 10/11/95	42.3 ppb
19	Wanaque Borough in Passaic County	200,902	33 tests from 03/23/95 to 06/04/01	41.9 ppb
20	Shorelands Water Company in Hazlet Township of Monmouth County	33,000	30 tests from 02/28/95 to 05/22/01	41.1 ppb

Source: Environmental Working Group analysis of New Jersey Department of Environmental Protection, Bureau of Safe Drinking Water 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

East Orange, Garfield, and Passaic Valley Water had the highest one-time peak measurements, at 301.2, 257.4, and 223.1 ppb, respectively, more than three times 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 New Jersey

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	East Orange in Essex County	73,552	301.2 ppb on 07/07/99
2	Garfield in Bergen County	26,000	257.4 ppb on 06/17/97
3	Passaic Valley Water in Totowa Borough of Passaic County	275,000	223.1 ppb on 07/18/97
4	Newark in Essex County	275,221	211.0 ppb on 09/18/96
5	Fair Lawn in Bergen County	32,000	210.3 ppb on 07/25/95
6	Burlington City in Burlington County	9,835	177.0 ppb on 08/24/00
7	Shorelands Water Company in Hazlet Township of Monmouth County	33,000	174.1 ppb on 08/25/98
8	United Water-NJ in New Milford of Bergen County	713,737	173.7 ppb on 09/05/95
9	Pequanock Township in Morris County	15,000	166.9 ppb on 08/29/95
10	Haledon Borough in Passaic County	12,500	166.1 ppb on 08/17/99
11	Salem City in Salem County	6,883	164.0 ppb on 09/13/95
12	Avon By the Sea in Monmouth County	2,500	164.0 ppb on 06/22/00
13	NJ American Water Co.-Short Hills in Essex County	196,863	161.1 ppb on 08/28/97
14	NJ American Water Co.-Monmouth in Shrewsbury of Monmouth County	302,491	161.0 ppb on 08/21/96
15	Keansburg in Monmouth County	11,200	159.8 ppb on 08/12/98
16	Newton Town in Sussex County	8,000	154.8 ppb on 05/06/98
17	Harding Woods MHP in Pittsgrove Township of Salem County	960	153.1 ppb on 08/20/97
18	Point Pleasant in Ocean County	19,000	149.5 ppb on 04/05/00
19	Old Bridge Township in Middlesex County	54,500	148.7 ppb on 07/25/95
20	Sparta Township in Sussex County	45	148.3 ppb on 11/17/96

Source: Environmental Working Group analysis of New Jersey Department of Environmental Protection, Bureau of Safe Drinking Water 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.