

Drinking Water & Pregnancy

Basic Information You Should Know

Over the years, public concern has prompted researchers to evaluate drinking water contaminants and their effects on adverse birth outcomes. Links between drinking water contamination and adverse birth outcomes have been studied using databases of water samples that are required by state and federal drinking water regulations, as well as birth certificate databases that contain information on birth characteristics like gestational age and birth weight. Previous studies performed on animals have led researchers to classify some of these contaminants as teratogens.

Chlorine Disinfectants & Their Byproducts in Public Water Systems

Over 84% of U.S. households receive water from public water systems, many of which use chlorine as part of the disinfection process. The addition of chlorine to drinking water eventually creates unwanted disinfectant byproducts when the chlorine reacts with residual organic matter. One of the main byproducts created are total trihalomethanes (THMs) like chloroform. Moderate evidence from studies of THMs and adverse birth outcomes indicates an association of THMs with small for gestational age (SGA), neural tube defects (NTDs), and spontaneous abortions. Other chlorinated solvents have not been extensively researched; however, there have been a few studies analyzing the effects of trichloroethylene (TCE). The studies of TCE-containing drinking water found cases of neural tube defects, oral clefts, cardiac defects, and choanal atresia. More attention needs to be given to this area of research because there have only been a few studies, and the evidence is not strong enough to suggest significant association.

Health effects of chlorine disinfectants and disinfectant byproducts: The EPA has outlined both the health effects and maximum allowed levels of chlorine disinfectants and their byproducts in public water supplies. The limits listed below are also a good guide for well owners.

Disinfectants

- o **Chlorine:** Can cause eye and nose irritation and stomach discomfort. Limit to 4 parts per million
- o **Chloramines:** Can cause eye and nose irritation, stomach discomfort and anemia. Limit to 4 parts per million
- o **Chlorine dioxide:** Can cause anemia and nervous system problems in infants and young children and similar effects on fetuses during pregnancy. Limit to 0.8 parts per million.

Disinfectant Byproducts

- o **Total Trihalomethanes:** Can cause liver, kidney, or central nervous system problems, and can increase the risk of cancer. Limit to .08 parts per million
- o **Bromate:** Can increase the risk of cancer. Limit to .01 parts per million.
- o **Chlorite:** Can cause anemia, nervous system problems for infants and young children and similar effects on fetuses during pregnancy. Limit to 1 part per million.
- o **Haloacetic Acids:** Can increase the risk of cancer. Limit to .06 parts per million.

Nitrates and Nitrites

Nitrates and nitrites are nitrogen-based chemicals that exist naturally in water, soil, plants, and food. Nitrates and nitrites are found more commonly in groundwater than in surface water.

Principle sources are fertilizers, septic tank waste, livestock manure, and erosion of natural deposits. The most vulnerable wells are those in farm communities or areas with large numbers of aging septic tanks.

Health effects of Nitrates and Nitrites:

Ingestion of water containing high nitrate or nitrite concentrations can be fatal to infants. When ingested, nitrate is converted to nitrite by bacteria in saliva and in the digestive tract. In babies, this process can interfere with the ability of the child's blood to carry oxygen, which can lead to a blood disorder called methemoglobinemia or "baby blue syndrome." Symptoms include shortness of breath and blue-tinged skin. Water containing nitrate or nitrite should not be used to prepare food or formula for infants.

Nitrates and nitrites are rarely a problem for people older than six months. However, some individuals are more susceptible to health problems from these contaminants. These include:

- **Women who are pregnant or trying to become pregnant, as some studies have shown an increased risk of spontaneous abortions or birth defects.**
- Persons without sufficient stomach acids to metabolize and excrete nitrates or nitrites.
- Persons who lack the enzyme, methemoglobin reductase, which converts affected red blood cells back to normal.

In addition, long-term exposure to these contaminants can lead to diuresis, starchy deposits, and hemorrhaging of the spleen.

Arsenic

Arsenic is classified as a metalloid and is distributed throughout the earth's crust as arsenic sulfide or metal arsenates and arsenides.

Sources of Arsenic:

- Mining of ores and management of waste materials associated with mining operations
- Commercial and industrial uses
- Processing of glass, ceramics, paints, pigments, dyes, soaps, textiles, etc.
- Agricultural sources (pesticides, insecticides, cattle, sheep dips, etc.)
- Medicinal sources (anti-syphilis drugs)
- Weathering of arsenic-containing rocks

Arsenic is typically found in groundwater due to natural sources.

Health effects of Arsenic:

In recent years, researchers have suspected arsenic in drinking water in utero and for early life exposures. There is a potential for arsenic to affect child development, health, and adult disease.

Epidemiologic studies from 1992 to 2007 have produced mixed findings regarding pregnancy outcomes. Some studies indicate that exposure to arsenic may lead to spontaneous abortion, stillbirths, reduced birth weight, and infant mortality. Studies in Thailand, Taiwan, Bangladesh, and India suggest that arsenic exposure may have an effect on child cognitive function as well. Some researchers found impaired visual perception, reduced pattern memory and switching attention, reduction in some performance and full-scale scores tests, and reduction in vocabulary, object assembly, and picture completion scores.

Adult diseases following early life exposure to arsenic include cancer in the liver, bladder, kidney, lung, and skin.

Lead

Lead is a type of heavy metal that typically enters drinking water through the corrosion of pipes, plumbing, or faucets.

Health effects of Lead:

Exposure to lead is especially harmful in infants, young children, and pregnant women's fetuses. Adverse health effects of lead include:

- Permanent brain damage (in more severe cases)
- Decreased intelligence
- Problems with growth, development, and behavior
- Increase in blood pressure
- Harm to kidney function
- Adverse effects on the nervous system
- Damage to red blood cells

Mercury

Mercury is a metal found in the earth's crust. It can enter drinking water sources by:

- Rain or snow carrying mercury from the air
- Seeping into groundwater from industrial or hazardous waste sites
- Improper disposal of household products that contain mercury

Health effects of Mercury:

Inorganic mercury is typically found in water sources rather than organic mercury and children are more susceptible to adverse health risks. High levels of inorganic mercury contamination in drinking water is not common, however, exposure to high levels has adverse health outcomes, including:

- Irritability
- Nervousness
- Change in hearing or vision
- Difficulties with memory

Animal studies have shown that inorganic mercury can pass from a pregnant mother to her fetus causing kidney damage, tumors, and changes in the immune system. Further research needs to be done to see if these health outcomes are similar for people as well.

Pesticides

Water supplies, especially in agricultural areas, can be exposed to pesticides.

Health effects of Pesticides:

Pesticides can cross over the placenta from the mother to the fetus, harming fetal development. Babies who are exposed to pesticides in the womb have a greater risk of birth defects such as:

- Cleft lip and palate
- Childhood leukemia
- Circulatory and respiratory system malformations
- Miscarriage

To avoid contamination and possible adverse health outcomes, encourage well water testing. The Environmental Protection Agency (EPA) has set standards for municipal water systems, however they do not apply to private wells. Private wells should be tested annually and additional tests may be recommended. Contact your local or state agencies or the wellcare® Hotline at 888-395-1033 for contaminants of local concern and to obtain a list of state certified laboratories.

For more information about wells and other wellcare® publications

wellcare® is a program of the **Water Systems Council (WSC)**. WSC is the only national organization solely focused on protecting the health and water supply of the 43 million people nationwide who depend on wells for their water supply.

This publication is one in a series of wellcare® information sheets that can be downloaded for FREE from the WSC website at www.watersystemscouncil.org. Healthcare providers, well owners and others with questions about wells or ground water can contact the wellcare® hotline at 1-888-395-1033 or visit www.wellcarehotline.org. You may also want to join the wellcare® Well Owners Network. To join call 1-888-395-1033 or visit www.watersystemscouncil.org. MEMBERSHIP IS FREE!

Association of Clinicians for the Underserved

The Association of Clinicians for the Underserved (ACU) participated in the writing and research for this information sheet. The ACU is a nonprofit, transdisciplinary organization of clinicians, advocates and health care organizations united in a common mission to improve the health of America's underserved populations and to enhance the development and support of the health care clinicians serving these populations. Please visit the ACU at www.clinicians.org.



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