

wellcare® information for health care providers: **Drinking Water And Children's Health**

Basic Information You Should Know

In June 2009, The American College of Pediatrics (ACP) issued a report calling for improved public education about drinking water and children's health. The report raised concern about children's increased susceptibility to the possible health effects of contaminated drinking water from any source – public water systems, private water wells, and bottled water. The ACP report concluded that “well water can be used safely by families, but regular testing is recommended,” and called for better information that health care providers can share with their patients.

The U.S. has one of the safest drinking water supplies in the world. Well water comes from aquifers – layers of soil, sand and rock that exist deep underground. As stated in the ACP report, “Groundwater is naturally filtered on its way from the surface to the water table so it is relatively free of particulate organic material and bacteria.” The report goes on to say, “It will only remain so if it is protected on its way from the aquifer to the tap.” This information sheet provides recommendations to health care providers and families to ensure safe drinking water for children. It also lists ways to ensure groundwater remains protected from environmental and natural contaminants. More information on these and other potential groundwater contaminants can be found in the wellcare® information sheets available on the Water Systems Council (WSC) website, www.watersystemscouncil.org. Copies can also be requested through the wellcare® Hotline at 1-888-395-1033.

Drinking Water Sources

Well water is the drinking water source for more than 23 million U.S. households. The ACP and WSC recommend that private well owners test their water annually, and in some cases more often such as:

- If someone in the household is pregnant or nursing;
- If there are unexplained gastrointestinal illnesses in the family;
- If contaminants are found in a neighboring well;
- If there is a change in water taste, odor, color or clarity; and/or
- If there is a spill of chemicals or fuels into or near the well.

Tests should include bacteria, lead, nitrates/nitrites, and any contaminants of local concern. The following section provides information on contaminants that may be of special concern to households, especially with young children.

Customers of public water systems can ask their water supplier what types of testing/treatment they perform. The public water authority should provide a Consumer Confidence Report, which provides public water customers with information about the source of their water, the presence of contaminants, if any, in their drinking water, and how these contaminants may affect their health.

Bottled water users may want to check label for origin of water location. Bottled water is not necessarily safer than tap water. Consumers should look for bottled water that has been treated, such as distilled water.

Contaminants Found In Drinking Water

To avoid major health risks, it is important to educate your patients on contaminants found in drinking water. Encourage them to arrange for annual testing of drinking water at homes, schools, and day cares by state-certified laboratories. Your patients should be aware of the following drinking water contaminants and the potential health effects:

1. The pathogen, *Cryptosporidium parvum*, is found in human and animal fecal waste and can enter water sources that contribute to drinking water supplies. The infection caused by this parasite has been defined as one of the “emerging microbial threats to the population”. The small size and composition of this pathogen enables it to resist typical filtration and disinfection measures.

If your patient is exposed to *Cryptosporidium parvum*, he or she may experience gastrointestinal problems including vomiting, diarrhea, and/or cramps. Infants and the elderly become dehydrated more quickly from these symptoms. Patients with weakened immune systems, for example from AIDS, chemotherapy, or recent transplants are especially vulnerable, and the illness is much more severe.

As a healthcare provider, you should sample stools more frequently. If patients complain of these symptoms, ask questions regarding their drinking water sources. To specifically test for *Cryptosporidium*, request an acid-fast fluorescent test, as most standard parasite cultures do not automatically test for this.

Safe and effective treatment has not been extensively developed; therefore, suggested treatment includes supportive care. In some cases, it may be necessary to replace electrolytes and rehydrate the patient, orally or intravenously.

2. *Fecal coliform bacteria* such as *Escherichia coli (E. coli)*, found in human and animal intestines, can enter drinking water sources through sewage or animal waste contamination. The specific strain of *E. coli* that produces a powerful toxin and is capable of causing severe illness is called *E. coli 0157:H7*.

A patient infected by *E. coli 0157:H7* may present symptoms including severe bloody diarrhea and abdominal cramps. In some cases, the infection may cause non-bloody diarrhea with no fever. Exposure to children below the age of 5 and the elderly can cause destruction of red blood cells and kidney failure, resulting in hemolytic uremic syndrome.

Patients should be encouraged to have a state-certified laboratory test their household well water annually. Households whose tests indicate a presence of *E. coli* should take precautionary measures before drinking the water. Advise them to boil their water at a rolling boil for at least one minute. Houses at higher altitudes require longer boiling times for their water. Disinfectants can also be used if the local health department's guidelines and procedures are followed. The use of disinfectants requires periodic monitoring, and if the problem still exists, suggest drilling a new well or adding a “point-of-entry” disinfection unit using chlorine, ultraviolet light, or ozone.

3. **Disinfectants** are added to water to control microorganisms (bacteria and parasites). The addition of chlorine and other disinfectants is an effective way to treat water; however in the process, these disinfectants react with matter in the water and form **Disinfectant Byproducts (DBPs)** as a result. Drinking non-chlorinated water from private wells is likely not contaminated with **DBPs**.

Disinfectant byproducts include **bromate, chlorite, haloacetic acids**, and **total trihalomethanes**. Patients who have been exposed to DBPs can present many different symptoms, depending on the contaminant. Epidemiologists have performed studies in which exposure to DBPs was associated with bladder, rectal, and colon cancers. Other epidemiologic studies involving chlorinated drinking water revealed a link to reproductive and developmental issues including spontaneous abortion, neural tube defects, pre-term delivery, intrauterine growth retardation, and low birth weight.

According to the Environmental Protection Agency (EPA), disinfectants like **chloramines, chlorine**, and **chlorine dioxide** that are present above EPA standards can cause eye and nose irritation, stomach discomfort, anemia, and have nervous system effects in children.

Inform your patients of the risks associated with drinking water that has been contaminated with high amounts of disinfectants. Those who have private wells should be encouraged to test their well water periodically. The use of disinfectants in appropriate amounts has positive effects on drinking water, but excess disinfectants and the presence of DBPs can be detrimental to health.

4. **Lead** can contaminate drinking water through corrosion of household plumbing systems, erosion of natural deposits, and lead service lines. The EPA has suggested that approximately 20% of background lead exposure in children comes from drinking water. They estimated a higher percentage for infants who drink formula that has been mixed with contaminated drinking water.

Lead exposure at even minimal amounts can create serious behavior and brain developmental problems for children. Low-level exposure can cause irritability, hyperactivity, and inattentiveness. Children exposed to higher levels of lead may develop a learning disability, hearing loss, and have delayed growth. More serious cases can result in permanent brain damage and death. In adults, lead exposure can raise blood pressure and cause kidney problems.

As a health care provider, perform blood tests on your patients to look for increased levels of lead. If levels are high, consider drinking water as the source and suggest immediate testing of the patient's water sources, whether it is from a private well, school, or day care.

For a preventive measure, suggest using cold water for drinking, cooking, and making baby formula, as hot water dissolves metals like lead quicker than cold water. Remind your patients that lead can also be ingested through food that has absorbed drinking water during cooking. Before using tap water for cooking purposes, run cold water for at least one minute.

5. **Nitrates and Nitrites** are most commonly known to enter water sources through run-off that contains excess fertilizer and animal waste. Other means of contamination include erosion of natural deposits and leaching from poorly constructed septic tanks, cesspools, and sewage.

6. **Copper** is an essential nutrient that our bodies require but it should only be absorbed in small amounts. Taking in larger amounts of copper has negative health effects. Copper is not a natural occurring contaminant in drinking water; therefore, contamination is usually caused by a source like corroding plumbing systems.

A major indication of high copper contamination is a bitter metallic taste in the water, as well as the presence of blue-green stains on plumbing fixtures. If there is any suspicion that high levels of copper has entered drinking water, a state certified laboratory should be contacted to test the water.

If the tests indicate high levels of copper in the water, the first step in treatment is to identify the source. One option of treatment is to remove the copper components and replace them with approved plastic components. Other treatment options include: carbon, ion exchange resins, activated alumina, pH-acidity adjustment, and reverse osmosis. The contaminated water should not be boiled because it will concentrate the amount of copper in the water. Recommend other sources of water, such as bottled water that has been treated.

As a health care provider, suggest having samples taken of hair, nails, blood, urine, or other tissues to any patient that suspects overexposure to copper.

Health effects in adults and children as a result of high exposure to copper are the same. They include nausea, vomiting, diarrhea, liver damage, kidney damage, and alteration in behavior. Anyone who has previously been diagnosed with Wilson's disease has a higher risk of experiencing damaging effects of copper. Advise your patients, particularly those diagnosed with Wilson's disease, to contact a health care provider if their drinking water is contaminated with high levels of copper.

To avoid copper contamination in drinking water, encourage regular testing of private wells. Private well owners are not required to, but should be encouraged to follow EPA standards to provide safe, quality drinking water to the people they supply.

7. Although **Mercury** can enter drinking water through natural occurrences, contamination is more commonly due to man-made causes. If mercury is mishandled and not properly stored at industrial and hazardous waste sites, it can come in contact with underground water supplies and contaminate private wells. Your patients should be advised to properly discard mercury-containing household products like outdoor paint and thermostats to avoid mercury leakage into the environment.

Inform your patients of the health effects caused by overexposure to mercury. Serious damage can be caused to the brain, nervous system, and kidneys. Children and fetuses are at a higher risk for developing these health effects.

Preventive measures should be taken to avoid mercury-causing health effects. Encourage private well owners to contact a state-certified laboratory to arrange testing for mercury. If high levels of inorganic mercury are present, distillation and reverse osmosis are recommended. To remove organic mercury, filtration by a granulated activated carbon system is recommended. A special copper-zinc filtration system can also be used. Some private wells may require drilling a deeper well. Advise patients to use treated bottled water as their source of water until treatment is effective. Water should not be boiled because it will release mercury into the air.

In addition to precautions that private well owners can take, dental clinics can also take precautions to reduce groundwater contamination. For example, dental clinics should use amalgam separators to keep mercurial amalgam from entering groundwater through dental sewages.

8. **Perchlorates** can enter groundwater if factories release them into the soil and water. Sources of perchlorates released into the environment are rockets, fireworks, road safety flares, and perchlorate-containing consumer products.

Overexposure to perchlorates can cause hypothyroidism and ultimately affect hormone production. Perchlorates are especially harmful to fetuses and pregnant women, particularly those who have previously been diagnosed with an iodide deficiency. Thyroid hormone is essential for normal growth and development; therefore, children are more likely to be affected by high exposure to perchlorates. A patient who is not receiving appropriate levels of thyroid hormone may develop adverse effects on the skin, cardiovascular system, pulmonary system, kidneys, gastrointestinal tract, liver, blood, neuromuscular system, nervous system, skeleton, male and female reproductive system, and numerous endocrine organs.

Informing your patients of the potential health affects and encouraging those who have private wells to have their water tested annually is the best preventive treatment. Perchlorates can be removed through anion exchange, carbon adsorption, distillation and reverse osmosis technology.

If the drinking water is positive for excess perchlorates, perform the necessary tests to measure perchlorates in your patient's blood, urine, or breast milk.

9. **Fluoride** occurs naturally in groundwater. Volcanoes and industry also release fluoride that can enter drinking water.

Fluoride has positive and negative health effects. At low levels, fluoride helps prevent tooth decay; however, at high levels, it can be harmful to your health. Children below the age of 9 who are still developing teeth are most sensitive to excess fluoride. Overexposure can result in enamel fluorosis. In adults, overexposure to fluoride over a long period of time can lead to bone fractures, and eventually skeletal fluorosis.

The most effective preventive measure is to inform your patients of these health effects and encourage private well owners to arrange for annual testing by a state certified laboratory.

If tests indicate that fluoride presence is above optimal levels, suggest an alternate source of treated drinking water, especially for children, until the water has been successfully treated. Boiling the water is not an effective treatment option, as it actually increases the fluoride concentration.

Children who obtain their drinking water from a non-fluoridated source are recommended to receive systemic fluoride supplementation; however, recent literature states that topically applied fluoride (varnish) may be more effective and safe.

As a health care provider, encourage the protection of drinking water supplies by suggesting to:

- Annually test water for contaminants, and keep records to document water quality over time.
- Test water as soon as there is any noticeable change to its taste, color, or odor.
- Protect the well head. Learn its location and inspect for signs of damage or tampering.
- Install a secure well cap or sanitary seal.
- Carefully manage activities near the water source. Avoid mixing or using pesticides, fertilizers, herbicides, degreasers, fuels, and other pollutants near the well. Keep hazardous chemicals out of septic systems.
- Properly dispose of household products that contain contaminants.

Well water is a safe, protected, and natural source of drinking water. By following the guidelines above, well owners can ensure that their well continues to provide a trusted drinking water supply for their families for many years.

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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