



Children's Health in the Aftermath of Floods

Children are different from adults. They may be more vulnerable to chemicals and organisms they are exposed to in the environment because:

- Children's nervous, immune response, digestive and other bodily systems are still developing and are more easily harmed;
- Children eat more food, drink more fluids, and breathe more air than adults in proportion to their body size – so it is important to take extra care to ensure the safety of their food, drink and air;
- The way children behave – such as crawling and placing objects in their mouths – can increase their risk of exposure to chemicals and organisms in the environment.

Mold

After homes have been flooded, moisture can remain in drywall, wood furniture, cloth, carpet, and other household items and surfaces and can lead to mold growth. Exposure to mold can cause hay-fever-like reactions (such as stuffy nose, red, watery or itchy eyes, sneezing) to asthma attacks (see <http://epa.gov/asthma>). It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth. Buildings wet for more than 48 hours will generally contain visible and extensive mold growth.

Some children are more susceptible than others to mold, especially those with allergies, asthma and other respiratory conditions. To protect your child from mold exposure, you can clean smooth, hard surfaces such as metal with soap and water and dry thoroughly. Flood water damaged items made of more absorbent materials cannot be cleaned and should be discarded. These items include paper, cloth, wood, upholstery, carpets, padding, curtains, clothes, stuffed animals, etc.

If there is a large amount of mold, you may want to hire professional help to cleanup the mold. If you decide to do the cleanup yourself, please remember:

- Clean and dry hard surfaces such as showers, tubs, and kitchen countertops.
- If something is moldy, and can't be cleaned and dried, throw it away.
- Use a detergent **or** use a cleaner that kills germs.
- Do not mix cleaning products together or add bleach to other chemicals.
- Wear an N-95 respirator, goggles, gloves so that you don't touch mold with your bare hands, long pants, a long-sleeved shirt, and boots or work shoes.

Homes or apartments that have sustained heavy water damage will be extremely difficult to clean and will require extensive repair or complete remodeling. We strongly advise that children not stay in these buildings. Find more mold resources at www.epa.gov/mold/moldresources.html or read EPA's brochure, "Flood Cleanup and the Air in Your Home" at www.epa.gov/mold/flood/flood_booklet_en.pdf.

Carbon Monoxide

NEVER use portable generators indoors! Place generators outside and as far away from buildings as possible. Do not put portable generators on balconies or near doors, vents, or windows and do not use them near where you or your children are sleeping. Due to loss of electricity, gasoline- or diesel-powered generators may be used in the aftermath of floods. These devices release carbon monoxide (see www.epa.gov/air/urbanair/co/), a colorless, odorless and deadly gas. Simply opening doors and windows or using fans will not prevent carbon monoxide buildup in the home or in partially enclosed areas such as a garage. In 2001 and 2002, an

average of nearly 1,000 people died from non-fire-related carbon monoxide poisoning, and 64% of nonfatal carbon monoxide exposures occurred in the home.

If your children or anyone else in your family starts to feel sick, dizzy or weak or experiences a headache, chest pain or confusion, get to fresh air immediately and seek medical care as soon as possible. Your child's skin under the fingernails may also turn cherry-red if he/she has been exposed to high levels of carbon monoxide. Fetuses and infants are especially vulnerable to the life-threatening effects of carbon monoxide.

Install a carbon monoxide detector that is Nationally Recognized Testing Laboratory (NRTL) approved (such as UL: see www.ul.com/consumers/monoxide.html). These are generally available at local hardware stores. Carbon Monoxide is lighter than air, so detectors should be placed closer to the ceiling. Detectors should be placed close enough to sleeping areas to be heard by sleeping household members.

Learn more about carbon monoxide from the National Institute for Occupational Safety and Health (see www.cdc.gov/niosh/flood.html), the Centers for Disease Control and Prevention (see www.cdc.gov/MMWR/preview/mmwrhtml/mm5402a2.htm), and FIRST ALERT[®] (see www.homesafe.com/coalert/detect.htm).

Contaminated Water

While all people need safe drinking water (see www.epa.gov/naturalevents/flooding.html#drinking), it is especially important for children because they are more vulnerable to harm from contaminated water. If a water source may be contaminated with flood waters, children, pregnant women and nursing mothers should drink only bottled water, which should also be used to mix baby formula and for cooking. We also recommend you sponge bathe your children with warm bottled water until you are certain your tap water is safe to drink.

Your child may or may not show symptoms or become ill from swallowing small amounts of contaminated water. Symptoms can vary by contaminant. If your child drinks water contaminated with disease-causing organisms, he/she may come down with symptoms similar to the "stomach flu." These include stomach ache, nausea, vomiting, and diarrhea, and may cause dehydration (see www.nlm.nih.gov/medlineplus/ency/article/000982.htm).

Some contaminants, such as pesticides and gasoline, may cause the water to smell and taste strange, and others such as lead and disease-causing organisms may not be detectable. Drinking water contaminated with chemicals such as lead or gasoline may not cause immediate symptoms or cause your child to become ill but could still potentially harm your child's developing brain or immune system.

Because you cannot be sure if the water is safe until private wells are professionally tested or city water is certified as safe by local officials, we urge parents to take every precaution to make sure their child's drinking water is safe.

If you have a flooded well, do NOT turn on the pump, and do NOT flush the well with water. Contact your local or state health department or agriculture extension agent for specific advice on disinfecting your well. More information on how to manage a flooded well is available at: www.epa.gov/safewater/privatewells/whatdo.html.

Your public water system or local health agency will inform you if you need to boil water prior to using it for drinking and cooking. Additional information about emergency disinfection of drinking water is available at: www.epa.gov/safewater/faq/emerg.html.

Tap water that has been brought to a rolling boil for at least 1 minute will kill disease-causing organisms. Boiling will not remove many potentially harmful chemicals, and may actually increase concentrations of heavy metals (including lead), which can be harmful to a child's developing immune system. Chemically treating tap water with either chlorine or iodine will kill many disease-causing organisms, but will not remove harmful chemicals or heavy metals.

Household Items Contaminated by Floodwaters

Drinking Water Containers: Clean thoroughly with soap and water, then rinse. For gallon-sized containers, add approximately 1 teaspoon of bleach to a gallon of water to make a bleach solution. Cover the container and agitate the bleach solution thoroughly, allowing it to contact all inside surfaces. Cover and let stand for 30 minutes, then rinse with potable water.

Kitchenware and Utensils: In general, metal and glazed ceramic that are thoroughly washed and dried can be sanitized and kept. Follow local public health guidance on effective and safe sanitation procedures. Wood items must be thrown away, as these items can absorb contaminants or grow mold from the exposure to flood water and they cannot be properly sanitized.

Children's Toys and Baby Items: Throw away ALL soft or absorbent toys because it is impossible to clean them and they could harm your child. Throw away ALL baby bottles, nipples, and pacifiers that have come in contact with flood waters or debris.

Other Flood Topics

Teenagers: Teens are still growing and developing, especially their reproductive, nervous and immune systems. Teens are less likely to understand dangers and may underestimate the dangers of certain situations, or they may be reluctant to voice their concerns about potential dangers. Whenever possible, teens should not participate in post-flood clean-up that would expose them to contaminated water, mold and hazardous chemicals. Older teens may help adults with minor clean-ups if they wear protective gear including goggles, heavy work gloves, long pants, shirts, socks, boots and a properly fitting N-95 respirator.

Older Adults and People Living with Chronic Diseases: Flooding often leads to the development of micro-organisms and the release of dangerous chemicals in the air and water. Older adults and people living with chronic diseases are especially vulnerable to these contaminants. Learn the steps older adults and those living with chronic diseases can take to reduce their exposure to these environmental hazards when recovering from a flood (see www.epa.gov/aging/resources/after-the-flood.htm).

Bleach: Household bleach contains chlorine, a very corrosive chemical which can be harmful if swallowed or inhaled. It is one of the most common cleaners accidentally swallowed by children. Children – especially those with asthma – should not be in the room while using these products. Call Poison Control at (800) 222-1212 immediately in case of poisoning.

Formerly Flooded or Debris-filled Areas: Children in these areas may be at risk of exposure to dirt and debris that may have been contaminated with hazardous chemicals like lead, asbestos, oil and gasoline. Children can be exposed by direct contact through their skin, by breathing in dust particles or fumes, or by putting their hands in their mouths.

Mosquitoes and Disease-Causing Pests: Flood water may increase the number of mosquitoes and other disease-causing pests. To protect your child, ensure that they use insect repellents containing up to 30% Deet, Picardin, or Oil of Lemon Eucalyptus. The American Academy of Pediatrics recommends that Deet not be used on infants less than 2 months of age and that Oil of Lemon Eucalyptus not be used on children under 3 years of age. Other ways to protect children

include staying indoors while the sun is down, wearing light colored, long sleeved shirts and pants, covering baby carriages and playpens with mosquito netting, and clear standing water or empty flower pots, etc of water.

To access experts children's environmental health issues related to flooding, please contact the Pediatric Environmental Health Specialty Units in your area:

Region 1 - Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and 10 Tribal Nations

www.childrenshospital.org/clinicalservices/Site1899/mainpageS1899P0.html

(888) 244-5314

Region 2 - New York, New Jersey, Puerto Rico, the US Virgin Islands, and 7 Tribal Nations

www.mssm.edu/cpm/peds_envIRON.shtml/

(866) 265-6201

Region 3 - Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia

www.health-e-kids.org/

(866) 622-2431

Region 4 - Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and 6 Tribal Nations

www.sph.emory.edu/PEHSU/

(877) 337-3478

Region 5 - Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, and 35 Tribal Nations

www.uic.edu/sph/glakes/kids/

(800) 672-3113

Region 6 - Louisiana, Arkansas, Oklahoma, New Mexico, Texas, and 65 Indian Tribes

www.swcpeh.org/

(888) 901-5665

Region 7 - Iowa, Kansas, Missouri, Nebraska and nine Tribal Nations

www2.kumc.edu/mapehsu/

(800) 421-9916

Region 8 - Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming, and 27 Tribal Nations

www.rmrpehsu.org/

(877) 800-5554

Region 9 - Arizona, California, Hawaii, Nevada, the Pacific Islands, and over 140 Tribal Nations

<http://coeh.berkeley.edu/ucpehsu/contact.html>

(866) 827-3478

Region 10 - Alaska, Idaho, Oregon, Washington, and Native Tribes

<http://depts.washington.edu/pehsu/>

(877) 543-2436

For More Information

- EPA's Flooding Web Page: www.epa.gov/naturalevents/flooding.htm
- Clinician Recommendations Regarding Return of Children to Areas Impacted by Flooding and/or Hurricanes: A Joint Statement from the Pediatric Environmental Health Specialty Units

and the American Academy of Pediatrics:

www.aoec.org/documents/positions/Hurricane_recs_AAP_PEHSU.pdf

- Learn more about Pediatric Environmental Health Specialty Units:
<http://aoec.org/PEHSU/index.html>
- An online version of this fact sheet:
<http://yosemite.epa.gov/ochp/ochpweb.nsf/content/flood.htm>

For more information, contact the Office of Children's Health Protection and Environmental Education at (202) 564-2188