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**PEDIATRIC DISASTER PREPAREDNESS AND RESPONSE**  
**TOPICAL COLLECTION**  
**CHAPTER 10: PEDIATRIC DECONTAMINATION**

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## **CHAPTER 10: PEDIATRIC DECONTAMINATION**

The American Academy of Pediatrics (AAP) published specific recommendations in its policy and technical report, “Chemical-Biological Terrorism and Its Impact on Children” in February 2020.

### **GENERAL PRINCIPLES**

The purpose of this chapter is to describe many of the overarching principles specific to decontamination of the pediatric patient. General decontamination considerations with respect to child-specific procedures should include the following:

- Decontamination systems should be suitable for children of all ages, unaccompanied minors, nonambulatory children, and those with special health care needs.
- To ensure safety and protection for all, children should be directly supervised during and after a disaster. Every attempt should be made to keep children with their parents, throughout the decontamination.
- Given that children, especially smaller children and infants, are much more susceptible to hypothermia during decontamination procedures, warm water should be used and blankets for warming should be readily available.

### **Skin Decontamination**

Skin decontamination is critical and should occur as soon as possible after basic life support maneuvers. Whenever possible, decontamination should take place outdoors with plans to collect contaminated water. To minimize exposure to health care professionals and patients within the health care facility, the child should be disrobed outdoors—as per Occupational Safety and Health Administration (OSHA) regulations—before entering the ambulance or building, with attention to prevention of hypothermia. When dealing with infectious agents, skin contamination is a serious threat for both victims and the health care or other professionals who care for them. Health care professionals should not assist in disrobing unless they are wearing appropriate personal protective equipment (PPE).

- All clothing and shoes should be removed to decrease the likelihood of continued exposure. These items should be placed in a plastic bag or other container and sealed for later analysis for chemical residues. When possible, victims should disrobe themselves to minimize exposure to others.
- The skin should be washed with soap and water, and the hair should be thoroughly washed and rinsed.
- For field decontamination, emergency medical system professionals and some municipalities and fire departments may have portable shower units for this purpose. In other situations, these may be available for set up at the health care facility.
- Dry decontamination (absorbent or adsorbent materials) may be considered if wet decontamination is not available. Dry decontamination may be more effective with liquid contaminants than particulate matter.
- Children cannot always be decontaminated in adult decontamination units. Skin decontamination showers that are appropriate for adults may result in hypothermia in children because of their increased body surface area to mass ratio. As such, equipment such

as warming blankets and heating lamps should be readily available. Protocols should also include strategies for using warm water and low-pressure showers.

- Principles of showering include the establishment of 3 management zones in the decontamination staging area (hot [maximum contamination], warm [less contamination), and cold [no contamination) zones), use of water that has been warmed to a temperature of 100°F, a water pressure of 60 pounds per square inch (psi), and containment of the wastewater.
- In situations such as fire exposure, consider the likelihood that the mucous membranes and respiratory tract may have been affected.
- Pediatricians and health care providers should take measures to protect themselves from contaminated skin and clothing. Health care professionals should not assist in disrobing unless they are wearing appropriate PPE. In addition, parents or other caregivers may also be at risk for skin contamination and may require decontamination and/or PPE as appropriate.
- Health care workers should also doff PPE and shower after contact with victims and cleanse nondisposable equipment.
- If the event causes significant skin injury (eg, explosive device), care should first be focused on managing bleeding wounds at the scene, followed by more careful skin cleansing at a hospital facility.

### **Eye Decontamination**

Eyes should be flushed continuously with clean water or sterile saline for at least 15 minutes. If the victim wears contact lenses, they should be removed before the eyes are flushed. If there is persistent pain after eye flushing, ophthalmologic consultation is advised.

### **Personal Protective Equipment**

The level of recommended PPE will depend on the following: 1) whether responders are working in warm or cold decontamination zones and which hazardous substance(s) are suspected to have been released. It is important to note that PPE is only one part of a comprehensive worker protection plan; there are also administrative and engineering controls, as well as work practices, that are implemented to keep workers safe. PPE may include gown and gloves to protect the skin, and mask or other head gear to protect the respiratory tract. Although not necessarily specific to pediatric decontamination, it is important to remember to use universal precautions to prevent contact with blood, other bodily fluids, nonintact rashes, and mucous membranes. In addition, handwashing should be performed after contact with blood or body fluids, whether or not gloves are worn.

Respiratory masks consist of high-efficiency particulate air (HEPA) filters and organic vapor cartridges that will protect against many airborne hazards that first receivers/responders may encounter (toxic dusts, biological agents, radioactive particulates, organophosphates, and other pesticides or solvents). Acid gas cartridges also provide protection against chlorine. This equipment should be removed and discarded after use or cleaned between the care of patients.

**Table 10.1: 4 Levels of PPE** shows the 4 levels of PPE, from most protective (Level A) to least protective (Level D). Responders and health care providers working outside contamination areas but who are expected to have contact with previously contaminated victims (such as health care professionals in hospitals and clinics who are receiving and treating patients) may require Level C or D PPE.

<b>Table 10.1: Four Levels of Personal Protective Equipment</b>		
<b>Level</b>	<b>Description and Details</b>	<b>Equipment to Be Used as Appropriate</b>
A	Consists of a self-contained breathing apparatus (SCBA) and a totally encapsulating chemical-protective (TECP) suit. Select when the greatest level of skin, respiratory, and eye protection is required. Practical limitations include limited air supply (20–50 minutes) and potential heat stress while wearing the suit.	<ul style="list-style-type: none"> <li>• Positive pressure, full-facepiece SCBA, or positive pressure supplied air respirator (SAR) with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).</li> <li>• Totally encapsulating chemical-protective suit.</li> <li>• Inner and outer chemical-resistant gloves.</li> <li>• Boots, chemical-resistant, toe and metatarsal impact protection (eg, steel or composite).</li> <li>• Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally encapsulating suit).</li> <li>• Coveralls, long underwear, and/or hard hat (under suit), optionally, as applicable.</li> </ul>
B	Consists of a positive-pressure respirator (SCBA or SAR) and nonencapsulated chemical-resistant garments, gloves, and boots, which guard against chemical splash exposures. Provides the highest level of respiratory protection with a lower level of dermal protection.	<ul style="list-style-type: none"> <li>• Positive pressure, full-facepiece SCBA, or positive pressure air purifying respiratory APR with escape SCBA (NIOSH approved).</li> <li>• Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; 1 or 2 piece chemical-splash suit; disposable chemical-resistant overalls).</li> <li>• Inner and outer chemical-resistant gloves.</li> <li>• Boots, outer, chemical-resistant with impact resistance.</li> <li>• Boot-covers, outer, chemical-resistant (disposable).</li> <li>• Coveralls, chemical-resistant boot covers, face shield and/or hard hat (under suit), optionally, as applicable.</li> </ul>
C	Consists of an APR and nonencapsulated chemical-resistant	<ul style="list-style-type: none"> <li>• Full-face or half-mask, APRs (NIOSH approved).</li> </ul>

	<p>clothing, gloves, and boots. Provides the same level of skin protection as Level B, with a lower level of respiratory protection. Used when the type of airborne exposure is known to be guarded against adequately by an APR. Because of limitations of an APR, its use is allowable only when oxygen levels are adequate (ie, &gt;19.5%), air contaminants are known, and a cartridge can be selected to provide protection from contaminants.</p>	<ul style="list-style-type: none"> <li>• Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).</li> <li>• Inner and outer chemical-resistant gloves.</li> <li>• Eye protection is usually added if a half-face respirator is worn. Goggles or glasses, depending on the hazard encountered.</li> <li>• Coveralls, chemical-resistant outer boots, chemical-resistant disposable boot covers, escape mask, face shield and/or hard hat (under suit), optionally, as applicable.</li> </ul>
<p>D</p>	<p>Consists of standard work clothes without a respirator. For example, in hospitals, consists of surgical gown, mask, and latex gloves (universal precautions). Provides minimal respiratory and skin protection.</p>	<ul style="list-style-type: none"> <li>• Coveralls.</li> <li>• Boots/shoes.</li> <li>• Eye protection is often added.</li> <li>• Gloves, chemical-resistant outer boots, safety glasses or chemical splash goggles, escape mask, face shield and/or hard hat, optionally, as applicable.</li> </ul>

Source: OSHA. Emergency Preparedness and Response. [www.osha.gov/SLTC/emergencypreparedness/gettingstarted\\_ppe.html](http://www.osha.gov/SLTC/emergencypreparedness/gettingstarted_ppe.html). Accessed February 23, 2022.

### Management/Decontamination in the Field

First responders or triage supervisors can initiate decontamination and treatment at the scene of an incident or nearby if necessary. If there are certain hazardous materials at the incident site, there are specific protocols that will be initiated, including mobilizing those trained in handling particularly dangerous materials such as hazardous materials (hazmat) removal workers.

First responders typically work in what is known as a “warm decontamination zone,” which is any location where the type and quantity of hazardous material is unknown and where contaminated victims, equipment, or contaminated waste may be present. This zone is usually set up adjacent to the location where a chemical/biological agent release has occurred. This victim assessment and treatment area is to be distinguished or kept separate from the “cold zone” or “post-decontamination zone” (locations that are believed to be uncontaminated with the hazardous material). Usually, a hospital or other health care facility to which victims are transferred are referred to as “cold decontamination zones,” where patients have already been decontaminated.

### **Management/Decontamination at the Hospital (or other Facility)**

Hospitals often decontaminate patients prior to entry into the building, unless decontamination is confirmed to have occurred in the field. In contrast to the first responders in the field, hospital and other facility staff may be alerted in advance of hazardous exposure concerns and any prior decontamination efforts. Hospital staff can decrease their risk of exposure by wearing full PPE and respiratory masks until it is clear that secondary exposure risk has been eliminated. Secondary exposure usually depends on the amount of toxic substance in the victim's hair, skin, and clothing, as well as the concentration of the substance. If decontamination has not been completed prior to arrival, the victim must be treated and decontaminated in an area with adequate ventilation. Secondary exposure can be significantly decreased if a victim's contaminated clothing can be cut away using blunt-nose shears and isolated immediately. Timely removal of patients' clothing can reduce contamination and secondary exposure as much as 85%. Afterwards, victims need to shower with lukewarm water and liquid soap to remove hazardous substance from their skin and hair. As noted previously, this process must be carefully supervised when treating children; it may be necessary for a staff member wearing the appropriate PPE to assist children throughout the process.

Serious poisoning to health care workers has been reported following care of patients with organophosphate poisoning that required treatment. Victims who self-transport from the field and bypass emergency medical services personnel may increase the risk of exposure. Thus, removing contaminated clothing from all victims, improving ventilation, and using PPE may significantly decrease health care workers' exposure to hazardous materials. Physician offices should have a mechanism in place where patients can be screened in a setting outside the office, such as their vehicle, as a means to protect the facility and staff from exposure. Additionally, once victims have been transferred to the hospital or facility, it is important to have adequate documentation of exposure risks, symptoms, and clinical findings and for all patients treated.

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