Chemicals and Materials

First Aid for Chemical Exposures

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How long should the skin or eyes be flushed with water in the event of a chemical exposure?

The American National Standards Institute (ANSI) Standard Z358.1-2014)R2020) "Emergency Eyewash and Shower Equipment" does not specify how long the affected body part should be rinsed. It does specify that the equipment installed according to the standard is capable of providing flushing liquid for a minimum of 15 minutes.

Historically, most sources recommend that water rinsing or flushing following skin or eye contact with a chemical should continue for 15 or 20 minutes. However, all chemicals do not cause the same degree of effects (some are non-irritants while others can cause severe corrosive injury). At the present time, there is insufficient scientific evidence available to properly address the question of how long flushing should continue. It is agreed that it is very important that water flushing start immediately following skin or eye contact with a chemical.

"First Aid Guidelines" are available from the American Heart Association and the American Red Cross. They state that it "can be beneficial to rinse eyes exposed to toxic chemicals immediately and with a copious amount of tap water for at least 15 minutes or until advanced medical care arrives. If tap water is not available, normal saline or another commercially available eye irrigation solution may be reasonable."

Always:

- Brush powdered chemicals off the skin with a gloved hand or piece of cloth.
- Remove all contaminated clothing from the victim, making sure you do not contaminate yourself in the process.
- Monitor for hypothermia when cooling large burns.

Note that the manufacturer or supplier may also specify a cleansing agent (e.g., non-abrasive soap) if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate.

OSH Answers has more information on emergency eyewash and shower equipment.

What should a workplace do if they choose to have additional first aid procedures available?

If an employer opts to offer additional first aid measures (including over-the-counter medications, use of epinephrine auto-injectors, naloxone, etc.), it is suggested that they first seek legal counsel so that they are aware of any liability issues and to check with your local jurisdiction responsible for health and safety. For example, in some jurisdictions, distribution of over-the-counter medications is not recommended (although an individual who can purchase using a vending machine may be permissible). In other jurisdictions, distribution of over-the-counter medications may be permitted under specific circumstances (including the appropriate training of first aid personnel).

Under what circumstances should oxygen be administered as a first aid measure?

In the past, emergency oxygen was commonly recommended as a first aid procedure for almost any chemical inhalation exposure. Later, concern was expressed that the administration of oxygen itself may be harmful if carried out improperly or in the wrong circumstances.

The presence of oxygen cylinders in the workplace can introduce additional hazards. For example, since oxygen supports combustion, the presence of oxygen cylinders could contribute to a fire hazard in the workplace. Also, since oxygen is stored under high pressure, the cylinder can behave like a missile if the valve breaks or the tank is punctured. Therefore, the risks and benefits of storing and maintaining an emergency oxygen supply in the workplace must be weighed.

There are some situations where the benefits of emergency oxygen outweigh the potential risks associated with maintaining and storing oxygen cylinders in the workplace. Emergency oxygen may be beneficial following exposure to chemicals that interfere with the body getting the necessary levels of oxygen to sustain life and health, including chemicals that:

- Displace oxygen in the air, reducing the amount of oxygen available for breathing (e.g., helium, argon, methane, carbon dioxide or nitrogen).
- Reduce the ability of blood to transport oxygen (e.g., carbon monoxide poisoning, or methemoglobinemia – the presence of an oxidized form of hemoglobin in the blood that does not transport oxygen).
- Compromise the use of oxygen by body tissue, as with cyanide or hydrogen sulfide toxicity.
- Interfere with the ability of oxygen to cross through the lungs to the bloodstream, as occurs with pulmonary edema, a potentially fatal accumulation of fluid in the lungs. Ammonia, phosgene, and chlorine are examples of chemicals that can cause pulmonary edema.
- Provoke a severe asthma attack (e.g., toluene diisocyanate).

Additional training of first aid providers is required since basic first aid training courses do not include oxygen administration. First aid providers must be familiar with the laws that govern the use of oxygen administration in their workplace.

When should vomiting be induced following ingestion of a chemical?

Vomiting should NOT be induced following ingestion of a chemical in an occupational setting unless advised by a Poison Centre or doctor. Some of the arguments against inducing vomiting are:

- The amount of chemical unintentionally ingested by an adult is generally estimated to be very small (14-21 mL or about 0.5-0.75 oz.)
- There is no conclusive evidence that people who swallow a chemical and who do have their stomachs emptied have more successful outcomes than people who do not.
- There can be significant risks associated with inducing vomiting, especially in emergency situations.
- There does not seem to be a reliable and safe first-aid procedure for inducing vomiting in adults.
- Medical attention is usually available quite quickly in most situations.

In the event of chemical ingestion, the best action is to call your local Poison Control Centre or a doctor and follow their advice. They will ask you specific questions, such as the name of the product swallowed, the amount swallowed and the condition of the person who swallowed the chemical. This information will assist them in determining the best course of action.

Should water or milk be given to dilute a chemical that has been ingested?

Much of what we know about the benefits of diluting an ingested chemical with water or milk is based on *in vitro* (test tube) and *ex vivo* (using harvested rat esophagi) studies.

Based on their evaluation of the evidence for dilution with milk or water, the American Heart Association and American Red Cross recommend that people should not take anything by mouth for an ingested poison unless specifically told to do so by a doctor or the Poison Control Centre.

How do I know which antidote to have available for the chemicals in my workplace?

It is a common misperception that antidotes are available for most chemical poisonings. True antidotes are the exception rather than the rule.

Activated charcoal is sometimes considered to be an antidote. Activated charcoal works by binding the chemical in the stomach so it cannot be absorbed through the stomach. According to the American Academy of Clinical Toxicology and the European Association of Poisons Centres, "the administration of activated charcoal may be considered if a patient has ingested a potentially toxic amount of a poison (which is known to be adsorbed to charcoal) up to 1 hour previously...". In general, the administration of activated charcoal is NOT considered a **first aid** procedure. Activated charcoal may be administered in the emergency department or under medical supervision.

Some chemical classes do have true antidotes - cyanides and organophosphate pesticides are good examples. You can determine which chemicals used in your workplace have antidotes by consulting with a doctor with certification in medical toxicology or occupational medicine, or the manufacturer or supplier of your product. These specialists can advise you on situations where it may be appropriate to store an antidote onsite. Special training of first aid providers will be required. In some cases, it may be appropriate to request your local hospital to stock an antidote that must be administered by a medical professional.

How do I know which first aid procedures to follow for chemicals used in my workplace?

In order to know what first aid procedures to follow, it is essential that you know what chemicals are present in your workplace. Consult your chemical inventory and the First-aid measures section on the safety data sheets (SDSs) for those products. Create a list of chemicals, their properties and their corresponding first aid requirements. Be sure that the emergency first aid providers in your workplace have the appropriate training and authority (if necessary) to respond to the effects of chemicals used at your workplace.

Finally, make sure your local hospital is aware of any chemicals on your site that may require special first-aid procedures, antidotes, or medical follow-up.

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