

HEALTH CONCERNS

Dangerous situations can arise very quickly, and a teacher must know what to do when they occur. There is no time to form a plan of action in an emergency. The plan must be worked out in advance and quickly recalled when an emergency arises. *Most laboratory accidents can be prevented if practioners use approved activities, good laboratory management techniques, and safe practices during the investigation.*

HEALTH CONCERNS

ALLERGIES

An allergy is a hypersensitivity to a foreign substance that is harmless to most people but produces a violent reaction in an allergy sufferer. Allergic reactions are the body's efforts to eliminate something it considers harmful. In some people the histamine that the body produces in response to an allergen can cause muscle cramps, disorientation, unconsciousness, and death from shock or suffocation.

Teachers should be aware of their students' allergies of their students as well as their own. These should always be reviewed before beginning an experiment, whether it is performed indoors or outdoors.

It is a good practice to inform the student's parents about the live and preserved plants, animals, chemicals, outdoor activities, and foods that may be tasted or used in your classroom. Express any concern about students' possible allergic reactions to the materials. Parents should respond by listing allergic reactions that their children may have if exposed to the materials listed. This sharing of information may prevent a student from having a severe allergic reaction in your classroom.

LATEX ALLERGIES

Some laboratory investigations, such as a dissection, may require students and teachers to wear gloves during the

procedure. Latex gloves may pose a hazard to the person wearing them, as about one percent of the general population is allergic to latex. Research indicates that high-latex, protein- content powdered gloves are the most dangerous and should be avoided in schools. Students known to have latex allergies, spina bifida, and other myelodysplasias are at the highest risk.

Latex gloves are the most common cause of allergic reactions to latex. Proper glove-wearing behaviors, including the removal of all jewelry and the avoidance of hand lotions that might react with the latex, are important factors in ensuring glove integrity. Substituting vinyl gloves may prevent many of the allergic reactions caused by latex.

Latex allergy can often be determined by a skin test or a blood test, but neither method has proved to be very reliable.

SYMPTOMS OF LATEX ALLERGIES

Individuals who are allergic to latex will often develop "contact dermatitis"—a rash—when they come into contact with latex. Other symptoms might include itching, watery eyes, and sneezing. With continued exposure, chronic lesions could develop, and these could cause anaphylaxis or suffocation.

The rising incidence in the natural rubber latex sensitivity / allergy is associated with the increased glove use recommended by the U. S. Department of Health’s list of standard precautions.

GLOVE TYPES

Three types of gloves are recommended for use by teachers and students.

- 1. Polyethylene gloves are thin, flat, loose, transparent gloves usually worn by persons handling food. These are suitable for dissections and the cleaning of bodily fluids that may be introduced into the classroom or laboratory.

- 2. Vinyl gloves are shaped to fit the hand, and they come in various sizes. They conform to the hand better than do the polyethylene type, but not as well as latex gloves.

- 3. Latex gloves come in many varieties—powdered or dry, hypoallergenic or regular. They conform well to the hand and are suitable for tasks that require fine finger dexterity.

Most literature is in agreement that latex gloves offer the best protection against HIV and hepatitis B viruses.

BURN HAZARDS

Burns from heat or chemicals are among the common accidents that can occur in the science laboratory or classroom.

Careful planning, classroom management techniques, and safety training for students can prevent burns from occurring.

Accidents may still happen, however, so ensuring that only first-degree burns occur is a desirable secondary goal in laboratory safety.

The following information is adapted from the U.S. Department of Health and Human Services’ *Manual of Safety and Health Hazards in the School Science Laboratory*.

DEGREE OF BURN	INJURY TO BODY	FIRST-AID PROCEDURE
First-degree burns	• Affect the outer layer of the epidermis • Characterized by redness and heat • Itching, burning, and pain common	• Hold burn under cool water for 5 minutes. • Cover with clean dressing.
Second-degree burns	• Affect deeper layers of the epidermis • Characterized by mottled red skin and blisters • Considerable pain and body fluid loss through blisters • Possible infection and hospitalization	• Call 911. • Call the school nurse. • DO NOT remove burnt clothing. • DO NOT cover burns with dressing.
Third-degree burns	• Affect skin and deeper tissue • Are white or charred in appearance • Little pain because nerve endings are burned • Internal loss of body fluids • High risk of infection • Extensive hospitalization required	• Call 911. • Call the school nurse. • DO NOT remove burnt clothing. • DO NOT cover burns with dressing.

CHEMICAL BURNS

Handle hazardous chemicals with extreme care to prevent chemical burns. Hold the chemical at arm's length toward the back of the working area on the laboratory table. Do not place hazardous chemicals in unstable containers or in an apparatus that is not properly secured.

If a student receives a chemical burn, remove his or her clothing and place the student in the safety shower for at least 15 minutes. Call the school nurse, and call 911. Cover burns with clean dressing.

A chemical burn to the eyes should be continuously washed for at least 15 minutes at the eyewash station. Call the school nurse, and call 911. Remove contact lenses. Cover both eyes with clean dressing.

USE GLOVES AND WASH YOUR HANDS BEFORE AND AFTER GIVING FIRST AID, TO PREVENT THE SPREAD OF PATHOGENS! GLOVES DO NOT PROVIDE 100% PROTECTION FROM INFECTION.

PREVENTION

Most chemical burns result from accidental contact with heated objects or liquids. Heated objects should be constantly attended by the student conducting the investigation or placed where students will not make accidental contact with them.

Hot plates are one of the more dangerous pieces of equipment because they retain heat for a long period of time after they have been switched off. A hot plate sitting on the edge of a laboratory table appears harmless—until a student leans an elbow on it while conducting an investigation. Hot plates should always be placed out of reach to prevent students from accidentally touching or leaning on them while they are hot.

Students should never have to reach across a hot apparatus to perform an experiment. The apparatus should be placed so that if hot liquids are spilled, they will land on the laboratory table, not the student.

Remember . . .

- ☞ Open ends of glassware used for heating should be pointed away from all other students.
- ☞ Use a hot plate rather than a Bunsen burner when evaporating liquids.
- ☞ Set hot-plate thermostats at the correct temperature for the experiment, not at the maximum temperature.
- ☞ Operate Bunsen burners at the lowest level possible.
- ☞ Do not hold objects in a Bunsen burner flame for an excessive period of time.
- ☞ Do not boil hot-water baths unless absolutely necessary.
- ☞ Light bulbs used in experiments should be the lowest wattage possible.
- ☞ Mix heat-generating chemicals slowly.
- ☞ Use diluted solutions of chemicals when possible.

If a student should ingest or inhale a chemical, call the school nurse, 911, and the poison control center in your area. If you need to perform CPR, use a mouth-to-mask resuscitator so that you do not succumb to the chemical as well.

GLASSWARE HAZARDS

Most injury-related laboratory accidents involve glassware failure that is caused by improper use. Because it is fragile, glassware used in science laboratories should be made of Pyrex or Kimax. This type of durable glassware offers the best resistance to chemicals, heat, and accidental breakage. Remember . . .

- ☼ Never use glassware that is scratched or chipped, or else breakage and injury may result. Dispose of glassware in an appropriate container.
- ☼ Always lubricate glass tubing, thermometers, and rods when inserting them in rubber stoppers.
- ☼ Always protect the hands with several layers of cloth when inserting glass in rubber stoppers.
- ☼ Do not try to cut through glass with a file. To properly cut glass, make a scratch on the glass tubing or rod with a sharp triangular file using a quick motion. Snap the tubing or rod at the scratch, and fire polish the cut ends.
- ☼ Wrap or strip glassware with masking tape if it is to be used under a vacuum or under pressure. This will prevent flying pieces of glass in the event of an implosion or explosion.
- ☼ Never heat pipettes, volumetric flasks, or burets as they can expand and the liquids inside can increase in volume when heated.
- ☼ Do not heat bottles, graduated cylinders, volumetric glassware, funnels, jars, droppers, watchglasses, desiccators, or glass plates.
- ☼ Manipulate heated glass with caution to avoid burns. Remember that glass cools slowly.
- ☼ When bending glass tubing or fire polishing cut glass tubing, never hand the tubing to anyone until it has cooled.
- ☼ If a student receives a minor cut or scratch, wash your hands, put on protective gloves, and clean the area with soap and water. Place a clean dressing over the wound and send the student to the school nurse.
- ☼ If a student receives a wound that causes severe bleeding, send for the nurse and call 911. Put on protective gloves and apply pressure to the wound until help arrives. If the student has been impaled by an object that is still in the wound, DO NOT remove the object or severe bleeding could result.

Many injuries occur during the cleaning of glassware. In addition to the possibility of injury from broken glass, there is the threat of injury from the cleaning solutions used.

Most glassware can be cleaned with detergents and brushes. When stronger cleaning solutions are needed, trisodium phosphate, dichromate-acid, and alcoholic potassium hydroxide are used. All of these cleaning solutions are hazardous chemicals

BIOHAZARDS

A biohazard is defined as any biological material (living or dead) that is a pathogen (disease-carrying organism).

The biohazard symbol  is universal and should be used on all potentially pathogenic materials.

BIOLOGICAL SPILLS

Biological spills that occur in a science laboratory or classroom can generate aerosols that can be dispersed in the air throughout the room. These spills can be very dangerous if they involve infectious microorganisms.

If a spill occurs, follow these steps.

- ✿ Remove any contaminated clothing.
- ✿ Vigorously wash the exposed area with soap and water for one minute.
- ✿ Wearing disposable gloves, soak up the contents of the spill with paper towels.
- ✿ Place contaminated paper towels in a plastic bag for disposal.
- ✿ Apply disinfectant to the spill area.
- ✿ Consult the MSDS, and call a physician if necessary.



BLOOD SPILLS

The cleaning of blood spills should be limited to persons who are trained for the task. If an untrained person encounters a blood spill, they should limit access to the area and call for assistance immediately. Follow these steps for the proper removal of blood spills.

- ✿ Wear disposable gloves.
- ✿ If the gloves develop holes, remove

them and wash hands immediately; then use new gloves.

- ✿ Remove contaminated gloves by grasping a glove at the wrist and pulling it off, turning the glove inside out.
- ✿ Double-bag gloves and contaminated materials.
- ✿ Use disposable towels only.
- ✿ If the spill involved broken glassware, NEVER pick up the glass directly with the hands.
- ✿ Use a brush and dustpan to collect broken glassware.
- ✿ Clean up biological spills of ANY type with a 1:10 solution of bleach (one part bleach to ten parts water). Leave the solution on the contaminated area for 15 minutes. This solution will destroy most viruses and bacteria.

STANDARD PRECAUTIONS

Standard precautions have been created by the U.S. Department of Health to minimize the risk of infection from all types of sources; these apply to everyone. All blood, bodily fluids, and bodily substances should be considered potentially infectious. Use the steps below to prevent infection and to develop a procedure for infection control.

- ✿ Wash hands with soap.
- ✿ Wear disposable gloves and wash hands after removing the gloves.
- ✿ Wear mask and eye protection or a face shield.
- ✿ Wear lab aprons or coats.
- ✿ Place contaminated waste (gloves, paper towels, bandages, etc.) in a plastic bag.
- ✿ Notify custodial staff for proper disposal of waste.
- ✿ Custodial staff should place the material in a red plastic biohazard bag and follow proper disposal procedures.

LIFTING HEAVY OBJECTS

Teachers and students must know how to use their bodies properly when lifting or moving heavy objects. Observe the following guidelines to avoid possible injury.

THINK BEFORE LIFTING

- ☼ Assess the size of the object and get help if necessary.
- ☼ When possible, use an assistive device or try pushing or pulling the object first.
- ☼ When lifting an injured student, explain the process so that, if possible, the student can help.
- ☼ Make sure your path is clear and unobstructed before lifting the object.

WHILE LIFTING

- ☼ Bend your knees, keep your back straight, and hold the object close to your body.
- ☼ Spread your feet about one foot apart and use your leg muscles.
- ☼ Never twist your body. Move your feet first, then allow the leg muscles to turn the body.
- ☼ Never jerk the load. Lift in a smooth motion, and don't twist your body.
- ☼ If the object is too heavy to lift alone, GET HELP!
- ☼ Use the same technique to set down the object that you used to pick it up.

FIRST-AID KITS

Keep first-aid kits in a conspicuous place in science laboratories and preparation rooms—preferably next to a sink. Mark the kits' location clearly, and make students aware of the location and procedures for using the kits.

ITEMS RECOMMENDED FOR FIRST-AID KITS

- ☼ box of disposable gloves (latex or plastic)
- ☼ antiseptic and disinfectant
- ☼ bottle of bleach—prepare solution at the time it is needed (dilute 1 part bleach to 10 parts water)
- ☼ disposable towels
- ☼ sterile gauze for covering large wounds
- ☼ medical tape
- ☼ scissors
- ☼ bandage strips for covering small wounds
- ☼ plastic bags for holding contaminated waste

ITEMS NOT RECOMMENDED FOR FIRST-AID KITS

- ☼ iodine (can cause tissue damage)
- ☼ ice pack compress (swelling of soft tissue should be examined by a physician)
- ☼ ammonia inhalants (if student is unconscious, get help)
- ☼ tourniquet (use pressure until medical assistance is available)

In addition to keeping first-aid kits in the laboratory and preparatory rooms, teachers should have a transportable first-aid kit for use during a field investigation. Several types of transportable kits are available that can be worn around the teacher's waist.

LIVE ANIMALS IN THE CLASSROOM

Occasionally, live animals may be brought into the classroom to facilitate student observations of, and respect for, living organisms and the conditions under which they thrive. The National Association of Biology Teachers (NABT) supports these experiences as long as participants observe the guidelines developed by the scientific and educational communities for the proper care of and respect for all living animals.

“Studying animals in the classroom enables students to develop skills of observation and comparison, a sense of stewardship, and an appreciation for the unity, interrelationships, and complexity of life. This study, however, requires appropriate, humane care of the organism. Teachers are expected to be knowledgeable about the proper care of organisms under study and the safety of their students.”

NSTA, *Guidelines for Responsible Use of Animals in the Classroom*, 1991

GUIDELINES FOR THE STUDY OF LIVE ANIMALS

Teachers and students must be aware of the responsibilities involved with the study of live animals. The guidelines below were developed to assist with the introduction of live animals into the classroom or laboratory (see Appendix B).

- ☼ Do not perform investigations on any animal that might cause suffering or pain, or that might pose a health hazard to the teacher or students.
- ☼ Animals brought to the classroom should be observed carefully by a science instructor. The health and safety of the animal and the students should be a priority during classroom activities.
- ☼ Animals that “live” in the classroom should be treated with care and respect while sharing the living space with students.
- ☼ Be aware of any allergies students may have toward animals.
- ☼ Wear personal protective equipment when caring for animals, especially animals that are not domesticated. Some wild (non-domesticated) animals may carry infectious diseases or organisms that can be transmitted to humans.
- ☼ Students should notify the teacher prior to bringing an animal to the classroom. This way, potentially dangerous situations can be prevented.

HANDLING LIVE ANIMALS

Use precautions when keeping live animals in the classroom. Teachers should be aware that diseases such as salmonellosis can be transmitted to students who handle classroom animals. The small painted turtle that frequents elementary school classrooms has been found to carry salmonella.

Keeping the cages clean of fecal remains will reduce the presence of bacteria that may cause an illness.

Always insist that students **wash their hands** before feeding the animals, as well as after they have handled the animals or touched materials from the animal’s cage.