

Laboratory safety



A zoology laboratory is a place for serious scientific work and study. Students and teachers must recognize that a number of potential safety hazards are present in all science laboratories. In a zoology laboratory, the principal safety hazards are electrical circuits, potentially dangerous chemicals, hot liquids and heat sources, broken glass, live animals, and sometimes infectious agents (pathogenic bacteria, viruses, and parasites). Achieving safety in the laboratory, as in other places, requires paying attention to potential hazards and observing appropriate safety measures. Nothing we do is without some degree of risk. For example, people sometimes fall out of bed and injure themselves; many people also drown in swimming pools each year. But science laboratories can provide a safe environment when both students and teachers are aware of potential hazards and follow appropriate safety procedures.

The following list of safety rules is offered as a good start toward safe practices in the lab. This is not a complete list of safety rules, and it is certainly not a substitute for proper safety awareness for the particular lab in which the student is engaged. It is essential that students understand the need and importance of safety. All actions in a laboratory have consequences. Be protected by paying attention, listening to your instructors, and knowing about the materials and procedures necessary to perform each laboratory investigation. You should also be mindful of the activities of other students around you. Frequently it is an accident caused by another person that endangers someone in a laboratory.

Some Basic Rules of Safety for the Laboratory

1. Use common sense.
2. Avoid horseplay in the laboratory.
3. Never eat, drink, or smoke in the laboratory.
4. Always wash your hands for at least 15 seconds and rinse them well after handling chemicals or live or preserved animals.
5. Always wear close-toed shoes in the laboratory. Sandals or open-toed shoes are not appropriate.
6. Be familiar with the location, operation, and proper use of fire extinguishers, eyewash fountains, safety showers, and other safety equipment in the laboratory.
7. Know the location of emergency exits and the evacuation routes to be used in case of an emergency.
8. Always be cautious when using electric hot plates and gas burners. You can get a serious burn by touching a hot surface or by spilling a hot liquid.
9. Use protective mittens or tongs to handle hot objects.
10. Be cautious when transferring liquids because aerosols may be formed, which can be dangerous to your eyes and lungs.
11. Wear safety goggles or other appropriate protective eye gear when performing or observing experiments or demonstrations.
12. Be familiar with the properties of, and hazards associated with, all chemicals used in the laboratory exercises. When you are in doubt about the hazards associated with any chemical, consult the Material Safety Data Sheets (MSDS) provided by the manufacturers. The appropriate MSDS for all potentially hazardous chemicals should be kept in the laboratory. Your laboratory instructor should provide you with appropriate warnings for the materials to be used, but you may also ask to see the MSDS for any chemical to be used if you feel you need further information. Laboratory instructors should teach all students to read the MSDS.
13. Beware of electrical equipment with frayed or bare wires or with faulty switches or plugs. Report such damaged items to your instructor.
14. Always work in a well-ventilated area when studying preserved specimens.
15. Make sure that all specimens you dissect are properly secured in a dissecting pan or appropriate surface. A specimen not properly secured might slip and lead to an injury from a scalpel or other sharp dissecting instrument.
16. Keep scalpel blades sharp to avoid slipping and possible injury.
17. All broken glass should be placed in a sharps container or one designated as a glass receptacle.
18. Any contact with human blood should be reported promptly to your instructor to limit your exposure to possible infection.
19. Clean all laboratory tables and other work surfaces after each use.

20. PRACTICE SAFETY AWARENESS, and remember that you are responsible for the safety of yourself and your coworkers.

Safety Precautions When Using Preserved Animals

Some of the chemicals used to preserve animals and parts of animals can be toxic, flammable, and/or dangerous if used improperly or under improper conditions. Ethanol, isopropanol, formaldehyde, and phenol are commonly used preservatives. Some specimens are held in propylene glycol-based preservatives such as Carosafe™ after tissue fixation has been accomplished using another material, for example, a formalin solution. Propylene glycol is a common cosmetic and food additive and is generally regarded as safe, so its use represents an improvement in safety by reducing exposure to other more hazardous materials. There are some new safer fixatives and preservatives in use today. Carolina's Perfect Solution™ is one such material. This nontoxic formula is used both as a tissue fixative and as an external preservative. So, it is very important to understand what chemicals are present in preserved specimens so safety precautions may be undertaken relative to the risk of those chemicals.

It is very important for students and instructors working with preserved specimens to understand the proper precautions and conditions for safe usage of such materials. All instructors are responsible for implementing proper safety procedures when students will be using potentially hazardous chemicals and for communicating appropriate information about these materials to their students in accordance with applicable federal, state, and local regulations. In recent years these regulations have greatly increased in complexity as a result of increased public concern about environmental health and safety.

The following information, supplied through the courtesy of the Carolina Biological Supply Company, provides some excellent safety guidelines to follow when handling and dissecting preserved animal specimens. Other suppliers use similar chemicals for their preserved animal specimens. You should carefully study the safety information supplied with any preserved specimens before you begin to handle or dissect them.

Carolina provides specimens preserved in Carosafe™ (contains propylene glycol), Carolina's Perfect Solution™ (a safer proprietary fixative and preservative), and, when specially ordered, formalin solutions.

Information is provided in the catalog regarding which particular preservative is used in a certain type of specimen. Note that specimens are never provided in a formalin preservative unless this is specifically requested by the customer. Note also that specimens

are provided with a specific Material Safety Data Sheet (MSDS) prepared according to the type of preservative used.

Regardless of the preservative that is used, we recommend you follow these safety tips whenever working with preserved specimens:

1. Wear appropriate protective eyewear at all times.
2. Wear appropriate protective equipment such as gloves and lab coats.
3. Work only in a well-ventilated area.
4. Prohibit eating, drinking, and smoking in the work area.
5. In the event of contact, wash skin with soap and water; flush eyes with water.
6. If overexposure to any chemical occurs, seek medical attention immediately.

Formalin-preserved or embalmed specimens should always be used in a well-ventilated area to prevent irritation to the eyes, skin, or respiratory tract. The use of goggles lessens eye irritation from formaldehyde vapors.

The components of Carosafe™ and those of Carolina's Perfect Solution™ can irritate eyes and skin. In addition, the vapor of some components can be irritating if inhaled.

For all of these preservatives, wash eyes or skin with water if exposure occurs.

When working with preserved materials, be careful with sharp objects such as pins, scalpels, and the spines and teeth of specimens. When using a scalpel, we recommend cutting away from oneself and ensuring that fingers are kept out of the cutting path at all times.

Carolina-preserved specimens are available in Carolina's Perfect Solution™, a proprietary formula that has been tested and found to be nontoxic. It is both a fixative and a preservative. It keeps exposure to formaldehyde to an extremely low level while producing specimens of very high quality.

Carolina-preserved specimens are also available in Carosafe™, a propylene glycol-based shipping and holding fluid. Carosafe™ is not a fixative; it is a preservative designed to prevent mold and tissue deterioration after the tissue has been properly fixed with formalin or, for some small specimens such as insects, fixed with alcohol. Carosafe™ is an effective substitute for the standard formalin preservative and acts to hold the unpleasant odor of formaldehyde to an absolute minimum.

The following table contains further safety and health information regarding the three most common chemicals used by Carolina in the preservation process. This information is given in the form of a columnar table. Additional information may be obtained by calling Carolina during regular business hours at 336-584-0381.

Comparative Safety of Preservatives

	Formaldehyde	Carosafe™ (Propylene Glycol)	Carolina's Perfect Solution™
Physical Data			
Hazardous components (OSHA PEL)	Methanol (TWA 200 ppm) Formaldehyde (TWA 0.75ppm)	Propylene glycol	Components proprietary. Not hazardous under normal conditions of use.
Flash point	184° F (combustible)	225° F	101° F
Lower explosion limits	7%	2.6%	
Upper explosion limits	73%	12.5%	
Fire extinguishing media	Alcohol foam, water fog, carbon dioxide, dry chemical	Water fog, carbon dioxide, dry chemical	Foam, carbon dioxide, dry chemical
Unusual fire or explosion	Vapor heavier than air, may travel along ground to distant ignition source and flash back	No unusual fire hazards noted.	No unusual fire hazards noted.
Threshold limit value (TLV) ACGIH	200 ppm (TWA) methanol 0.3 ppm ceiling formaldehyde	None known.	1000 ppm(TWA) one component
Effects of Overexposure			
Eyes	Vapor causes severe irritation, redness, tearing, bhirred vision. Liquid may cause severe or permanent damage.	Direct contact may cause irritation.	Direct contact may cause irritation.
Skin (contact)	Irritation, dermatitis, strong sensitizer.	Direct contact may cause irritation.	Direct contact may cause irritation.
Inhalation	Irritation of respiratory tract, dyspnea, headache, bronchitis, pulmonary edama, gastroenteritis.	Vapor may cause irritation to respiratory tract.	Vapor may cause irritation to respiratory tract.
Ingestion	May be fatal or cause blindness if ingested. LD ₅₀ (oral-rat) = 500 mg/kg	Expected to be relatively nontoxic. Individuals with kidney problems may see more severe effects. LD ₅₀ (oral-rat) = 20,000 mg/kg	Nontoxic. May cause gastrointestinal discomfort.
Chronic effects	Listed by the National Toxicology Program (NTP) as reasonably anticipated to cause cancer in humans. Also listed by IARC and OSHA as possible human carcinogen.	Not listed as causing cancer by NTP, IARC, or OSHA. Gastrointestinal discomfort, nausea, vomiting, lethargy, and diarrhea have been cited for chronic exposure.	Primary components not listed as causing cancer by NTP, IARC, or OSHA. Contains a very small amount of a potential human carcinogen.
Target organs	If inhaled, eyes, nasal passages throat.	None.	None.
First aid measures	If inhaled, remove to fresh air. Call 911 or emergency medical service. If not breathing, give artificial respiration using proper respiratory medical device. If eye or skin contact, immediately flush with running water for at least 20 minutes. Seek medical attention for all instances of overexposure to this chemical.	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If eye or skin contact, immediately flush with running water. Seek medical attention for all instances of overexposure to this chemical.	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If eye or skin contact, immediately flush with running water. Seek medical attention for all instances of overexposure to this chemical.
Spill control measures	If a spill occurs, cleanup personnel should wear full protective clothing. Eliminate sources of ignition. Keep nonessential personnel away. Absorb spilled material on vermiculite or other suitable absorbent. Containerize for disposal.	Eliminate sources of ignition. Equipment used in handling must be grounded. Do not touch or walk through spilled material. Absorb material with dry earth, sand, or other suitable noncombustible absorbent. Containerize for disposal.	Cleanup personnel should wear proper protective clothing to avoid contact with liquid. Absorb material on vermiculite or other suitable absorbent material. Containerize for disposal. Flush area of spill with water.
Disposal	Dispose in accordance with all applicable local, state, and federal regulations. Contact local or state waste agencies if disposal questions arise.	Dispose in accordance with all applicable local, state, and federal regulations. Contact local or state waste agencies if disposal questions arise.	Dispose in accordance with all applicable local, state, and federal regulations. Contact local or state waste agencies if disposal questions arise.
Personal protection	Wear gloves, lab coat, splash goggles, and any other appropriate equipment suggested by the laboratory supervisor.	Wear gloves, lab coat, splash goggles, and any other appropriate equipment suggested by the laboratory supervisor.	Wear gloves, lab coat, splash goggles, and any other appropriate equipment suggested by the laboratory supervisor.
Storage information	Store tightly closed in a location suitable for general chemical storage.	Store in a location suitable for flammable liquid storage.	Store in a cool, dry, well-ventilated area, Store below 120°F.

TWA—time weighted average; ACOIH—American Conference of Governmental Industrial Hygienists; IARC—International Agency for Research or Cancer; OSHA—Occupational Safety and Health Administration; PEL—Permissible Exposure Limit; NIOSH—National Institute for Occupational Safety and Health; RTECS—Registry of Toxic Effects of Chemical Substances; LD₅₀—lethal dose for 50% of a population.