

Ilia State University

Instructions for Ensuring the Safety of the Laboratory

Chapter 1. Risk assessment and risk management procedures, injuries and accidents

Safety norms should always be adhered when conducting research or educational process in the laboratory in order to minimize unforeseen events and accidents. Therefore, let's act quickly and in accordance with the situation.

The risks of the expected threat should be assessed in advance when planning the research, so taking into account the risk management policy, the planned work will be suitable for a certain level of biosecurity. Accordingly, the work environment, personal protective equipment, and Standard Operating Procedures (SOP) should be developed to ensure that the work is carried out as safely as possible.

If a student, visitor, or staff member is injured as a result of an accident during research or teaching process, the relevant faculty members and the person responsible for laboratory safety shall perform the following procedures:

1. Immediately notify the person responsible for laboratory safety and the authorized person of the relevant faculty.
2. The injured person must immediately cease all activity. A person with a work permit in the laboratory or a person responsible for safety should act in accordance with the laboratory spill standard (circumscribe the area of the spill and neutralize the spill).

The severity of the injury should be assessed — whether the victim is responsive. If the injury requires serious medical intervention, immediately report to the emergency service at 112 and call an ambulance.

Notification should be made to the university administration and medical staff.

3. In the case of a minor injury, when the injured person can continue to work (i.e., the injury wasn't serious, such as a slight scratch or small cut caused by clean glassware or sterile sharp objects, slightly irritated dry skin, e.g., after the contact with alcohol or other similar solvents) and there is no health hazard, a decision is made on the spot whether to continue the activity or not after appropriate treatment of the wound/injury. After leaving the laboratory, it is recommended to consult a doctor.

If the injury is accompanied by any type of complications, the victim must inform the faculty administration and the person responsible for the safety of the laboratory. If the victim has not contacted you within 48 hours, the person responsible for the safety of the laboratory should inquire about their condition.

Chapter 2. Laboratory Personal Protective Equipment (PPE)

The use of appropriate clothing and Personal Protective Equipment (PPE) is essential to ensure safety in the laboratory environment. Students, faculty members, and researchers must adhere to basic safety requirements at all times in the laboratory space of Ilia State University:

- You should always wear a lab coat while working in the laboratory (disposable or reusable — depending on the specifics of the work);
- Appropriate disposable gloves are required for all procedures that may involve direct or incidental contact with blood, biological fluids, or other potentially infectious materials or laboratory animals. After use, you should remove the gloves aseptically and then wash your hands;
- Personnel should wash their hands before leaving laboratory workstations;
- In order to protect the eyes and face, as well as to protect against artificial ultraviolet radiation, protective safety glasses, a face shield, must be used during procedures involving the risk of exposure (spraying);
- Depending on the purpose, it is necessary to use a mask (surgical mask/N95 respirator);
- It is prohibited to move outside the laboratory with a lab coat, for example: in the yard, canteen, offices, library, resting areas and toilets;
- It is prohibited to work in open shoes in the laboratory;
- A Standard Operating Procedure (SOP) is written for laboratory works;
- Presence of standard disinfectant solutions on working surfaces;
- Cleaning working surfaces after completing the work;
- It is prohibited to eat, drink, smoke and use cosmetics in the laboratory space;
- It is prohibited to store food in the laboratory space;
- A separate hanger is intended for laboratory coats. It is forbidden to place a laboratory coat together with civilian clothes.

The course leader or researcher is responsible for the appropriate attire of those in the laboratory. Faculty staff may require students in educational and research laboratories to cease activity and leave the laboratory if they fail to follow these guidelines.

3.1 Educational (basic) laboratory. Biosafety level I (BSL-1)

The requirements for personal protective equipment required during the implementation of work in the educational laboratory are determined by the course lecturer/thesis supervisor for each course in which laboratory work is carried out. It is the responsibility of the head of the research to teach the students to perform the mentioned method correctly and safely in compliance with the safety norms in the educational laboratory. Students learning this methodology are required to accurately perform the procedure

using standard operating procedures (SOPs) and report any problems (including spills) to the research supervisor immediately. It is mandatory for students to follow the laboratory research supervisor's instructions and safety standards regarding personal protective equipment at all times. While working in the educational laboratory, it is mandatory to follow the basic safety requirements mentioned above.

3.2 Research laboratories — Biosafety level 1+ (BSL-1+)

When working in a research laboratory, it's mandatory to follow all the above-mentioned basic safety requirements. Additional requirements:

- Depending on the specifics of the research, a disposable coat is used instead of a reusable one;
- It is necessary to use an N95 respirator when working with poisonous chemicals;
- Safety glasses or a face shield;
- Closed shoes are mandatory;
- Additional gloves when working with potentially hazardous biological material;
- Biological material spill kit;
- Long unbound hair is prohibited. If necessary, a headwear must be used;
- Chlorine-containing disinfectant (marked with deadlines) and 70% ethanol should be present on work surfaces. After finishing the work, the surfaces must be decontaminated.

3.3. Second level biosafety laboratory (BSL-2)

When working in a second level biosafety laboratory, all the above-mentioned basic safety requirements are mandatory. The laboratory provides work on biologically hazardous material, namely work on pathogenic microorganisms.

Additional safety requirements:

- Second level biosafety cabinet;
- A complete package of personal protective equipment (disposable coat, gloves, protective glasses, N95 respirator, headwear, shoe covers);
- Presence of high concentration (1-5%) chlorine-containing disinfectants on work surfaces (marked with deadlines);
- Decontamination of surfaces after completion of work;
- Autoclave on the territory of the laboratory — decontamination of biological waste;
- Closed shoes are mandatory;
- Biological Material Spill Kit.

3.4 Computer and other types of work

For individual labs or courses where only data analysis or other computational work is performed, no hazardous materials are present, and no hazardous work is performed, the above-mentioned safety clothing requirements are not necessary. The supervisors determine security requirements at their own discretion.

3.5 Off campus work

Work that takes place off campus, such as collecting samples, observing objects, or using equipment, is also subject to the above-mentioned guidelines. It is the duty of the supervisor of the research to determine the appropriate safety equipment and to comply with the safety norms of the mentioned manual, to follow the rules for handling foreign samples. It is the student's responsibility to comply with and follow the specified safety regulations. Due to the varied nature of off-campus work, the quality of personal protective equipment is determined by the course supervisor.

Chapter 4. Basic rules of behavior in the laboratory

4.1 Labeling of laboratories

Entrance doors of all types of laboratories must be labeled with appropriate information:

- International biohazard sign on the door;
- Entry is allowed only to authorized persons;
- Corresponding level of the laboratory;
- Name of the laboratory depending on the specifics;
- Appropriate personal protective equipment required in the mentioned laboratory;
- Responsible persons and their contact numbers.

Educational/Basic Laboratory — Biosafety Level 1 (BSL 1)



Biological threat

Entry is allowed only when accompanied by authorized persons

Personal protective equipment — laboratory coat, gloves, glasses, mask, headgear, shoe cover

Responsible persons —

Tel.:

Tel.:

Emergency contact: Tel.: 112

4.2 Food in the laboratory

Food or drink of any kind is prohibited in laboratories. Food is stored in a non-laboratory room, office, or communication lounge. If a person working in the laboratory needs food or water, they will leave the laboratory after taking off personal protective equipment and washing their hands.

4.3. Persons with special needs and/or medical conditions

Persons with special or medical needs should be accommodated as safely as possible. Most educational and research laboratories should be equipped with wheelchairs at safely accessible workstations, and these workstations should be comfortable to work in.

It is the responsibility of the laboratory research supervisor to convince lab personnel to report personal medical infirmities, as withholding information may put them at greater risk while working in the laboratory. Students and researchers with work permit in the laboratory are obliged to notify the research supervisor in case of personal medical incapacity. Also, the research supervisor should be informed about the pregnancy. The information received from the student and the ways sought to solve them are confidential. In some cases, it is necessary for a doctor to attend laboratory work.

4.4 Chemical, fire and electrical safety

Chemical substances used in the laboratory should be classified in accordance with their chemical properties: flammable, corrosive, toxic and reactive substances. There are special fireproof storage cabinets for the mentioned groups in the laboratories. If possible, they should be used. If it isn't, chemicals can be stored separately in appropriate laboratory cabinets.

4.5. Emergency telephone numbers

In case of emergency, you should call University Security Office or 112.

4.6. Safety shower and eye wash liquids

A safety shower and an eyewash station are installed in some laboratories near the washrooms. Showers should be monitored regularly.

The area under the showers should be empty and easily accessible so that it can be used without hindrance in case of necessity. In laboratories where shower stations are not installed, it is necessary to have a sufficient amount of eyewash products (2-3 liters of 0.9% Saline Solution with a labeled period) near washrooms of the laboratory.

4.7 Firefighting equipment

Fire-fighting equipment — fire extinguishers (with a marked expiration date) are located in all laboratories or directly outside each laboratory. The expiration date of fire extinguishers is monitored annually, which is confirmed on the label attached to them. A representative of the University's Material Resources Office shall conduct a date inspection of the fire extinguishers located in each department to ensure their suitability.

Also, the pressure measuring device must be in the green operating zone to respond immediately. A fire extinguisher should be located in an easily accessible place.

4.8. First aid kit and spill kit

A basic first aid kit is provided in each laboratory. Be sure to look it up and make sure students know its location in the labs they work at. If the kit needs to be refilled/restored, notify the person responsible for laboratory safety.

4.9. Electrical panels (switches)

There should be nothing in front of the electrical panels that could obstruct access to them. Also, make sure the electrical equipment is on a table, desk, bench, or other elevated surface. Electrical equipment and wiring must be raised at least 20 cm above the ground with some solid non-conductive material.

4.10. Vent hoods (fume hoods)

Vent hoods are designed to protect laboratory personnel from harmful gases. The fume hoods must be in operation during the working period (working, short-term storage of reagents). Volatile chemicals should only be used in a fume hood. Make sure the device has power and is working. If you are sure that the device is not working properly, contact the person responsible for security in your laboratory.

4.11. Biosafety cabinets

The function of the biosafety cabinet is to protect personnel working on biologically hazardous material, to protect the environment from contamination with hazardous material, and to protect the research material itself from contamination. A second level biosafety cabinet should be used in a second level biosafety laboratory when working with pathogenic microorganisms. Work permit at the biosafety cabinet is granted to personnel after passing special training for working with the cabinet.

Annual certification of the biosafety cabinet by an authorized specialist is mandatory. The cabinet must be marked with certification dates. In case of expiration of the certification period, the use of the cabinet is prohibited. If the cabinet does not work properly (the appropriate parameters are not displayed on the monitor) despite the certification,

immediately inform the person responsible for biosafety. Working in a malfunctioning biosafety cabinet is strictly prohibited.

Chapter 5. Management of Laboratory Waste

Management of laboratory waste includes chemical, biological, and various forms of electrical waste, which must be managed in accordance with University policies and procedures established by the University.

5.1. Sorting and collection of the waste

Disposing of laboratory waste in a household landfill is prohibited. It is necessary to sort the waste while working in the laboratory. Expendable materials (disposable coats, disposable gloves, filter papers, napkins, etc.) are placed in the red bags marked with the international biosafety mark. The biosafety bag must be marked on the outside with information on the contents. The bag must be tied tightly. After tying it, the bag must be treated with a disinfectant liquid from the outside and moved to a place designated for waste, where a secondary packaging container is located. The waste will be removed by the responsible company from there.

Laboratory sharps (pipette tips, needles, broken glass tubes and flasks) are placed in sturdy containers. The procedure is the same — the container the bag must be worked over with a disinfectant liquid from the outside and moved to a place designated for laboratory waste.

Liquid chemical waste is neutralized with appropriate liquids in appropriate chemical-resistant containers. Fluids containing liquid biological material are decontaminated with disinfectant solutions containing 1-5% chlorine for an appropriate contact time, then can be flushed down the sink.

5.2. Labeling of waste

Labeling of laboratory waste is necessary — bags marked with the biosafety sign must display information about the material is placed in them: chemical waste (substance, reagent, element symbol, etc.), biological waste (biomaterial, organic compounds, medium, name of microorganism etc.), disposable material (coat, gloves, shoe covers) or sharp/breakable material (bucket, needle, glass). It is possible to label the waste with this information. The specified information should be legible/understandable. The label must be replaced if damaged by chemical solutions. Labels may be found in safety binders.

When you fill out the waste label, do so completely — it must include the operator's contact information and the date.

5.3. Segregation/distribution

Separate the waste into the main categories: flammable, corrosive and toxic. Additionally, exclude acids with a pH of 2 or less, bases with a pH of 12 or more, water-reactive chemicals, peroxide-forming chemicals, strong oxidizers, cyanides, and known carcinogens as much as possible.

Keep liquid and solid waste separate when possible.

5.4. Management of biologically hazardous waste.

Disposing of laboratory biological waste in the household landfill is prohibited. Any type of laboratory biohazardous waste needs to be decontaminated before disposal. Laboratory disposables (gloves, pipette tips, needles, etc.) may not require decontamination prior to disposal depending on the waste disposal company's service. It is necessary to sort the waste during work, e.g.: sharp objects (pipette tips, needles, broken glass test tubes) are placed in solid containers, and non-sharp disposables, e.g.: gloves, shoe covers, coats, are placed in red bags marked with the biosafety symbol, tightly closed and treated externally with disinfectant solution. Then it is placed in special marked containers, which are placed in the area designated for waste, from where it will be taken out by the responsible company.

Liquid biological waste is decontaminated (with a solution containing 1-5% chlorine, the contact time is determined according to the percentage) and then it can be poured into the sink. Substances that have been treated with phenol (TRIzol and TRI reactive) are no longer considered biohazardous, but must be treated as organic chemical waste.

5.5. Utilization and removal of waste

Disposing of laboratory biological waste at the household landfill is prohibited! Laboratory waste is collected in special containers in a place designated for it. Liquid waste cannot be poured into the sink without neutralization. Waste may not be collected in a container for more than six months from the date of collection of waste in that container. When five months have passed since the collection of waste in a certain container, notify the laboratory safety committee or the company responsible for waste disposal.

Chapter 6. Laboratory Safety Binders

Laboratory safety binders should be placed in all laboratories where research or educational laboratory work is located. Laboratory safety binders should contain the following information:

√	Emergency contact and safety information
√	Standard Operating Procedures (SOPs) — for all procedures conducted in the laboratory
√	List of chemical substances (reagents) and Safety Data Sheets (SDS) (Material Safety Data Sheets (MSDS))
√	Chemical storage guide
√	Hazardous waste guidelines and waste labels

If the chemical list, procedures, or safety data sheet (SDS) is generally maintained and accessible on a laboratory or office computer by the research team, this form is also acceptable. However, the printed version of the said files should also be kept in safety binders as a backup, which should be updated periodically and should be available to the person in charge of the laboratory and also to the emergency responders.

6.1. Standard Operating Procedures (SOPs)

Standard Operating Procedures for general laboratory procedures (operational rules for gas cylinders, corrosives, etc.) developed by Environment, Health and Safety (EHS) and approved by the Scientific Safety Committee should be placed in a binder for students, faculty members, and researchers.

6.2. List of chemical substances

Each laboratory should keep a hard copy of the chemicals list in binders and update it annually.

Safety Data Sheets (SDS), formerly called Material Safety Data Sheets (MSDS), for each chemical must be placed in a safety binder or, if necessary, a supplemental binder, in every laboratory. As with the list of chemical substances, the safety data sheets should be updated periodically throughout the year, and reviewed during the annual inventory. If a chemical is no longer used in the laboratory, the safety data sheet for that chemical should be removed from the binder.

Chapter 7. Information for the staff conducting research

7.1. Responsibilities of persons responsible for biosafety in the laboratory and students

Faculty members, researchers, and students are responsible for safety in the laboratory. University administration, in particular faculty members and researchers, are responsible for creating a safe environment for all individuals working in the laboratory. It is the responsibility of faculty members and researchers to supervise and mentor students, visitors, and others who work in the laboratory as laboratory assistants or other supportive staff (e.g., engineers). Researchers, whether they are students or not, must follow the provided safety rules and regulations and be actively involved in the process of recording laboratory safety issues.

Responsibilities of faculty members/researchers:

- Ensuring that students have adequate knowledge of safety methods.
- Providing information regarding hazards and safety issues in the laboratory.
- Encouraging adherence to safety norms in the laboratory.
- Ensuring that engineering and safety devices are functioning properly and secured accordingly.

Responsibilities of the student:

- Reading the relevant sections of this instruction, which contains information about possible dangerous and hazardous situations in the laboratory.
- Following safety procedures and regulations regarding hazardous laboratory procedures.
- Equipping themselves accordingly and following the requirements for the use of personal protective equipment.
- Reporting any deficiencies in technical security measures to the course instructor.

7.2. A guide for graduating students involved in research

All research supervision is the responsibility of the responsible faculty member. At the first stage, the threat assessment is carried out. Supervision requirements are based on 3 levels of threat assessment: initially, the main researcher determines the risk level of the procedures. However, if the already determined hazard level is found to be inappropriate, it will be reviewed by the Laboratory Safety Committee of the Faculty of Natural Sciences and Medicine.

7.2.1. Training/basic laboratory — level 1: low threat

- Students can work alone in the laboratory and during non-working hours as well.
- The faculty member may not be on campus but should be available via cell phone.
- If a faculty member is out of the country (e.g., at a conference), another faculty member must be designated as their replacement mentor.

Examples of such work include: computer work such as creating graphs, analyzing data, searching literature, writing a publication; washing chemical vessels; cleaning the laboratory; using most of the analytical tools (e.g., spectrophotometers, pH meters, HPLC, etc.); feeding and caring about animals; Procedures associated with the use of low-hazard reagents.

7.2.2. Research laboratory, level 1+: moderate threat

- The instructor should familiarize students with laboratory safety norms and procedures in advance;
- Student may work independently during office hours if staff are present in the building;
- Students can also work during off-hours with a lab partner who has at least one year of lab experience;
- A faculty member (or designated substitute) must be on campus and accessible via cell phone.

Examples of such work include: procedures and equipment that use reagents of moderate hazard and toxicity.

7.2.3. Research laboratory level 1+, level 2: high threat

- The student must have a certificate of occupational exposure training on high-risk infectious agents and high-risk procedures.
- The student must work normal business hours (not weekends or late nights)
- The student must work with another student, lab member, or faculty member with at least one year of lab experience.
- The professor should be in an office, laboratory, or other location in the building that should be known to others (e.g., an auditorium or conference room) where they can be quickly reached.

For example: work with high concentration acids and bases (>10M); when working with highly dangerous cryogen and gases; high level biological threat; Procedures related to the risk of fire and explosion; Working on infectious agents — resistant microorganisms

7.3. Visitors

Visitors to the laboratories are also subject to the above-mentioned rules, except for the following:

1. All laboratory procedures except computer work will be moved to level 1+, 2 in terms of guidance.
2. Interns may work only when a graduating student mentor, PhD student, lab member, or faculty member with appropriate safety training is in the lab (and not another intern).
3. First of all, additional mandatory questionnaires/forms must be completed; which may include a contract or affiliation agreement, memorandum of agreement, release of liability/risk assessment agreement, emergency medical information, parental consent, including medical care, and other documents required for risk management and legal purposes. Any program involving minors must be registered with the university.

1. The faculty is responsible for:
 - a. discussing safety issues with students in educational and research laboratories;
 - b. setting an example of safe practice and ensuring a strong culture of safety in the laboratory;
 - c. encouraging a clean, orderly work environment to facilitate safe practices;
 - d. resolving problems identified during laboratory safety inspection in a timely manner;
2. Students must follow laboratory safety norms:
 - a. It is forbidden to bring food and drink into the laboratory
 - b. Use protective glasses and lab coats appropriately
 - c. Follow proper hazardous waste handling, labeling and disposal procedures
 - d. Store chemicals properly
 - e. Document cases conformably and provide information to appropriate personnel
3. Students should be familiar with:
 - a. location of all emergency and safety related equipment (e.g., fire extinguishers, fume hoods)
 - b. emergency instructions posted in all laboratories along with evacuation plans in case of fire
 - c. they should call 112 from the laboratory or office phone to contact the person responsible for laboratory safety (or Tbilisi Police/Fire station) in an emergency.
4. Students should have free access to and know the location of:
 - a. Safety Data Sheets (SDS) for substances used in the laboratory

b. Standard Operating Procedures (SOPs) for basic procedures (e.g., gas cylinders — which are part of CHP) laboratory specific procedures (e.g., synthesis of chemicals or work with scintillating compounds).

Chapter 8. Safety maintenance trainings for students involved in research activities

All students and researchers involved in laboratory research activities are required to comply with these guidelines. Students who work only remotely (online) or conduct theoretical research are not required to undergo safety training. If you are unsure whether you have a student who meets the above-mentioned criteria, please contact the person responsible for laboratory safety.

Information about each student's training should be recorded and kept in a laboratory safety binder. Information must be updated at the beginning of each semester by the person responsible for laboratory safety, and faculty members are responsible for checking the recorded information to ensure that the requirements of the guidelines have been met by all students.

8.1. Basic safety training: must be conducted before starting work in the research laboratory

Before starting work in the research laboratory, all students must take a safety questionnaire (quiz). A student who does not pass this test must contact the person responsible for laboratory safety before starting work in the laboratory to be given access to the training materials to retake the quiz. After the student passes the quiz, they are not required to do it again.

8.2. Scientific-research seminar for safety maintenance: must be completed in the first semester of working in a research laboratory

All students are required to attend a 120–150-minute research workshop to learn how to properly assess and report laboratory emergencies, dispose of and manage laboratory waste, handle hazardous biological agents and chemicals, and use fire extinguishers. After successfully passing the scientific-research seminar once, the student is not required to pass the seminar again. Students who do not complete a safety seminar during the first semester will not be allowed to work in the laboratory until they have successfully completed said seminar. Research seminars will be held several times during the semester, taking into account students' study schedules.

All students or other supportive staff involved in research, as well as volunteers, are required to undergo safety training. After successfully passing it, students and

researchers must report it to the person responsible for laboratory safety at their university in order to be able to carry out scientific research in the laboratories.

8.3. The highest level of laboratory safety maintenance training

In the second level biosafety laboratories, where students perform high-risk work, such as working with virulent agents or particularly toxic substances, as well as conducting experiments on laboratory animals, additional higher-level training is required (e.g.: specifics of working with a biosafety cabinet. Respirator N95 fitting). In such cases, students must undergo the necessary training before starting the relevant work. In most cases, this type of safety training should be conducted individually or in small groups by the research supervisor.