ETH zürich

Biosafety Concept according to ESV and SAMV

for Level 1 and 2 Laboratories at ETH Zurich

This plant safety concept was adopted by the department of Safety, Security, Health and Environment (SSHE) of ETH Zurich. It forms the binding framework for implementation of the statutory requirements which must be complied with during activities involving pathogenic or genetically modified organisms in contained systems (Levels 1 and 2). The plant safety concept incorporates the measures adopted by ETH Zurich for occupational safety and for the safety of people, animals and the environment.

Safety, Security, Health and Environment

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1) Validity of plant safety concept

This plant safety concept was adopted by the department of Safety, Security, Health and Environment (SSHE) of ETH Zurich. It forms the binding framework for implementation of the statutory requirements which must be complied with during activities involving pathogenic or genetically modified organisms in contained systems (Levels 1 and 2).[1] The plant safety concept incorporates the measures adopted by ETH Zurich for occupational safety and for the safety of people, animals and the environment.

The plant safety concept of ETH Zurich, which is presented here, is based on the document *Safety concept according to ESV and SAMV for Level 2 laboratories – Template for plant-specific additions*[2] and the corresponding guideline of the Federal Office for the Environment (FOEN).[3] The various templates for operating instructions and rules of conduct have been adapted to the particular plant and are listed in the Annexes together with the already existing company documents containing performance standards for environmental and occupational safety or for quality assurance.

The individual institutes and research groups that work with pathogenic and / or genetically modified organisms create their own biosafety concept adapted to their specific situation. This plant safety concept, as well as the overall concept presented here, will be updated whenever the risk situation changes, especially if new working methods are adopted, new organisms are handled, new items of equipment which are relevant to biological safety are introduced, existing premises are converted for other purposes or new rooms are used, but equally so if the respective activities, processes, or the use of rooms, etc. have been discontinued (see Chapter 5.1).

2) Safety objectives

Work in the laboratories of ETH Zurich involves the use of hazardous chemical, radioactive and biological substances. In the course of this work, it is never possible to entirely rule out a potential risk to people, animals and the environment. The ETH Zurich takes the necessary safety measures to protect people, animals and the environment from negative effects. As an employer, ETH Zurich acknowledges its responsibility for occupational safety and the protection of its employees health and accordingly takes the necessary measures.[4]

[1] A plant where work is done with pathogenic or genetically modified organisms falls within the scope of the Containment Ordinance of August 25, 1999 on the Contained Use of Organisms (Einschliessungsverordnung, ESV, SR 814.912) and the Ordinance on the protection of personnel from hazards due to microorganisms of August 25, 1999 (SAMV, SR 832.321). The scopes of these ordinances complement each other and contribute to protection of the environment, protection of the population and protection of the health of individual employees.

[2] *Safety concept according to ESV and SAMV for Level 2 laboratories – Template for plant-specific additions;* 24 pages plus a 30-page annex; published by: Federal Office for the Environment (FOEN); obtainable from: http://www.bafu.admin.ch

[3] *Richtlinie: Betriebliches Sicherheitskonzept nach ESV;* published by: Federal Office for the Environment (FOEN); 2008, obtainable from: http://www.bafu.admin.ch

[4] The University defines its protection goals to prevent accidents at work as well as harmful and undesirable effects on the environment and the population.

3) Safety organization

3.1 Responsibility and liability

The heads of the organizational units (research groups, institutes) assume the operative responsibility for ensuring the safety of people and the environment as well as safety at the workplace.[5] They ensure that the plant safety concept is implemented and followed and have established the organizational structure necessary for this purpose. At least one person has been entrusted with the task of monitoring the biological safety and the precise details concerning status, duties and responsibilities have been set out in the job description. These job descriptions also specify the duties, tasks and competences of the laboratory managers and project leaders and set out the responsibilities in normal situations as well as in cases of emergency. The job descriptions are an integral part of the specific biosafety concepts of the individual research groups or institutes, respectively. The necessary financial and personnel resources for the purpose of maintaining biological and chemical safety as well as radiation protection are made available by the respective institutes.

As a matter of principle, ETH Zurich as an institution and not the individual ETH employee shall be held liable to third parties (whether a company or a person). The ETH may, however, take recourse against employees who fail to comply with safety provisions deliberately or through gross negligence, thereby inflicting harm on a third party for which the ETH is liable. This covers the liability issue. However, the criminal-law aspect must also be considered. The following applies to all persons who bear responsibility for safety aspects at ETH Zurich: The responsibility of persons under criminal law is derived from their sphere of responsibility in relation to observing safety rules. Only those persons who, by virtue of their position, are able to prevent hazards through their own intervention can be held accountable under criminal law. This is the case if they have failed to intervene where intervention would have been appropriate and possible for them.

3.2 Organizational chart

The organizational chart below shows the positions responsible for biosafety. The following organizational chart is for the ETH level. The position of Biosafety Officer (BSO) and other safety officers within the organizational units (research groups, institutes) are documented in an organizational chart, which is an integral component of the respective safety concept.

[5] According to Article 7 Paragraph 4 of Ordinance 3 dated 18 August 1993 to the Employment Act (Health Protection, ArGV 3, SR 822.113) the following applies: „The rules regarding responsibilities in the plant do not exempt the employer from his responsibility to protect health."

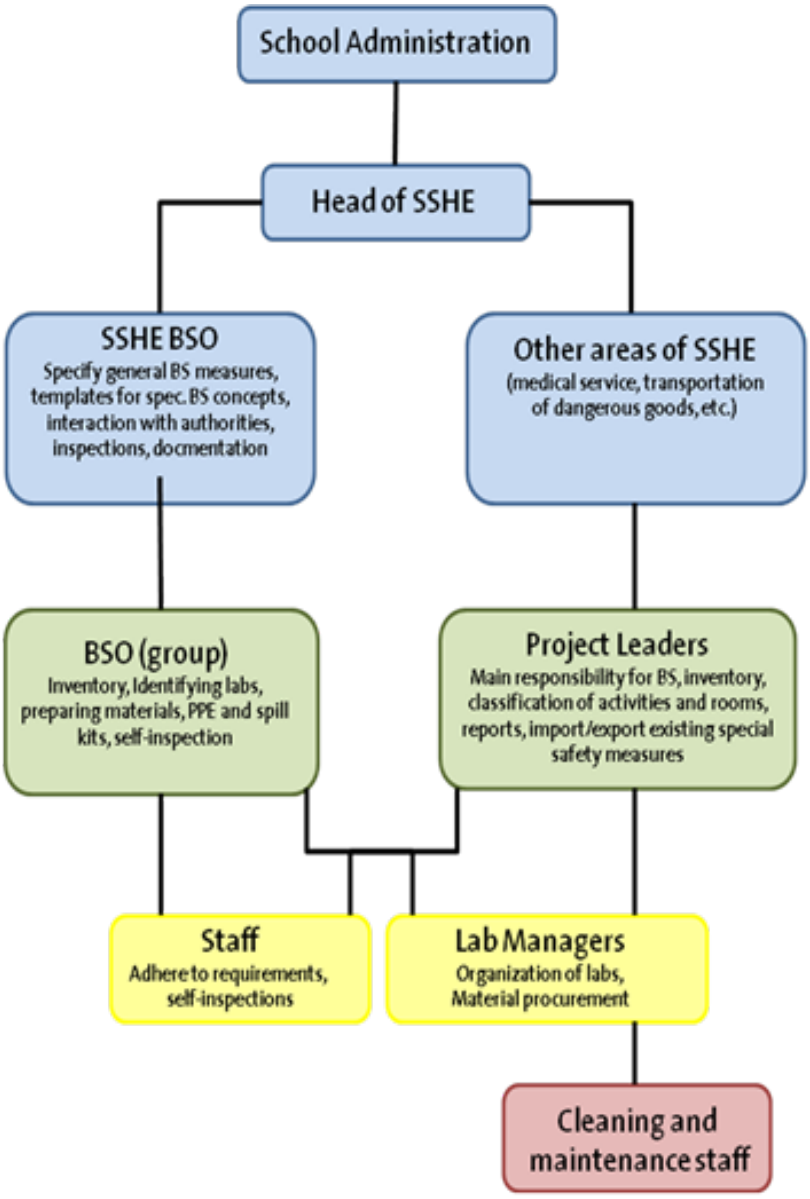

Fig. 1: Responsible positions for biosafety

3.3 Duties of Biosafety Officers (BSO) and Laboratory and Project Leaders

The status, duties and responsibilities of Biosafety Officers (BSO) and Project Leaders (PL) are set out in the job description of the respective employees. The ETH Zurich conforms to the respective guideline of the Swiss Agency for the Environment, Forests and Landscape (SAEFL)[6]. The lists of duties and job descriptions of the project leaders and the BSO of the individual research groups or institutes are an integral part of the specific biosafety concepts.

⇨ *Duties of Biosafety Officers of the Staff Unit SSHE (SSHE-BSO)* ***Annex 1***

3.4 List of employees

Group 2 microorganisms represent a potential hazard for employees. The individual research groups or institutes keep a list of persons who work with Group 2 organisms and, if required, arrange for a

[6] *Guideline: Biosafety Officer (BSO) – Status, duties and responsibilities.* Published by: Swiss federal Office for the Environment, Forests and Landscape (BAFU), 2005; obtainable from: http://www.bafu.admin.ch

health file to be created according to the Ordinance on the Protection of Personnel from Hazards due to Microorganisms (SAMV) (see Chapter 4.4). The research groups or institutes shall furnish these lists to SSHE-BSO on request.

4) Emergency organization: Planning and incident management

4.1 Emergency telephone numbers and contacts for safety issues

The emergency telephone numbers and contact addresses of persons able to provide information on safety matters are available in every laboratory and near the telephones. This is of paramount importance for dealing with an incident quickly. Each research group or institute is responsible for drawing up this telephone list.

⇨ *Emergency telephone numbers and contacts for safety issues at ETH* ***Annex 2***

4.2 Emergency planning: Procedures in case of incidents in the laboratory and crisis situations

When working with organisms, emergency situations, which vary in severity, may arise owing to spillage of infectious material, release of aerosols, injuries, fire, explosion and water discharge. While minor incidents are, in general, dealt with by the person(s) who caused them – with the assistance of the Biosafety Officers if appropriate – the emergency services must always be alerted in the event of serious incidents.

⇨ *Emergency planning: Procedures in case of incidents in the laboratory* ***Annex 3***

4.3 Report sheet for laboratory incidents

In the event of a laboratory incident involving Class 2 activities, the precise circumstances leading to contamination of the body or to an injury – even if only a minor one – must be recorded. All laboratory incidents must be reported to the BSO and the supervisors; incidents involving bodily injury and / or material damage must also be reported to SSHE, using the corresponding report sheets. A current version of the report sheets can be downloaded from the SSHE website **http://www.sicherheit.ethz.ch/docs/index**.
The report sheets for laboratory incidents are used by the BSO, supervisors and SSHE-BSO to investigate the causes of incidents, so that measures can be initiated to reduce and prevent risks. The completed report sheets are kept on file by the BSO, SSHE-BSO and supervisors for at least 5 years.

4.4 Health file

In order to ensure rapid availability of the various employees' occupational health data, these are collected together in the so-called health file. The Occupational Health Services of ETH Zurich (currently represented by several exteral occupational physicians) keeps a health file for those employees for whom a medical examination has become necessary as a direct result of their work. This could involve either medical diagnoses and measures after an occupational accident or laboratory incident or after other forms of exposure to microorganisms or if there is good reason to suspect an infectious disease acquired during work activities, or preventive measures such as a vaccination.[7]

The following details are recorded in the health file (according to Art. 14 (3) SAMV):

- reasons for the particular medical precautions
- investigations into the employees' immune status

[7] A vaccination is the most important example, in this connection, of "a particular occupational health measure".

- vaccinations given
- results of medical examinations after accidents and incidents or other forms of exposure to microorganisms or if there is good reason to suspect an infectious disease acquired during occupational activity.

The health file is kept by the attending doctor, either as a separate dossier or as a component / folder in an already existing medical history, if, for example, the person examined also consults the same doctor privately. The form and layout of the health file are left to the attending doctor's discretion.[8]
If other work-related medical examinations (e.g. concerning radiation protection) are also carried out by the doctor involved, these shall be included or combined in the same personal dossier.

4.5 Safety documentation for emergency services

In order to be able to ensure a reliable response in the event of a fire or other incidents, ETH Zurich has informed the emergency services about its activities and the corresponding premises. The information required has been put together in direct consultation with the local emergency/disaster services and authorities.

This information consists of:

- hazard plans / plan of the locality (fire zones; access routes; premises where work is carried out with organisms; storage locations and stored quantities of organisms as well as of radioactive isotopes or of flammable or explosive chemicals)
- protective measures required according to the response plan

5) Risk assessment

5.1 Compulsory reporting of activities

The risks of an activity and the reporting and authorization requirements according to ESV (Art. 8-10) and SAMV (Art. 5 and 6) are established at an early stage. To this end, before the start of the activity, the project leaders report to the BSO all new activities, major changes (e.g. use of new organisms with significantly different characteristics) or significant new knowledge concerning safety-related aspects of an ongoing activity. The individual research groups or institutes also inform the authorities of the end of an activity.

5.2 Project list and inventory of biological agents

The BSO of the individual research groups or institutes keeps an overview of the activities involving organisms within their area of responsibility and records them in a project list. They shall provide this list to the SSHE-BSO on request. The project list is updated at least every six months and whenever there are new reports and requests.

[8] The attending doctor does not necessarily have to be an occupational health specialist, but may, according to SAMV, also be a company doctor or an independent medical examiner. What is crucial, however, is that this person knows the work situation and the working conditions, so that a link to the workplace can be established during the health assessment and the necessary plan of occupational health measures can be drawn up. In this regard, compare Art 2.4 of EKAS guideline 6508 on the calling-in of occupational health doctors and other occupational safety specialists.

6) Safety measures and rules of conduct

6.1 Access control and signalization of Level 2 working areas

Access to Level 2 laboratory facilities is restricted to an authorized group of persons and is governed by the containment concept of the individual research groups or institutes. Nonetheless, it must always be ensured that, in the event of an incident (e.g. fire), the emergency services are able to access the area quickly and safely (fire brigade key) and that the escape routes are secured. The entrance area to Level 2 laboratories is signalized and warning signs (restricted access and warning of the hazards emanating from the organism) are mounted. With regard to the signalization of laboratories and equipment with the "Biohazard" warning symbol, the individual research groups or institutes are guided by the principles of the template below.

⇨ *Meaning and use of the «Biohazard» warning symbol* ***Annex 4***

6.2 Instructions for safe working

6.2.1 Operating instructions and rules of conduct

Rules concerning various aspects of occupational safety and environmental safety in the individual research groups or institutes are set out in the operating instructions, work instructions or the so-called Standard Operating Procedures (SOPs). These documents are attached to the Annex of this plant biosafety concept.

6.2.2 Laboratory safety rules

The staff of the individual research groups or institutes adhere to the legally binding "Principles of good microbiological practice" according to Annex 3 SAMV. Based on the "Principles of good microbiological practice", the laboratory rules applicable to the individual research groups or institutes are adapted and supplemented accordingly. These are an integral part of the respective biosafety concept.

⇨ *General laboratory rules* ***Annex 5***

6.2.3 Use of Class 2 safety cabinet

Correct operation and use including regular maintenance of the safety cabinets are essential for the protection of people and the environment, as well as for the quality of research and test results and are explained in detail in a separate information sheet. The individual research groups or institutes can establish specific regulations for the use of the safety cabinets and incorporate these in their biosafety concept. The respective research groups or institutes are responsible for maintenance of the safety cabinets.

⇨ *Use of Class 2 safety cabinets* ***Annex 6***

6.2.4 Biological safety during centrifuging

In order to prevent the harmful formation of aerosols during centrifugation and the dispersal of organisms, the employees of the individual research groups or institutes adhere to the instructions of the centrifuge manufacturer and use appropriate aerosol-tight covers with its rotors.

6.2.5 Prevention of infectious diseases transmissible by blood

In order to prevent infectious diseases, the pathogens of which can be transmitted by blood or other body fluids, special safety precautions apply to the handling of relevant samples. The respective research groups or institutes draw up the supplementary rules as required.

⇨ *General measures to prevent infectious disease transmissible by blood* ***Annex 7***

6.3 Training / Information to ensure safety at work

At ETH Zurich, training is an important element for ensuring the safety of people and the environment. The ETH Zurich offers its BSO external and internal training courses. The respective project manager is responsible for inducting new employees and instructing them in biosafety (he or she can, however, delegate this task, e.g. to the BSO). When the instruction in biosafety has taken place, this must be recorded in writing.

6.4 Standards for laboratory cleaning

6.4.1 Disinfection and cleaning – hygiene plan

The hygiene plan serves to promote personal safety at work and also helps to minimize the escape of organisms into the environment. It is the responsibility of the research groups or institutes to draw up such a hygiene plan; it is an integral part of the specific biosafety concept. Factors such as the spectrum of activity, concentration used and exposure time are crucial for the optimal use of cleaning agents and disinfectants. Only disinfectants which are effective for dealing with the organisms to be rendered inactive may be used and the manufacturer's instructions regarding use must be followed. The directions for use, safety datasheets and the internal instructions on use of the products employed in the particular research groups or institutes are listed in a separate documentation, which is an integral part of the respective biosafety concept.

6.4.2 Safety instructions for the cleaning service

The research groups or institutes draw up cleaning regulations (e.g. factsheet, etc.) and inform Building Services (facility management) of these regulations. Building Services shall pass the regulations on to the cleaning service and instruct them accordingly. If special conditions apply in individual laboratories, the BSO must inform the cleaning staff of these. The specific safety instructions for cleaning personnel are an integral part of the respective biosafety concept. Special safety precautions are followed when handling waste which could contain pathogens of infectious diseases transmissible by blood or other body fluids. See also Chapter 0.

6.5 Disposal of biologically contaminated waste

6.5.1 Disposal plan

Correct disposal of contaminated waste is a key requirement for minimizing or preventing the escape of organisms from a laboratory and thereby averting a risk to people and the environment. The separate disposal plan contains detailed information on how the handling of waste is organized.[9]+[10]

⇨ *Disposal plan for biologically contaminated waste* ***Annex 8***

6.5.2 Inactivating biological waste by autoclaving

Operation of the autoclave is laid down in the operating instructions. These operating instructions are an integral part of the specific safety concept of the particular research groups or institutes. Autoclaving procedures should be selected so that all biological waste is safely inactivated. The effectiveness of the inactivation must be established.

[9] See also the implementation guide issued by SAEFL: BULETTI M. 2004: Entsorgung von medizinischen Abfällen. Vollzug Umwelt. Federal Office for the Environment (FOEN), Berne. 72 S.; Order no.: VU-3010-D. Obtainable from: http://www.bafu.admin.ch

[10] See also the statement of the Swiss Expert Committee for Biosafety on waste disposal in medical microbiological diagnostic laboratories, 11 pages, revised edition August 2006; Swiss Expert Committee for Biosafety, c/o Federal Office for the Environment, CH-3003 Berne; obtainable from: http://www.efbs.admin.ch

6.6 Purchasing, servicing and maintenance of equipment

6.6.1 Declaration of conformity and manuals

The individual research groups or institutes ensure that the machinery (equipment) used in their plants complies with the applicable safety regulations. Therefore, when purchasing new equipment, they insist that the declaration of conformity[11] and the manual[12] are also supplied and they file these documents in an orderly way in a place where they are accessible. The equipment documents and declaration of conformity are an integral part of the respective specific biosafety concept.

6.6.2 Responsibility for servicing and maintenance of equipment

In the individual research groups or institutes, all technical equipment is serviced regularly, so that, apart from the quality of the research and diagnostic results, the safety of the workforce and the protection of people and the environment in general can be ensured. Service plans for individual items of equipment and the rules concerning responsibilities are set down in writing. Service plans and contracts are an integral part of the specific biosafety concept.

6.7 Transportation of organisms or infectious biological agents

With regard to in-house and external transportation of organisms or infectious biological agents, the individual research groups or institutes generally adhere to the statutory requirements and follow the relevant national and international transport regulations[13] on labeling and packing. If a sample containing organisms is transported outside the plant for diagnostic or research purposes, the smallest quantities and lowest concentration of cells possible are packed for reasons of safety.[14] The subsequent goods are transported with the appropriate labeling.

If, as a special case, wastes involving a risk of contamination (e.g. tissue waste, waste containing blood, secretions or excreta, blood bags and banked blood) or strong-smelling or nauseating wastes are transported, the labeling and packing regulations listed in ***Annex 8*** *Disposal plan for biologically contaminated waste* are applied.

⇨ *Transport and shipping of microorganisms and GMO* ***Annex 9***

[11] With a declaration of conformity the manufacturer or supplier (the so-called “distributor”) confirms that the basic safety and health requirements have been met and the machine sold has been built according to the state of the art. In the event of an accident due to a technical fault in the machine, the distributor is liable and the purchaser, therefore, better protected.

[12] The machine or item of equipment must also be supplied with a manual (with details regarding installation, operation, troubleshooting and maintenance), which is used to instruct the employees.

[13] International transport regulations: “UN Recommendations on the Transport of Dangerous Goods, Model Regulations”.

[14] The shipping of concentrated organisms in the form of cultures belong to Group 2 or 3 and according to Category A international regulations, must be carried out by the plant’s dangerous goods safety adviser or under his supervision and the relevant packing and labeling regulations must be complied with. For the function of the dangerous goods safety adviser, refer to the Ordinance on Dangerous Goods Safety Advisers for the transport of hazardous materials by road, rail and waterways of 15 June 2001 SR 741.622 (Gefahrgutbeauftragtenverordnung, GGBV).

In summary, the following applies:

UN number	Official description	Hazard label	ADR packing instructions	Field of application
UN 3373	Biological substances Category B	**Class 6.2**	**P 650**	Group 2 (possibly 3) and Category B microorganisms
UN 3245	Genetically modified microorganisms	**Class 9**	**P 904**	Group 1 microorganisms[15]
UN 1845	Carbon dioxide, solid (dry ice), only to be marked for air transports	**Class 9**		Packing material
UN 1977	Nitrogen, cryogenic liquid	**Class 2.2**		Packing material

6.8. Chemical safety

6.8.1 Storage / quantities

As a general target, chemicals will only be kept in the laboratories of ETH Zurich in the quantities necessary for uninterrupted daily working. Highly flammable liquids are kept in suitable, marked cupboards or cupboard compartments. The long-term storage facility is located outside the laboratories and complies with the fire regulations. The relevant guidelines of the Federal Coordination Commission for Occupational Safety [16] are complied with.

When handling and storing chemicals, the individual research groups or institutes follow the stipulations of the relevant safety datasheets which are filed in an orderly manner.

6.8.2 Disposal

Chemical wastes, strong acids and alkalis, (chlorinated) organic solvents, toxic substances, etc. are collected and disposed of according to the disposal concept applicable throughout the ETH. The ETH Zurich has an appropriate collection point and plant number for depositing hazardous waste. The disposal concept of ETH Zurich is online at http://www.sicherheit.ethz.ch/docs/environment_docs/Entsorgungskonzept_ETH_Zurich.pdf .

6.9 Radiation protection – working with ionizing radiation

Working with ionizing radiation, i.e. handling isotopes, is regulated in separate operating procedures and work instructions and is based on the regulations in force[17] and the recommendations given in the Experts' course of the Paul Scherrer Institute (PSI).
The individual research groups or institutes are responsible for obtaining the respective authorizations and for updating them. Copies of the authorizations are to be attached to the specific biosafety concept.

[15] These are GMOs which do not correspond to the definition of potentially infectious substances, but are nonetheless able to modify animals, plants or microbiological substances in a way that does not normally result from natural reproduction (quoted from ADR).

[16] *Chemische Laboratorien* (Guideline no. 1871 of the Federal Coordination Commission for Occupational Safety) *Brennbare Flüssigkeiten – Lagern und Umgang* (Guideline no. 1825 of the Federal Coordination Commission for Occupational Safety) *Säuren und Laugen* (Guideline no. 6501 of the Federal Coordination Commission for Occupational Safety) Order address: http://www.suva.ch/

[17] Radiation Protection Act of March 22, 1991 (StSG, SR 814.50), Radiation Protection Ordinance of June 22, 1994 (StSV, SR 814.501) and Ordinance on the Use of Open Sources of Radiation of November 21, 1997 (SR 814.554)

6.10 Planning, building, modification, decommissioning and relocation

One of the tasks of the Safety Officers is to keep the applications for changes to the safety precautions in line with the latest scientific and technical developments, even though this might mean structural modifications or a new building.
The respective Safety Officers (e.g. BSO, SSHE-BSO) are always consulted whenever new building work or structural modifications are carried out at ETH Zurich and whenever technical changes are made to safety-relevant facilities.[18]

Specially adapted safety precautions, especially to decontaminate the laboratories and the technical facilities, are taken at the appropriate time for structural modifications, changes in use, decommissioning and relocation. If, despite prior decontamination, it is impossible to completely rule out risks due to organisms, this aspect shall be governed explicitly in the incident management for the particular phase of building regarding an increased risk due to organisms (e.g. removal of filters, etc.).

7) Annex

Annex 1	**Duties of Biosafety Officers of SSHE (SSHE-BSO)**
Annex 2	**Emergency telephone numbers and contacts for safety issues**
Annex 3	**Emergency planning: Procedures in case of incidents in the laboratory**
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Annex 8	**Disposal plan for biologically contaminated waste**
Annex 9	**Transport and shipping of microorganisms and GMO**

[18] Safety aspects such as fire prevention, rules on access or environmental and occupational safety are closely related to planning and construction. Structural measures are often a prerequisite for technical safety precautions. Structural and technical safety measures which are considered together with the proposed operating procedures at the planning stage ensure trouble-free operation in the future.

Annex 1:

Duties of Biosafety Officer of SSHE Staff Unit (SSHE-BSO)

Scope of duties	Responsibility / Activity
Accountability	to SA[1]
Biosafety concept	Create a general concept valid for whole ETH
	Templates for specific concepts of the individual groups and institutes
	Advise GL[2] and BSO on supplementing templates
	Update / adapt the biosafety concept as required
Interaction	Federal and cantonal authorities
	Other safety offices and emergency services of ETH
Information events	For GL
	For students
	For specific areas (groups, institutes)
	On managing incidents
	Own further training
Inspections	Prepare checklists for (self-)inspections
	Conduct inspections
	Feedback on (self-)inspections to GL and BSO (deficits, measures)
Disposal	Advise GL and BSO on disposal issues
	Availability of templates for disposal instructions
Support GL and BSO	Risk issues
	Reporting and authorization procedures
	Safety measures
	Planning, building and decommissioning facilities

Scope of duties	Responsibility / Activity
Accidents and incidents	Prepare a form for reporting
	Template for group-specific incident / accident management procedures
	Templates for incident / accident management signs
	Templates for signs with emergency numbers
	Templates for content of spill kits
Health risks	Confer with OHS[3] (Class 2 and 3 microorganisms)
	Determine general measures for health and hygiene measures at work
	Draft written instructions for women in case of pregnancy
Health file	Determine the content in cooperation with OHS
Measures	Interaction with authorities (building and technical measures)
	Interaction with other safety offices
	Interaction with emergency services
BSC[4]	Advise GL and BSO regarding BSC
	Evaluate proposal for purchase of BSC
PPE	Advise GL and BSO on PPE[5]
Laboratory organization	Establish requirements applicable to whole ETH
	Availability of templates for lists (LV, service / maintenance)
	Advise BSO and GL on supplementing these templates
	Advise BSO and GL on organization of laboratory
Safe working practices	Advise GL and BSO on specific work techniques
Logistics / Equipment	Advise GL and BSO on purchase, operation and servicing of specific equipment
Cleaning / Decontamination	Advise GL and BSO on cleaning and decontamination procedures

Scope of duties	Responsibility / Activity
Transport (internal)	Availability of templates for regulations (in and between the groups)
Transport (external)	Consult with DGSA[6] regarding changes in transport regulations
	Support BSO
	Provide addresses of authorized carriers to BSO

[1] SA: School Administration
[2] GL: Group Leader
[3] OHS: Occupational Health Services
[4] BSC: Biosafety Cabinet
[5] PPE: Personal Protective Equipment
[6] DGSA: Dangerous Goods Safety Adviser

Annex 2:

Emergency telephone numbers and contacts for safety issues at the ETH Zürich

Emergencies	telephone number	responsible
emergencies: **particular incidents, fire, first aid**	**888** **044 342 11 88**	Emergency Desk (AZ) of the ETH
emergencies: **technical problems**	**888** **044 342 11 88**	Emergency Desk (AZ) of the ETH
emergencies: **fire**	**0-118**	fire brigade
emergencies: **first aid**	**0-144**	ambulance
emergencies: **poisoning, intoxication, effect of chemicals**	**888** **044 342 11 88**	Emergency Desk (AZ) of the ETH

An updated list of all contact people of the SSHE unit at the ETH Zürich can be found here: **Contact persons**.

Annex 3:

Emergency plan – action in the event of incidents and accidents in the laboratory

1) General rules on procedure for incidents

As a basic rule, the notices in laboratories and other premises regarding escape routes, fire-fighting equipment and manual alarm buttons must be followed.

2) Minor incidents and emergency situations

Minor incidents are, in general, to be dealt with by the person(s) who caused them – if appropriate with the assistance of the Biosafety Officers (BSO). In the event of serious incidents, the emergency services (internal / external) must be alerted.
In an emergency situation, the response should always follow the same pattern and proceed in a linear way.

	minor incidents	**emergencies**
1. Keep calm	get an overall view of the situation	leave the danger zone in case of aerosol formation, fire, etc..
2. Alarm	inform BSO	alert the emergency services (internal / external)
3. Secure	confine the contaminated area	rescue (self-protection!)
4. Act	Disinfect or decontaminate according to hygiene plan	extinguish, etc. (self-protection!)

3) Emergency telephone numbers

Emergency telephone numbers for external emergency services and in-house persons responsible for safety are available on stickers in the laboratories next to the telephones and by the first-aid boxes (“zip-bags”).

4) *Emergency planning*: spillage of infectious material WITHOUT aerosol formation

SPILLAGE / RELEASE OF INFECTIOUS MATERIAL <u>WITHOUT</u> AEROSOL FORMATION	
1. ALARM	alert the BSO of the group / institute
	WHERE did the incident occur? **WHAT** was spilled / released? **HOW MANY** people are affected? **WHO** calls?
2. SECURE	Employees should <u>not leave the affected area if possible</u>. The most effective way of dealing with the incident is to: • keep calm • confine the contaminated area • disinfect or decontaminate with disinfectant according to hygiene plan • get clearance from the BSO of the group / institute or his / her deputy
3. ACT	complete the report sheet for laboratory incidents

5) *Emergency planning*: spillage of infectious material WITH aerosol formation

SPILLAGE / RELEASE OF INFECTIOUS MATERIAL WITH AEROSOL FORMATION	
1. EVACUATE THE DANGER ZONE	**Immediately evacuate all people from the danger zone.** Employees who might have been affected should, if possible, decontaminate themselves immediately; otherwise, they should remain in a separate room to prevent any further spread of the organisms.
2. ALARM	alert the BSO of the group / institute
	WHERE did the incident occur? **WHAT** was spilled / released? **HOW MANY** people are affected? **WHO** calls?
3. SECURE	• seal off the room, switch off the ventilation, wait 30 min • dekontaminate people • disinfect the room as instructed by the Laboratory Manager according to hygiene plan • disinfect contaminated equipment • issue the all-clear for the room after checking that it has been decontaminated
4. ACT	complete the report sheet for laboratory incidents

6) *Emergency planning*: injuries

See also poster: Emergencies in the Lab - What to Do?

INJURIES		
1. ALARM	Emergency Desk (AZ)	Tel.-Nr. **888**
	if necessary: ambulance	Tel-Nr. **0-144**
	WHERE are the injured people? **WHAT** happened? **HOW MANY** people are affected? **WHO** calls?	
2. RESCUE / ACT	• provide first aid • remove gloves and labcoat • wash hands and injured areas of the skin • disinfect with hand disinfectand or 70% ethanol • complete the report sheet for laboratory incidents	

7) *Emergency planning*: fire / explosion

FIRE / EXPLOSION		
1. ALARM (if the fire alarm has not be set off automatically)	Emergency Desk (AZ)	Tel.-Nr. **888**
	if necessary: fire brigade	Tel-Nr. **0-118**
	alarm BSO of the group / institute	
	WHERE is the fire / explosion? **WHAT** happened? **HOW MANY** people are affected? **WHO** calls?	
2. RESCUE	Evacuate all people from the danger zone to a predetermined assembly area via the designated escape routes	
3. ACT	fight the fire (self-protection!) complete the report sheet for laboratory incidents	

8) Emergency planning: flooding / inundation

FLOODING / INUNDATION INVOLVING RELEASE OF ORGANISMS		
1. ALARM	Emergency Desk (AZ)	Tel.-Nr. **888**
	if necessary: ambulance	Tel-Nr. **0-144**
	alarm BSO of the group / institute	
	WHERE is the flooding / inundation? **WHAT** happened? **HOW MUCH** water escaped? **WHO** calls?	
2. SECURE	• protect material and equipment • shut off the main supply lines • clean and decontaminate surfaces • decontaminate the waste-water installations	
3. ACT	complete the report sheet for laboratory incidents	

Annex 4:

«Biohazard»: Meaning and use of the warning symbol

1) Purpose

The “biohazard” warning symbol draws attention to the risks due to Group 2 pathogenic or genetically modified organisms and serves to reduce the dispersal and uncontrolled multiplication of organisms and to protect people from unintentional infection.[1] The warning symbol is aimed at three different groups of people, with a different purpose in each case:

- It reminds employees that infectious organisms are present in a certain working area and that contamination is to be expected.
- It serves to warn plant personnel without the necessary knowledge not to enter the designated area or touch instruments and containers marked in this way.
- It serves to draw the attention of the emergency services to the protective measures to be taken.[2]

2) Principles for the use

With regard to the placing of the “biohazard” warning symbol, the ETH Zürich is guided by the following principles:

- It is used sparingly to retain its signaling effect.
- It is positioned in the entrance area to the BSL 2 rooms.
- It is also attached to equipment (e.g. to the incubator) or positioned in working areas inside an already marked room if there is a possibility of a higher biohazard risk there compared with the immediate surrounding working area.
- It is attached to the second or third layer of packaging of a sample contained in a pack which is impermeable to liquids if this sample is stored, processed or transported outside a marked room.
- It is attached temporarily to equipment (e.g. to a centrifuge) outside a marked laboratory if work involving Group 2 organisms is being done there as an exception.
- It is attached to doors of freezers located outside a marked room, if Group 2 organisms are kept there.[3]

3) Special case: Handling of wasted bags labeled with the biohazard sign

Commercially available, autoclavable waste bags for biological waste carry a warning symbol. After this waste has been autoclaved and inactivated, the “biohazard” warning symbol on the bags is no longer applicable. So this is clear, autoclaved or inactivated waste bags must be identifiable as “autoclaved”. To this end, they are equipped with heat-sensitive indicators.
Inactivated waste must not be disposed of with the industrial waste until the “biohazard” warning symbol is no longer visible. To this end, it is hidden by a second layer in order not to unjustifiably unsettle third parties in the disposal chain.
These requirements are set out in more detail in the disposal concept.

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[1] The Containment Ordinance (Einschliessungsverordnung / ESV) provides for the use of the biohazard warning symbol for laboratories of Safely Level 2 and higher.

[2] The labeling of the laboratory corresponds to the similarly identified rooms in the risk plans for the premises of the ETH Zürich.

[3] If the insides of the freezers are subdivided into compartments with different doors, the warning symbol is attached to the various internal doors.

4) Appearance and form of the warning symbol and safety symbol

European biohazard warning sign

International biohazard symbol
(with or without text)

Annex 5:

Laboratory Rules for BSL 1 and 2

1) General

- The rooms are kept neat and tidy. Work surfaces are cleared of any unnecessary equipment and materials. All supplies are stored in designated areas or cabinets.
- Doors and windows are kept shut while working.
- Eating, drinking and keeping beverages and food in laboratory rooms in which work with biological materials is conducted or biological materials are stored is prohibited.
- When working with toxic or carcinogenic materials or with microorganisms, a lab coat or other prescribed protective clothing must be worn in the working areas. Specifically, this means:
    - Clean or change contaminated gloves immediately.
    - When wearing gloves, it should be made certain that no organisms or harmful substances are spread when telephoning, opening all types of doors, using water faucets, etc.
    - Safety glasses with side protectors and , if possible, with upper shields must be worn in working areas with hazardous biological or chemical materials; persons who wear glasses can either use corrected safety glasses or safety goggles that fit over their own glasses. Wearing protective glasses for operations in a safety cabinet is not required.
    - Protective clothing must be removed when leaving the working area.
    - Gloves may not be worn outside the laboratory.
- Do not touch mouth and eyes while working and until after you have thoroughly washed your hands.
- Contact lenses may not be worn.
- Cosmetics may not be used.
- Before leaving the laboratory rooms, hands must be washed (Level 1) / decontaminated (Levels 2 and 3).
- Pipetting by mouth is strictly forbidden. Suitable mechanical pipetting tools are used.
- All procedures should be performed in a way that prevents splashing or the formation of aerosols.
- Safety glasses must be worn while working.
- Work surfaces are cleaned and decontaminated at regular intervals and after use.
- All biological material is marked and kept in appropriate containers. Containers are always kept closed, except for the immediate use of the biological material.
- The use of needles and syringes should be kept to an absolute minimum. They must be properly disposed of after use.
- It is important to avoid the formation of aerosols, as far as possible, during all activities.
- The identity of the microorganisms used is checked if there is a certain probability of contamination by pathogenic organisms or if they are necessary for risk assessment.
- The use and placement of personal possessions (e.g. bags, cell phone, etc.) in working areas should be limited.
- Prior to taking up any activity involving microorganisms, employees must be instructed on their handling (in relation to their previous knowledge) and in relation to the task.
- Pest control must be undertaken periodically.
- Contaminated tools must be autoclaved or disinfected prior to cleaning.
- Waste containing pathogens must be collected as specified in the waste disposal concept and inactivated through autoclaving or disinfection.
- If infectious material is spilled, the contaminated area should be cleared and decontaminated immediately. Incidents in the laboratory which are relevant to safety are reported to the BSO.

- First aid instructions in case of accidents with pathogenic organisms must be immediately at hand in the working area. All accidents are to be reported to the responsible supervisors and the biosafety officer.
- Pregnant and nursing mothers may not handle infectious human pathogenic microorganisms or materials which contain such. Exceptions are explained in the regulations governing maternity protection.
- Prior to working with harmful chemical substances and before conducting experiments in which hazardous materials could possibly be released, the potential risk must be determined and the necessary protective measures taken. For activities with dangerous chemicals, the respective safety precautions listed in the safety datasheets must be followed and the rules of conduct for working with these substances (e.g. ethidium bromide, cytotoxins, etc.) defined precisely in the individual operations manual.
- Work with ill-smelling or toxic substances and highly flammable gases are carried out exclusively under the fume hood. Any additional protective measures required must be taken.
- Cold-store, flammable liquids as well as extremely and highly flammable substances are stored exclusively in refrigerators or freezers, the interior of which is explosion-proof.
- Compressed (gas) bottles must always be secured or chained to prevent them from falling. They may only be transported on carts intended for this purpose.
- When handling radioactive isotopes, the respective laboratory regulations for working with ionizing radiation must be complied with.

2) Specific instructions for BSL 1

Personal protective equipment (PPE)

- A laboratory coat must be worn when working. Do not wear the laboratory coat open.
- Laboratory coats should not be worn in offices, seminar rooms, toilets and in rooms where food and drink is stored or consumed.
- Nitrile gloves must be worn for all activities that involve a risk, such as handling harmful chemicals or radioisotopes, or when hands have cuts or lesions.
- Do not wear gloves outside the laboratory.

Working with GMO

- A suitable disinfectant should be used to clean and decontaminate all work surfaces.
- If genetically modified microorganisms are spilled, the contaminated surfaces must be decontaminated.

Waste

- Biological waste can be disposed of with regular household waste provided that it has NOT been genetically modified, does not concern an animal carcass, is not odor-intensive or nauseating and does not contain any harmful chemicals or radioisotopes.
- Genetically modified (micro)organisms, animal carcasses, material that smells strongly or is particularly nauseating or contains chemicals or radioisotopes must be treated according to the instructions for, disposal of solid and liquid waste.
- Sharp and pointed objects are disposed of in closed, solid containers.

Working with harmful chemicals and radioisotopes

When harmful chemicals or radioisotopes are also involved in working with biological materials, practices to protect against these substances must be respected, in addition to the work practices for biological safety. Generally, the protection against biological material can be combined with the protection against chemicals and radioisotopes. If this is not the case, the protection against harmful chemicals and radioisotopes should be given priority.

3) Specific instructions for BSL 2

Access

Access to the Level 2 rooms is restricted to employees who have received authorization from the group leaders.

Personal protective equipment (PPE)

- A laboratory coat must be worn when working. Do not wear the laboratory coat open.
- Wearing laboratory coats is limited to Level 2 rooms. These laboratory coats may not be worn outside Level 2 rooms.
- All activities with Group 2 biological material that could lead to the formation of droplets or aerosols must be conducted in a biological safety cabinet. For activities with Group 2 biological material that cannot be carried out in a biological safety cabinet, authorization from the federal authorities is required.
- Nitrile gloves must be worn when handling Group 2 biological material.
- Gloves must be removed prior to leaving Level 2 rooms.
- For specific procedures, it may be advisable to wear two pairs of gloves.
- Gloves must be replaced when they are wet or have been contaminated and when they have holes or tears. Always wash or decontaminate hands before putting on new gloves. Always disinfect hands prior to leaving the laboratory.

Working practices

- Work surfaces must be decontaminated and cleaned at regular intervals and after use with a suitable disinfectant. All work surfaces and objects that have come into contact with biological material or could have must be properly decontaminated.
- The use of sharp and pointed objects should be avoided. Plastic should be used in place of glass.
- If biological material needs to be removed from a Level 2 room, it must be double packed (primary receptacle and a closed, break-proof secondary receptacle); it must also be marked with a biohazard warning label in addition to the normal labeling.

Waste

- All contaminated or potentially contaminated material (Group 2 biological material, glassware, supplies, equipment) must be decontaminated before it leaves Level 2 rooms.
- All waste composed of Group 2 biological material or contaminated with such is to be treated as infectious waste.
- “Sharps” containers with a biohazard warning label are to be used for sharp, pointed objects.

Working with harmful chemicals and radioisotopes

When harmful chemicals or radioisotopes are also involved in working with Group 2 biological materials, practices to protect against these substances must be respected, in addition to the work practices for Level 2 biological safety. Generally, the protection against biological material can be combined with the protection against chemicals and radioisotopes. If this is not the case, a special risk assessment must be undertaken to determine the most suitable procedure. This should be discussed with the SSHE-BSO.

4) Special instructions for animal facilities

Depending on the level of the animal facility, the following work practices should be adopted in addition to the aforementioned. Furthermore, the directives for handling animals must be abided by especially with regard to the protection of animals as well as quarantine measures and sterility.

Access

- Access to animal facilities is restricted to employees who have received authorization from the group leaders.
- Access is only possible via a locking system.

Personal protective equipment (PPE)

- Only clothing permitted in the animal facility is worn and is removed before leaving.
- Nitrile gloves are always worn in the animal facility.
- Gloves must be removed before leaving the animal facility.
- Gloves must be replaced when they are wet or have been contaminated and when they have holes or tears. Always wash or decontaminate hands before putting on new gloves.
- For specific procedures, it may be advisable to wear two pairs of gloves, e.g. when handling animals. The second pair of gloves should be worn over the sleeves of the laboratory clothing.
- Group-specific requirements regarding the wearing of additional protective equipment must be followed.

Work practices

Always disinfect hands prior to leaving the animal facility.

Waste

- Animal carcasses are disposed of as special waste.
- Animal carcasses that have been infected with pathogenic microorganisms must be autoclaved prior to disposal.

5) Special instructions for greenhouses

Depending on the level of the greenhouse, the following work practices should be adopted in addition to the aforementioned.

Access

Access is only possible via a locking system.

Personal protective equipment (PPE)

- Only clothing permitted in the greenhouse is worn and is removed before leaving.
- If there is a possibility of releasing seeds or pollens of genetically modified plants to the environment on shoes, overshoes or special shoes must be worn in the greenhouse and removed before leaving.
- Group-specific requirements regarding the wearing of additional protective equipment must be followed.

Work practices

- Always wash or decontaminate hands prior to leaving the greenhouse.
- Minimize the amount of water used for irrigating the plants.
- Irrigation water from genetically modified plants which could contain pollen or seeds must be caught and inactivated or filtered before conducting it into the sewage system.
- Irrigation water from plants which have been infected with pathogenic microorganisms must also be caught and inactivated before conducting it into the sewage system.

Waste

- Plants which have been neither genetically modified nor infected with pathogenic microorganisms can be disposed of with the regular household waste or composted. The same applies to the earth in which these plants have been cultivated.

- Genetically modified plants and parts of plants which are potentially reproductive, as well as earth in which these plants have been cultivated must be autoclaved prior to disposal in the household waste. Genetically modified plant material without reproductive capacity can be disposed of with the regular household waste.
- Plants and parts of plant which have been infected with pathogenic microorganisms and the earth in which such plants have been cultivated must be autoclaved prior to disposal in the household waste.

Annex 6:

Use of a Class 2 Biosafety Cabinet (BSC)

This document is based on the SOP provided by BG
RCI: **http://downloadcenter.bgrci.de/shop/bgi/breihe**

1) General information

Class 2 safety cabinets ensure that people, product and the environment are protected. About 70% of the air is recirculated in the compartment; 30% of the air is discharged into the surrounding air through high-performance filters (HEPA). Accordingly, this volume of 30% is constantly extracted from the laboratory, thereby contributing to occupational safety and the protection of health.
Good microbiological practices (GMP) are essential even in the safety cabinet, since such cabinets protect only against aerosol contamination and not against contact contamination. Accordingly, the employee's hand must remain within the safety cabinet during work and must not be brought up to the face.

2) Hazards for people and the environment

Danger of release of biological substances from the cabinet as a result of incorrect working procedures.

3) Precautions and rules of conduct

- Avoid draughts in the working area; to this end, keep windows and doors closed during work in the safety cabinet. Do not position the cabinet too close to doors.
- Switch on the equipment approx. 10 (to 30) minutes before the start of work.
- Use personal protective equipment: at least laboratory coat.
- When working with particularly problematic chemical or biological agents, also use eye protection and disposable gloves (nitrile). (Refer to the specific operating instructions required for this purpose).
- Prevent aerosol formation as far as possible even under the safety cabinet.
- Prevent disturbances to the laminar air flow as far as possible:
    - no rapid or violent movements
    - only bring bulky items of equipment into the safety cabinet if absolutely essential and remove them immediately after use
    - do not store any unnecessary items in the safety cabinet – only introduce material and equipment to the extent absolutely necessary for the work
    - do not use Bunsen burners over extended periods – only ignite as required, using a sensor or foot switch
    - do not cover air holes
- All equipment brought into the safety cabinet must be cleaned and disinfected beforehand. Items of equipment removed from the safety cabinet must first be disinfected and, if necessary, then cleaned (in this sequence).
- The working surface of the safety cabinet must be cleaned and disinfected at the end of the work. Waste must be disposed of, Pasteur pipettes on hoses must be removed and vacuum hoses must be disinfected (see operating instructions on hygiene and waste disposal). If flammable disinfectants are stipulated, disinfect only by wiping with quantities of less than 20 ml in order to prevent any explosion.

- If work is not being carried out on the safety cabinet, it can be switched to stand-by in order to save energy. This prevents contamination of the workroom from the laboratory air.
- If work involving potentially hazardous biological substances has been carried out, the equipment must be switched off only by an authorized person. The sterility of the inside should be monitored from time to time by placing open Petri dishes lined with nutrients there. If microorganism growth occurs on the nutrients, the Laboratory Manager and the responsible person must be informed in accordance with the service plan.

4) Malfunctions and dangers 

Safe operation is only possible if the green light is showing and the front sash is down. Never ignore alarm signals.
The cabinet does not offer any protection against harmful gases and vapours.

- In the event of a complete functional failure during work with potentially dangerous biological substances work must be stopped (in a controlled manner). The laboratory manager and the BSO of the group / institute must be informed immediately.
- In the event of a visual and acoustic alarm, the cause of the malfunction must be established – if necessary, with the help of the operating instructions – and, if possible, corrected by the relevant person himself (e.g. by positioning the front sash correctly). If it is not possible to correct the malfunction or if attempts are unsuccessful, the responsible person must be notified in accordance with the service plan.
- If there is an indication that the preliminary filter or the HEPA filter needs to be replaced, work must be continued and the responsible person notified in accordance with the service plan, so that new filters can be ordered.
- If there is a similar signal with a warning tone, the work must be ended in a controlled manner and the responsible person must be notified in accordance with the service plan.

5) Tests, maintenance and disposal

Servicing and repair work must only be carried out with the permission of the Laboratory Manager and must normally be performed by the manufacturer.
The safety cabinet must be checked annually by a specialist (see service plan).
For maintenance, only replacement parts matching the original parts in terms of material and design may be used.

6) Accidents and first aid 

Rinse an open wound, allow it to bleed if possible and spray it immediately with disinfectant. Apply more disinfectant if necessary and allow it to act according to the instructions, though at least for 30 minutes.
If necessary, alert the ETH first-aid team (internal phone number: 888) or the ambulance (0-144). Pay attention to *Emergency planning: action in the event of incidents in the laboratory*. Complete Report sheet for laboratory incidents and inform laboratory managers and BSO.

Annex 7:

Measures to prevent infectious diseases transmissible by blood

1) Background

This leaflet is aimed at people working at the ETH Zürich (students, employees, etc.) who work with blood and other body fluids, especially laboratory personnel and cleaning service staff.

Infectious diseases, pathogens of which are contained in the blood, can be transmitted by blood or other body fluids which contain blood: e.g. through stab wounds, cuts, splashes into the eyes and onto the mucous membranes of the mouth as well as through contact with broken skin (open wounds). Blood and body fluids containing blood must always be regarded as infectious!

The only people who work in working areas with a high risk of infection are those who have been instructed about possible dangers from infectious diseases in the course of their work, measures to prevent exposure, hygiene regulations, the wearing and use of protective equipment and protective clothing, and action in the event of incidents. Stab wounds and cuts are prevented by technical means and appropriate equipment.

Employees who, on the basis of experience, are exposed to a higher risk of stab wounds and cuts from items contaminated with blood or who have foreseeable contact with blood are vaccinated against hepatitis B at the ETH Zürich.

2) Rules of conduct for laboratory personnel

To protect yourself and others (especially laboratory personnel and cleaning staff) against infectious diseases which can be transmitted through blood, the following basic rules of conduct must be followed:

- Avoid stab wounds and cuts: only place protective covers over used cannulae if absolutely necessary, preferably using a mechanical aid or the one-handed technique, but never with both hands (no two-handed recapping).
- Items contaminated with blood which pose a risk of injury (e.g. used cannulae and sharp disposable utensils) must be disposed of in unbreakable, puncture-resistant and closable containers. Hand over the containers for disposal no more than 2/3 full, tightly closed and marked as a biohazard.
- Disposable gloves are to be worn for activities involving possible contact with blood or body fluids. When disposing of the gloves, turn them inside-out, so the outside, contaminated glove surface is on the inside. Wash and moisturize hands.
- Always wear eye protection and a respirator when carrying out tasks which could cause splashes.
- Disinfect and / or sterilize protective clothing and other material which might be contaminated.

3) Rules of conduct for the cleaning staff

People entrusted with cleaning duties should be informed about the dangers of stab wounds and cuts. In particular, these people must be instructed that any waste bag could contain items / instruments capable of piercing or cutting and that appropriate precautions must be taken when disposing of waste bags:

- Never press waste bags down by hand.
- When emptying waste bins, never put bare hands or even hands protected by gloves into the bins.

- Only grasp waste bags near to the closure. Waste bins without a liner must be emptied by being tipped over.
- Wear liquid-proof protective gloves and dispose of them after work – then wash hands thoroughly and moisturize them.

4) What to do after an incident with possible transmission of infection

The following immediate action should be taken after an incident with possible transmission of infection:

- Wash hands and contaminated areas of skin immediately with soap and water and / or disinfect them.
- If the eyes or mucous membranes have been in contact with blood or with body fluids containing blood, rinse them immediately with plenty of water or a physiological liquid.
- In the event of an incident in which there is a risk of infection through blood (stab wound, cut, splash onto a mucous membrane or contact between blood and open, injured skin), proceed according to *Emergency planning: action in the event of incidents in the laboratory.*
- Report stab wounds, cuts and splashes to the laboratory managers and BSO without delay using the *Report sheet for laboratory incidents*.

Contact your line managers in the event of any uncertainty or if you have any questions.

Annex 8:

Disposal plan for biologically contaminated waste

This disposal plan regulates the handling of biologically contaminated waste.
Inactivating contaminated waste is a central issue with the aim of minimizing the possibility of organisms escaping from the laboratory and thus avoiding risks to people and the environment.

The following individual steps are important for waste inactivation and elimination:

- Description of waste and type of collection
- Labeling
- Storage
- Transport
- Inactivation (method, technique)
- Disposal

1) Basic principles

- Biologically active material should be handled so that as little waste as possible is created.
- The volume of actual waste is to be minimized by strictly separating biological and other materials.
- If possible, inactivation should take place on site in order to prevent unnecessary risks in transport.
- The waste must be labeled correctly. Inactivated material that can be disposed of in the municipal waste may not be marked with a hazard label, i.e. it must be neutrally packaged.
- If there is any uncertainty as to the effectiveness of the inactivation, an activity test must be performed before disposing of it in the municipal solid waste or municipal sewage.

The inactivation techniques used are thermal sterilization (dry), steam sterilization (autoclaving) as well as chemical decontamination (disinfection).
Genetically modified or pathogenic (micro)organisms in contaminated materials and waste, in contaminated equipment, animal carcasses, from animal husbandry and on the clothing of personnel (overalls, sleeves and gloves) must be inactivated prior to final disposal.

2) Legal requirements

2.1 Regulations of ESV and SAMV on disposal of organisms

The Swiss Ordinance on the Contained Use of Organisms (ESV) and the Ordinance on Occupational Safety in Biotechnology (SAMV) require measures to safely dispose of waste containing or composed of genetically modified or pathogenic (micro)organisms.

- For Safety Level 1 laboratories the safe disposal of contaminated materials, equipment and wastes.
- For Safety Level 2 laboratories the waste must be inactivated in most cases on site.
- Animals that have been inoculated with Class 2 microorganisms may only be sent directly to incineration without prior inactivation provided that the risk analysis has shown that the animals do not excrete any microorganisms.
- For other waste resulting from the work with animals, on-site inactivation may also only be foregone if the risk analysis proves that they are not contaminated with pathogenic microorganisms.
- For waste or animal carcasses that are infected or contaminated with prions, special regulations apply. Inactivation may be performed via autoclaving or other suitable process.
- Clinical samples as well as blood and other body fluids, tissues and organs that contain no cultures of pathogenic microorganisms or were not kept under conditions conducive to the growth of pathogenic microorganisms may, according to the statement of the Swiss Expert Committee

for Biosafety, SECB[1] concerning waste disposal in medical, microbiological and diagnostic laboratories, be incinerated without inactivation. Such waste must be labeled and packaged as special waste for transport to the incineration plant according to the national and international transport regulations (cf. transport guidelines of the Swiss Expert Committee for Biosafety, www.efbs.ch).

Depending on the type of waste, the Swiss Ordinance on the Disposal of Animal By-Products (VTNP), special waste and radiation protection laws additionally apply. For liquid wastes the relevant provisions of the Federal Law on Water Protection[2] must be adhered to.

2.2 Availability of an autoclave

ESV and SAMV stipulate that an autoclave to inactivate pathogenic and genetically modified microorganisms must be available in the same building for Safety Level 2 laboratories. For Level 1 activities, the availability of an autoclave is sufficient.

3) Types of waste and waste groups

3.1 Types of waste

The ETH Zurich produces various types of waste with genetically modified or pathogenic (micro)organisms:

- Liquid and solid cultures of pathogenic or genetically modified microorganisms
- Cultures of primary cells or cell lines
- Human or animal tissue samples, possibly also organs and body parts
- Human or animal blood and blood products as well as components thereof
- Excretion and secretion of human or animal origin
- Prions
- Plants and plant components infected with plant-pathogenic microorganisms
- Genetically modified plants and plant components
- Genetically modified animals
- Animals infected with human or animal-pathogenic microorganisms
- Contaminated consumables with risk of injury, such as needles, cannulas, inoculation loops, glass containers, shards, Pasteur pipettes, scalpel blades, etc.
- Other contaminated consumables, such as pipette tips, plastic containers, disposable gloves, protective clothing, wipes, etc. as well as replaceable components of laboratory equipment (tubes, seals, etc.).

3.2 Waste groups

Wastes are separated into waste groups for which the corresponding inactivation process applies.

- GMO waste: solid or liquid waste containing material with genetically modified (micro)organisms capable of propagation or consisting of such, but which does not contain any further hazardous substances.
- Infectious waste: solid or liquid waste containing material with pathogenic microorganisms capable of propagation or consisting of such, so that in case of an explosion there is the risk of infection to exposed persons.
- Prion-containing waste: solid or liquid waste consisting of material which contains prions of human or animal origin.
- Medical waste: waste from a clinical source, such as blood, all types of diagnostic samples, tissues, organs which do not contain cultures of pathogenic microorganisms.

[1] http://www.efbs.admin.ch/uploads/media/d-empfehlung-abfallentsorgung-2006_01.pdf

[2] Water protection law of 24 January 1991, version 23 August 2005, SR 814.20, http://www.admin.ch/ch/d/sr/c814_20.html

- Animal carcasses: waste consisting of animals or identifiable parts of animals.
- Mixed waste: GMO waste or infectious waste that also contains hazardous chemical substances or radioactive material.
- Sharps: waste with risk of injury (needles, cannulas, inoculation loops, glass containers, shards, Pasteur pipettes, scalpel blades).
- Special waste: any type of waste requiring special treatment (infectious biological materials, hazardous chemical substances, radioactive substances, materials with risk of injury or material that is foul-smelling or otherwise nauseating).
- Municipal waste: non-hazardous waste containing no material with either reproducible genetically modified or pathogenic (micro)organisms, hazardous chemical substances, radioactive substances, materials with risk of injury or material that is foul-smelling or otherwise nauseating.

4) Waste disposal procedures

It must be ensured for all waste that the procedure selected for inactivation is adapted to the type of waste and is effective. The general procedures are listed below.

4.1 Municipal waste

Scope

- Municipal waste is considered to be non-hazardous waste containing no material with either reproducible genetically modified or pathogenic (micro)organisms, hazardous chemical substances, radioactive substances, materials with risk of injury or material that is foul-smelling or otherwise nauseating.
- The procedure for disposal of municipal waste can be used in all rooms with a biological safety level 1 or 2.

Collection

- Municipal waste is collected in normal garbage bags.
- Municipal waste must be clearly differentiated from other waste.
- Containers for municipal waste are not located directly next to containers for other waste in order to prevent mix-ups.
- Containers must be closed before leaving the room in which the waste was generated.

Inactivation

None

Storage and disposal

Municipal waste in Level 1 and Level 2 rooms is brought to the building's central collection point by cleaning personnel. The waste is removed from the buildings according to the ETH waste management concept.

4.2 GMO waste

Scope

- GMO waste is considered to be solid or liquid material which contains genetically modified (micro)organisms capable of propagation or consisting of such, but which does not contain any further hazardous substances.
- The procedure for disposal of GMO waste can be used in all rooms with a biological safety level 1.
- The procedure for disposal of GMO waste in all rooms with a biological safety level 2 or 3 is combined with the procedure for disposal of infectious waste.

- For disposal of Class 1 genetically modified animals, the procedure for disposal of animal carcasses is used.
- For the disposal of Class 1 genetically modified plants and plant components capable of propagation, the procedure for disposal of GMO waste is used. Plant components that no longer possess the potential to propagate or materials that are contaminated with plant components incapable of propagation may be disposed of with the municipal waste.
- For waste that contains not only biological material, but also hazardous chemical substances or radioactive substances, the procedure for disposal of mixed waste is used.
- For waste that contains not only biological material but also material with risk of injury, the procedure for disposal of sharps is used.

Collection

- Liquid GMO waste is inactivated in the containers in which it was generated. Liquid waste may also be aggregated in containers. Containers that have come into contact with liquids containing GMO must also be inactivated. The waste must be labeled accordingly.
- Waste with risk of injury is collected in sharps containers.
- Solid GMO waste and materials contaminated with GMO waste or which have come into contact with such are collected in containers with autoclavable bags. The bags must be clearly differentiated from municipal garbage bags.
- Containers must be closed before leaving the room in which the waste was generated.

Inactivation

- Liquid GMO waste is chemically inactivated or autoclaved. For chemical inactivation the appropriate disinfectants in appropriate concentrations and contact times are used. Their effectiveness must be checked. Basically, disinfectants with low toxicity are applied.
- Solid GMO waste is autoclaved. The contaminated surfaces of large contaminated containers and equipment can be chemically decontaminated.
- When autoclaving, it is important that the required temperature and pressure are reached inside the containers and maintained for a sufficiently long period of time.

Disposal

- Each group determines when and by whom the bags with GMO waste are transported to autoclaving and autoclaved.
- Autoclaved GMO waste may be disposed of with the municipal waste.
- Liquid waste can be disposed of in the municipal sewage system after being fully inactivated (thermally or chemically) – but only if it doesn't contain any hazardous substances (e.g. antibiotics, bleach).

4.3 Infectious waste and prion-containing waste

Scope

- Infectious waste is considered to be solid or liquid waste containing material with pathogenic microorganisms capable of propagation or consisting of such, so that in case of an explosion there is the risk of infection to exposed persons.
- Prion-containing waste is considered to be solid or liquid waste consisting of material which contains prions of human or animal origin.
- The procedure for disposal of infectious or prion-containing waste is used in rooms with a biological safety level 2 or 3. The procedure is not used in level 1 rooms.
- For disposal of (genetically modified) animals infected with Class 2 or 3 pathogenic microorganisms or prions, the procedure for disposal of animal carcasses is used.

- For disposal of (genetically modified) plants and plant components capable of propagation that have been infected with Class 2 or 3 plant-pathogenic microorganisms, the procedure for disposal of infectious waste is also used.
- For waste that contains not only biological material but also hazardous chemical substances or radioactive substances, the procedure for disposal of mixed waste is used.
- For waste that contains not only biological material but also material with risk of injury, the procedure for disposal of sharps is used.

Collection

Liquid infectious waste is inactivated in the containers in which it was generated. Containers that have come into contact with liquid infectious material must also be inactivated. The waste must be marked with the biohazard warning label.
Waste with the risk of injury is collected in sharps containers marked with the biohazard warning label.
Solid infectious waste and materials which have been contaminated with infectious waste or have come into contact with it are collected in containers with autoclavable bags.

- Either autoclavable containers with biohazard warning symbols and neutral bags are used and the waste is autoclaved in the containers;
- Or containers which are not autoclavable are used with autoclavable bags with the biohazard warning symbols and the waste is only autoclaved in the bags.

Containers must be closed before leaving the room in which the waste was generated.
For Level 2 rooms: If exterior contamination of the containers or bags cannot be excluded, the outside of the containers must be decontaminated prior to leaving the room and transporting them to autoclaving.

Inactivation

- Liquid infectious waste is chemically inactivated or autoclaved. For chemical inactivation the appropriate disinfectants in appropriate concentrations and contact times are used. Their effectiveness must be checked. Basically, disinfectants with low toxicity are applied
- Solid infectious waste is autoclaved. The contaminated surfaces of large contaminated containers and equipment can be chemically decontaminated.
- When autoclaving material with pathogenic microorganisms, it is important that the required temperature and pressure are reached inside the containers and maintained for a sufficiently long period of time. For prions a temperature of 134 ^{o}C is maintained for one hour.

Storage and disposal

- Each group determines when and by whom the bags with infectious waste are autoclaved or transported to autoclaving and autoclaved, as the case may be.
- Infectious waste should, if possible, not be stored outside the room in which it was created. If it is not possible to autoclave infectious waste immediately after transport to autoclaving, it must be ensured that it is stored under controlled Level 2 conditions.
- Autoclaved, i.e. inactivated waste which is no longer infectious, may be disposed of with the municipal waste.
- Liquid waste can be disposed of in the municipal sewage system after being fully inactivated (thermally or chemically)) – but only if it doesn't contain any hazardous substances (e.g. antibiotics, bleach).

4.4 Medical waste

Scope

- Medical waste is considered to be waste that contains the following material, consists of such or has been contaminated with such: blood, all types of diagnostic samples, tissues, organs which do not contain cultures of pathogenic microorganisms and which also have not been kept under conditions conducive to the propagation of pathogenic microorganisms.
- The procedure for disposal of infectious waste is used in rooms with a biological safety level 2 or 3. The procedure is not used in Level 1 rooms.
- For medical waste that contains not only biological material but also hazardous chemical substances or radioactive substances, the procedure for disposal of mixed waste is used.
- For waste that contains not only biological material but also material with risk of injury, the procedure for disposal of sharps is used.

Collection

The same as infectious waste or

- Liquid waste (> 10 ml volumes) like infectious waste and
- Liquid waste (< 10 ml volumes) in closed primary containers as well as solid waste in non-breakable, liquid-tight, UN-certified special containers which are tightly sealed and cannot be reopened and which are furnished with sufficient absorbent material so that all the liquid can be absorbed (for details, see infectious special waste).
- Containers must be closed before leaving the room in which the waste was generated.

Inactivation

The same as infectious waste or

- Liquid waste (> 10 ml volumes) like infectious waste and
- Liquid waste (< 10 ml volumes) and solid waste like infectious special waste

Disposal

The same as infectious waste or

- Liquid waste (> 10 ml volumes) like infectious waste and
- Liquid waste (< 10 ml volumes) and solid waste like infectious special waste.

Pathological waste of human origin (body parts, amputations, removed organs, fetuses) may not be disposed of as waste, but are incinerated in a crematorium. Such waste is not considered special waste for ethical reasons.

4.5 Animal carcasses

Scope

- Under the category of animal carcasses is waste that consists of dead animals or discernible animal parts.
- The procedure for disposal of animal carcasses is used in all rooms in which this waste is generated.

Collection

- The carcasses of genetically modified animals are collected in tear-resistant, tightly sealed bags or leak-proof containers in the rooms in which they are generated and then frozen.
- Animal carcasses infected with pathogenic microorganisms are autoclaved in leak-proof autoclavable containers with biohazard warning labels and neutral, opaque, autoclavable bags.
- Containers must be closed before leaving the room in which the waste was generated.

- For level 2 rooms: If exterior contamination of the containers cannot be excluded, the outside of the containers must be decontaminated prior to leaving the room and transporting them to autoclaving.

Inactivation

- The carcasses of frozen, genetically modified animals do not need to be additionally inactivated.
- Animal carcasses infected with pathogenic microorganisms must be autoclaved.
- When autoclaving animal carcasses with pathogenic microorganisms, it is important that the required temperature and pressure are reached inside the containers and maintained for a sufficiently long period of time. For prions a temperature of 134 ^{o}C is maintained for one hour.

Storage and disposal

- Each group determines when and by whom the containers with animal carcasses are frozen or transported to autoclaving and autoclaved, as the case may be.
- Animal carcasses infected with pathogenic microorganisms should, if possible, not be stored outside the room in which they were generated. If it is not possible to autoclave these carcasses immediately after transport to autoclaving, it must be ensured that they are stored under controlled level 2 conditions.
- Autoclaved animal carcasses must be frozen. Frozen animal carcasses are collected and disposed of centrally at special waste collection points according to the ETH waste management concept.

According to epizootic disease laws, dead animals or parts must be clearly labeled for disposal and transport, accompanied by a document with information regarding the origin and type of material as well as the place of destination and incinerated in an approved waste disposal plant (see Appendix I VTNP (Ordinance on disposal of animal by-products)). For disposal and transport as special waste, a consignment note (for small quantities a collective list) is created according to OMW and the Lists for Handling Waste (LVA) and supplemented with entries according to ADR or an additional transport document according to ADR.

Coding as special waste per VeVA

LVA Code*	Description of waste
18 02 98	Animal waste with risk of contamination (e.g. tissue waste, waste with blood, secretions and excretions, blood bags and blood reserves, contaminated carcasses of [laboratory]animals)

* LVA Code: waste code of the Ordinance of the Dept. of the Environment, Transport, Energy and Communication concerning Lists for the Movement of Wastes of 18 October 2005; SR 814.610.1

Classification as dangerous good per ADR / SDR

Class	Category	UN Number	PG*	Description
6.2	B	3291	II	Clinical waste, unspecified, n.o.s. (animal waste)

* PG = Packing Group

4.6 Mixed waste

Mixed waste is considered to be GMO waste, infectious waste or medical waste which also contains hazardous chemical substances or radioactive material.

Biological-chemical waste
For liquid waste, a risk assessment must be done in order to determine which disinfectants are suitable for inactivation of the biological material with hazardous chemical substances. The SSHE BSO must be consulted.
Biological-chemical waste is not to be autoclaved or only under specific safe conditions.
Following inactivation with disinfectants, the waste must be disposed of as chemical waste according to the substance class. In this regard, the requirements for disposal of chemical waste must be observed.

Biological-radioactive waste
For waste with isotopes having a short half-life (P, S), the waste must be stored in a C laboratory under controlled conditions until it has become safe for biological inactivation.
For waste with isotopes having a long half-life, a suitable chemical inactivation should be selected before it is disposed of as radioactive waste.

4.7 Sharps

Waste with the risk of injury (*sharps*) is disposed of as special waste and not in the regular garbage. If it has come into contact with infectious material, it is first inactivated.

Coding as special waste per VeVA:

LVA Code*	Description of waste
18 01 01	Waste with risk of injury (sharps)

* LVA Code: waste code of the Ordinance of the Dept. of the Environment, Transport, Energy and Communication concerning Lists for the Movement of Wastes of 18 October 2005; SR 814.610.1

Classification as dangerous good per ADR / SDR:

Class	Category	UN Number	PG*	Allowance per ADR - GGBV
6.2	B	3291	II	333 kg or liters

* PG = Packing group

4.8 Special waste

Waste is disposed of as special waste only when the disposal methods listed in the sections above are not feasible or not sufficient.

Scope
In addition to the provisions of the ESV (Swiss Ordinance on the Contained Use of Organisms) and the SAMV (Ordinance on Occupational Safety in Biotechnology), the corresponding waste disposal regulations must be complied with, in particular the provisions of the Ordinance on the Movement of Wastes (OMW).[1]

[1] Ordinance of 22 June 2005 on Movements of Wastes (OMW) of 22 June 2005, SR 814.610: http://www.admin.ch/ch/d/sr/c814_610.html

Accordingly, it must be kept in mind that when special waste is disposed of, it continues to be special waste, with certain exceptions, even after the respective pretreatment (autoclaving, chemical inactivation). (See implementation aid "Disposal of medical wastes"[2]).
Special waste is any type of waste that requires special treatment (infectious biological materials, hazardous chemical substances, radioactive substances, materials with risk of injury or material that is foul-smelling or otherwise nauseating).

Collection

Depending on the type of waste

Inactivation

Depending on the type of waste, see above.

Disposal

Packaging for waste:

For packaging and transport of biological waste, classification according to ADR Appendix A is decisive. Infectious substances and contaminated waste are designated UN Class 6.2 and must be transported in packaging approved for Class 6.2. Infectious substances with various UN numbers are assigned to Class 6.2, for which different packing regulations apply. These must be observed when waste from medical-microbiological diagnostics is disposed of without prior inactivation on site. Class 6.2 differentiates among the following infectious substances:

- Infectious substances affecting humans (UN 2814)
- Infectious substances affecting only animals (UN 2900)
- Medical waste (UN 3291): waste such as consumables used in diagnostics, but from which there is little risk of infection or contamination.
- Diagnostic samples (UN 3373): diagnostic samples and cultures which contain pathogenic or genetically modified organisms which can be specified according to type and origin.

Analog to standard procedures in hospitals, direct incineration (without prior inactivation) of the sample material is suitable for certain samples in duly authorized incineration plants or special waste incineration plants. This type of inactivation and disposal as special waste must, however, be correctly indicated on the notification form sent to Federal Coordination Center for Biotechnology. Transport must take place in UN-certified or suitable and tested single-use containers which comply with the following conditions:

- Plastic receptacle with removable lid
- Impervious and odor-proof
- Puncture-resistant
- Not transparent
- Reopening of sealed containers should be prevented, both during transport and disposal.

The transport must be validated and the waste classified as code *18 01 02* – waste with risk of contamination, supplemented with a detailed description of the waste.
This information as well as the UN numbers refer exclusively to waste classification in terms of correct packaging and are not to be confused with the above mentioned codes for special waste that are crucial for designating disposal as special waste and which must be applied correctly in every case. Diverse national and international firms offer UN-certified containers that can be used for collecting and disposing of waste. Special waste generated in-house may only be stored in the interim in suitable containers in a place accessible only to qualified staff or trained operating personnel. The waste containers may not be compressed or otherwise compacted. Waste should be removed regularly, e.g. weekly.

[2] Implementation aid for the disposal of medical wastes, FOEN 2004: http://www.umwelt-schweiz.ch/imperia/md/content/abfall/medabf_rl_d.pdf

It must be marked according to the Waste Index of the Ordinance of the Department of the Environment, Transport, Energy and Communication concerning the Lists for the Movement of Wastes[3] with Code *18 01 03* – Infectious waste, supplemented with an accurate description of the waste and disposed of in authorized waste incineration plants or special waste incineration plants.
Waste is still considered special waste after inactivation if there is the possibility of harmful or annoying effects (nausea, intense odors) due to its composition or improper handling. Such special waste must be marked with the appropriate waste code (see tables), supplemented by an accurate description of the waste and disposed of in an authorized waste incineration plant or special waste incineration plant.
Special waste is disposed of in a waste incineration plant or special waste incineration plant with the appropriate VeVa disposal license for the special waste (Art. 8 VeVA). Consignment papers are required for special waste transports starting from a quantity of 50 kg per waste code and shipment (Art. 6 VeVA). For small quantities under 50 kg, consignment papers are not required, nor is "Special Waste" labeling in the three national languages (Art. 7 VeVA). However, in such cases the plant which has created the waste must keep a record of the transfer on file for 5 years (Art. 6, Para. 2 a VeVA).

4.9 Disposal of extremely nauseating or foul-smelling waste

Extremely foul-smelling or nauseating waste (waste with blood, etc.) is disposed of as special waste according to VeVA.[4] Infectious waste is first inactivated.

Coding as special waste per VeVA[5]:

LVA Code*	Description of waste
18 01 02	Waste with risk of contamination (e.g. tissue waste, waste with blood, secretions and excretions, blood bags and blood reserves)

* LVA Code: waste code of the Ordinance of the Dept. of the Environment, Transport, Energy and Communication concerning Lists for the Movement of Wastes of 18 October 2005; SR 814.610.1

Classification as dangerous good per ADR / SDR:

Class	Category	UN Number	PG*	Allowance per ADR - GGBV
6.2	B	3291	II	333 kg or liters

* PG = Packing group

[3] Ordinance of the Department of the Environment, Transport, Energy and Communication concerning Lists for the Movement of Wastes of 18 October 2005; SR 814.610. 1 (contains waste index according to Art. 2 OMW): http://www.admin.ch/ch/d/sr/814_610_1/index.html

[4] See pages 6 and 7 of the SECB statement on Waste Disposal in Medical Microbiology Diagnostic Laboratories, 11 pages, updated version August 2006; Swiss Expert Committee for Biosafety, c/o Bundesamt für Umwelt, CH-3003 Bern; obtainable at: http://www.efbs.admin.ch/ → Documentation → Statements → Closed system or direct: http://www.efbs.admin.ch/uploads/media/d-empfehlung-abfallentsorgung-2006_01.pdf

[5] Ordinance on the Movement of Wastes of 22 June 2005 (OMW, SR 814.610) See also: http://www.bafu.admin.ch/ → Topics → Waste → Movement of wastes

5) Disposal plan for solid wastes

	Solid wastes	How	When / Periodicity
Description of waste and collection	Basics of solid waste separation	Glass is collected separately from plastic waste and from waste with risk of injury.	
	Contaminated consumables with risk of injury (*sharps*): e.g. needles, scalpels and hypodermic needles	Collection in puncture-resistant, opaque and tightly sealed, leak-proof plastic containers which cannot be reopened after sealing.	As required, but at the latest as long as the collection container can be closed safely.
	Cultures of microorganisms (e.g. agar plates, cell culture flasks made of plastic without culture medium)	Aggregated or separately collected in autoclavable bags in robust, leak-proof containers s with lid	As required or when bags are max. 2/3 full; no compacting!
	Contaminated consumables without risk of injury (pipette tips, plastic pipettes, Eppendorf tubes, plastic containers, disposable gloves)		
	Diagnostic samples (blood samples, secretions, excretions, tissue samples, etc. in plastic vials)		
Labeling		All waste containers or bags are marked with the biohazard warning label. Waste with risk of injury is marked as such (e.g. “Caution Sharp Objects”). Waste containers and bags are provided with a temperature-sensitive indicator prior to autoclaving.	
Storage	Interim storage in the laboratory	Open containers and small bags (up to max. 2 liters) may be temporarily stored in the biosafety cabinet for brief periods of time, but must be disposed of at least 1x a week in the larger biosafety bags. Full, sealed biohazard plastic bags are stored intermediately in a container.	Weekly
Transport	Transport to place of treatment	Containers are brought to autoclaving by the most direct route and the material is inactivated **immediately** and without further interim storage.	Weekly
Inactivation	Loading the autoclave	The autoclave is loaded and operated by trained personnel.	
	Inactivation check	Autoclave records are collected and archived.	
	Autoclave maintenace	The autoclave is serviced according to the	min. 1x a year

	Solid wastes	How	When / Periodicity
		maintenance plan.	

Solid wastes		How	When / Periodicity
Disposal	Disposal of autoclaved waste	Glass waste which is unproblematic and similar to municipal waste (e.g. broken test tubes) are disposed of in suitable packaging and with the necessary safety precautions to avoid cuts in the regular garbage. Waste with risk of injury (*sharps*) is disposed of as special waste (see Chapter 2.1). Waste without risk of injury is disposed of with the regular garbage. Inactivated waste is only disposed of in the regular garbage if the **warning label "Biohazard" is no longer visible**. For this purpose, it is covered with a neutral bag.	

6) Disposal plan for liquid wastes

	Liquid waste (culture supernatants)	How	When / Periodicity
Description/ Collection	Basics of waste separation	Cell culture media and perfusion solutions are collected separately.	
	Type of container	For culture media, suction bottles (e.g. 2 liters) are used; perfusion solutions are collected in plastic canisters (e.g. 10 liters). Media supernatants are collected after centrifuging (e.g. in 1 liter bottles).	
Labeling	Labeling	Bottles with culture media are provided with a temperature-sensitive indicator prior to inactivation.	
Storage	Interim storage in the laboratory	Cell culture media and perfusion solutions are stored safely in the laboratory until final disposal.	
Inactivation	Chemical inactivating on site (in the laboratory)	Cell culture waste is inactivated on site with a suitable disinfectant (in the suction bottle).	
Transport	Transport to place of treatment	Waste is brought to autoclaving by the most direct route and the material is inactivated **immediately** and without further interim storage.	
Inactivation	Loading the autoclave	The autoclave is loaded and operated by trained personnel (select special program for liquids).	
	Inactivation check	Autoclave records are collected and archived.	
	Autoclave maintenance	The autoclave is serviced according to the maintenance plan.	min. 1x year

Disposal	Disposal of inactivated waste	Inactivated liquid waste is disposed of via the building sewer system in compliance with water protection regulations.	Weekly

Annex 9:

Transport and Shipping of Microorganisms and GMO

1) General

- The special regulations governing the transport and shipping of pathogenic and genetically modified organisms must be complied with. There are no special regulations for Group 1 wild type organisms.
- The transport regulations differ depending on the hazardousness of the organisms as well as the type of transport (internal, external, shipping).
- The regulations for external transport are based on the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR); the regulations for transport by airplane are found in the IATA Dangerous Goods Regulations (IATA-DGR).

2) Hazard labels according to ADR

Class	Symbol
Class 2.2 (gases)	
Class 6.2 (infectious substances)	
Class 9 (miscellaneous dangerous substances and articles)	

3) Transport of microorganisms and GMO on public roads according to ADR

	Organisms	ADR Classification	Packaging	Documents / Papers	Vehicle	Driver
(1)	BSL1	Not a hazardous good	Packaging per P650 recommended	None required; ask DGSA about marking!	no regulations	no special training
(2)	BSL 2 (no cultures)	Class 6.2, Cat.B UN 3373	Packaging per P650 mandatory	None required; ask DGSA about marking!	no regulations	no special training
(3)	BSL 2 as culture[a]	Class 6.2, Cat.A UN 2814 or UN 2900	Packaging per P620 mandatory (triple, officially approved for Class 6.2 with code on packaging)	ADR transport documents with names and phone numbers of responsible persons	Equipped per ADR (fire extinguisher,… and special equipment), 2 orange-colored warning signs	ADR special training for transport of hazardous goods
(4)	GMO, BSL 1[b]	Class 9 UN 3245	Packaging per P904; hazard label 9	None required; ask DGSA about marking!	No regulations	no special training
(5)	GMO seed[c]	Class 9 UN 3245[b]	see (2)	see (2)	see (2)	see (2)
(6)	GMO, BSL2, no culture	see (2)	see (2)	see (2)	see (2)	see (2)
(7)	GMO, BSL2, as culture[a]	see (3)	see (3)	see (3)	see (3)	see (3)
(8)	Clinical waste up to 333 kg[d]	Class 6.2 UN 3291	Packaging per P621 mandatory; marked with UN 3291 and hazard label 6.2[e]	Simple documentation with contents, address of shipper and consignee	Free choice of vehicles, fire extinguisher mandatory	no special training

[a] only applies if the cultures can cause a permanent disability or life-threatening/fatal disease in otherwise healthy people or animals. If this is not the case, they can be transported as UN3373. Patient specimens are not considered cultures.

[b] only applies if GMO are capable of altering other organisms in such a way that is not normally considered the result of natural reproduction.

[c] for cultivation of approved GMO seed → not a hazardous good.

[d] inactivated clinical waste is not a hazardous good → no ADR regulations.

[e] Patient specimens with minimal likelihood of containing pathogens are not subject to ADR regulations. Packaging must comply in points 2, 3 and 5 with P650 instructions; marked as "exempt human specimen" or "exempt animal specimen".

The ETH Zurich Dangerous Goods Safety Advisor (DGSA) must be consulted each time a first shipment or transport of BSL2 organisms is made. Subsequent transports may then be carried out autonomously, as agreed with the Dangerous Goods Safety Advisor.

4) External transport of animals

The transport of animals is not regulated under ADR and therefore requires no special labeling. Transport measures must be determined on a case-by-case basis; an equivalent safety standard must be realized as if the pathogenic organisms were transported separately.
Authorization from the Cantonal Veterinary Office and the Office of Biosafety is required for the transport of infected animals.

The following points must be observed:

- Use escape-proof cages or containers. If there is a risk of airborne spreading of the pathogen, special measures are necessary (e.g. airtight containers with adequate air supply).
- Animal protection regulations must be complied with.
- No bedding or litter may be lost.
- Cages or containers must be clearly marked (number and type of animals, pathogens).
- The number of animals must be checked before and after the transport.

5) External transport of plants

The transport of plants is not regulated under ADR and therefore requires no special labeling. Transport measures must be determined on a case-by-case basis; an equivalent safety standard must be realized as if the pathogenic organisms were transported separately.

The following points must be observed:

- Environmentally hazardous plants (exotic plants, for example) and plants infected with pathogens must be transported in airtight, sealed containers.
- Exception: Pathogene-free GMO plants may be transported openly if they do not bear blossoms or fruit.
- The plant protection ordinance must be complied with.

6) Shipping within Switzerland and to Europe

In principle, the same packaging regulations apply as in Chapters 3 – 5. Depending on the destination, the following documents may be additionally required:

- Customs declaration
- Customs tariff number
- Pro-forma invoice
- IATA dangerous good declaration (Shipper's Declaration) for air transport; not required for UN 3373.
- ADR transport documents for road transport

The Shipper's Declaration may only be signed by persons with the appropriate training; if necessary, this can be delegated to an external firm with the required certification. If a Shipper's Declaration is required, contact the Dangerous Goods Safety Advisor (DGSA) of ETH Zurich. Responsibility for the transported material lies with the sender!

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Status: 16.12. 2016