Procedure for safe handling of genetically modified organisms

Introduction

Under occupational health and safety and environmental regulations, procedures, and work instructions must be compiled and adhered to in order to minimize the risk of contamination of employees and/or the environment with GMOs. The procedures and work instructions relating to hygiene and safety at work are based on the principles of safe microbiological techniques.
The procedures and instructions are dependent upon the category of physical containment (CFI) under which the GMO work has been categorized by the Ministry of IenW. A category of physical containment (CFI) is a certain type of workspace where activities involving GMOs can be carried out safely. The CFI (e.g. ML-I, D-I, PCM-I) is determined by the type of workspace and the containment level (I, II, III, or IV). Design and work instructions have been established for each CFI, which can be found in Appendix 9 to the GMO Regulation.

This work instruction is structured around eight aspects:

1. Preparatory work
2. Access to GMO laboratories
3. Design requirements for contained areas
4. Work in laboratories
5. Cleaning and disinfection
6. Faults and maintenance
7. Storage and internal transport
8. Incidents, accidents, and emergencies

1. Preparatory work

- Before work with GMOs can commence, a permit/notification must be applied for and obtained (see procedure Requesting a notification/permit).
- A VM is responsible for a permit and is appointed by the dean of the FHML faculty or the head of department (MUMC+) on the recommendation of the BSO. An OL is responsible for (part of) the work specified in a notification; the OL is appointed by the BSO. See the procedure Appointing the BSO/ESO, VM/OL, and ABV.
- The BSO informs the VM/OL of his or her tasks and responsibilities.
- Employees who carry out GMO work must be registered with the BSO by the VM/OL by completing the form Approval as GMO worker and sending it to the BSO. The BSO will then verify that these employees are sufficiently trained. See the procedure Approval of GMO workers to various containment levels for the criteria applied when assessing the level of training.
- The VM/OL registers the room numbers in which GMO work will be carried out with the Biosafety Unit. If the workspace in question has not previously been used for GMO work, it must first be approved by the BSO. The design requirements for contained rooms are outlined in paragraph 3 of this procedure.

2. Access to GMO laboratories

- Only employees with authorization from the BSO and who have received instruction from the VM/OL/ABV/room manager are permitted to access GMO labs. In GMO labs it is also permitted to perform Non GMO work. Employees not working with GMOs must also be registered and must adhere to the applicable containment instructions. These are outlined in the work instruction Non-GMO work in a contained area.
- Students, interns, and visiting employees must work under the strict supervision of an authorized employee. Specific requirements apply for the approval of students and interns to level 2 GMO laboratories. These are described in the procedure Approval of students to level 2 laboratories.

3. Design requirements for GMO laboratories

The design requirements for the various categories of physical containment (GMO laboratories) are outlined in Appendix 9 to the GMO Decree and Regulation (Appendix 9 RGGO2013). The CFIs are checked during annual GMO audits to ensure compliance with these statutory design requirements. Before the CFI is commissioned or after the renovation of a CFI, a check to ensure compliance with the statutory design requirements must be carried out by the BSO before work can commence.

4. Work in laboratories

The work instructions for the various laboratories are outlined in the work instruction ML-I containment level, work instruction ML-II containment level, and the work instruction Working with genetically modified animals in animal laboratories.

5. Cleaning and disinfection

- The surfaces of workbenches must be cleaned with a suitable disinfectant, depending on the microorganism, at the end of every experiment and every day at a minimum.
- Following a spillage, the contaminated workplaces must be disinfected with a suitable disinfectant immediately. Consult the work instruction Disinfection of laboratories for further information.
- The workspace must be cleaned weekly.

6. Faults and maintenance

- Faults and defects on the equipment present in the laboratory must be brought to the attention of the respective maintenance department promptly. Before maintenance can be carried out on the equipment (either in the laboratory or the maintenance department itself), the equipment must be disinfected and released. The form Release equipment must be completed and handed over for this purpose. Pay attention, there is a separate form to release the BSCs (form Release Biosafety Cabinet (BSC)).
  During maintenance work, no (GMO) work may be carried out in the vicinity of the service engineer. This is to ensure that the service engineer can work safely.
- When maintenance/repair work needs to be carried out on the contained laboratories, the laboratory must be released. For this purpose the form Release contained laboratories for the purpose of repair work must be completed and handed over.

7. Storage outside of GMO laboratories, internal transport, and waste

- Report the storage locations outside of GMO laboratories to the BSO, who will record them in the central administration for GMOs.
- Complete information relating to the GMO must be stored in a database for GMOs. This information must always comprise the following:
  - GMO permit/notification number
  - Host (bacteria strain, cell line)
  - Vector
  - Insert
  - Origin insert (species)
- All GMOs must be stored double-contained.
- Non-GMOs stored in the same storage location must be packaged separately from GMOs.
- The outermost container (may also be the refrigerator or freezer) must be labelled with ‘GMO’. From ML-II, a biohazard symbol must also be displayed on the outermost container.
- Containers containing GMOs must be disinfected on the outside before being transported.
- All GMOs must be transported double-contained.
- If GMOs with ML-II categorization are transported, the outermost container must also be labelled with the biohazard symbol.
- For vacuum extraction, there must be a chlorine solution (1 tablet in a little water) in the collection bottle. To neutralise chlorine vapour a non-return container, containing a 0.1M NaOH solution, must be placed in between the pump and collection bottle. When the collection bottle is full, another chlorine tablet must be added to the liquid. Once the tablet has dissolved, the solution needs to be mixed well,

whereupon the liquid must be left for a minimal 30 minutes (overnight is better). The liquid can then be discarded down the sink (cover the collection bottle with a glove or similar when the chlorine tablet has been added, as this limits chlorine vapor).

- If waste is autoclaved in the department, each sterilization cycle in the autoclave must be verified by recording the pressure and temperature. The results must be documented in writing. The autoclave must undergo a technical inspection once a year. In addition, the effectiveness of the autoclave process must be checked at regular intervals, and at least once a year, using a bioindicator placed at the centre of the product being sterilized, such as an ampule of *Bacillus stearothermophilus* spores (Sterikon bio indicator, Merck, Darmstadt). Once the sterilization process is complete, the ampule must be incubated at the correct temperature and the result evaluated.

8. Incidents, accidents, and emergencies

- Experiments involving particular risks must be reported to the BSO in advance.
- The general emergency plan will enter into effect in the event of situations that the employee and colleagues are unable to manage (call 1333 within the UM and 1000 in the MUMC+/mobile +31(0) 433875566). The VM/OL for the project in question or the ABV for the department may be called, if necessary. A BSO must always be called and consulted. All telephone numbers can be found on the label on the door.
- If there are risks to the environment, the emergency must be reported to the following by and after consulting the BSO:
    - Human Environment and Transport Inspectorate (ILenT)
    - Maastricht local authority, via the UM or MUMC+ environmental consultant
- Following an emergency, the workspace may only be entered once it has been inspected and released by the BSO.
- A report must be compiled after all incidents and accidents. This is done by completing the form Registration GMO incident and sending it to the BSO. A copy of the report must also be retained in the logbook for the laboratory.

9. Other remarks

- The BSO should be consulted in all cases where the aforementioned instructions offer no information.
- As nothing is known about the consequences of an emergency in a GMO laboratory, extra care is given to avoiding emergencies.
  To this end, the following instructions apply:
    - Closed doors for complete fire compartmentalization
    - Floors have no drainage holes that drain directly into the sewer system

Abbreviations

ABV	Departmental Expert for Biosafety
BSO	Biosafety Officer
CFI	Category of physical containment
CPV	Central Laboratory Animal Facility
D-I	Animal enclosure class I
GMO	Genetically Modified Organism
IenW	Ministry of Infrastructure and Water Management; executive body: GMO Office
ILenT	Human Environment and Transport Inspectorate
ML-I/ML-II	Microbiological Laboratory Class I/II
MUMC+	Maastricht University Medical Centre+
OL	Research leader
PC-1/PCM-I	Plant cell class I
VM	Responsible Investigator

References

- Occupational health and safety information sheet no. 18, laboratories. SDU publishers, The Hague, 5th edition, 2010.
- Decree and Regulation on Genetically Modified Organisms, Environmental Management 2013, IenW April 2014.
- Website HSB Maastricht

Further information

For further information, please contact the BSO.