

## **Occupational health and safety program – Animal facility UiB**

### **Allergy to Laboratory animals**

Allergy to Laboratory animals, especially rodents and rabbits, is a severe problem that needs attention. The source of allergens is found in urine, saliva and epithelial cells from the animals. You therefore also find large concentrations of allergens in the bedding of the animal cages, and especially old male animals excrete large concentrations of these allergens.

Allergy can also be a problem if you are working with farm animals. The most common problem is however not the animals themselves. Grass allergy is very common when you are exposed to grass or hay that are fed to the animals or used as bedding.

Allergy to different chemicals is also a risk. We use many chemicals for cleaning and disinfection in the animal facility. In aquatic facilities, you are also exposed to many other chemicals. Some of these, like formalin, are known to cause allergy.

The Lab Animal Facility at the University of Bergen works continuously to replace chemicals with alternatives, which represent minimal risks of causing health problems. Sometimes researchers want to use certain chemicals for a particular project. It is important that you pay attention on how to handle these in a safe manner.

In the rest of this chapter, we will focus on allergy to fur bearing laboratory animals.

### **Allergy to fur bearing animals**

Allergy to fur bearing animals is a severe problem in animal research. Symptoms of allergy can be sneezing, watery eyes or rashes. In more severe cases, this can develop to coughing, wheezing, short breath and asthma.

Earlier studies have shown that 40% of all new employees will develop IgE antibodies to rodents unless preventive initiatives and personal protective equipment are applied. It has also been demonstrated that persons working with animals can bring allergens with them out of the animal facility. In this way there is a risk that sensitive persons becomes allergic to laboratory animals without themselves being in direct contact with the animals.

In 2012, the Lab Animal Facility, in cooperation with the occupational health unit at the University of Bergen, tested allergen concentrations at different places in the Lab Animal Facility.

We found, as expected, large concentrations in the dirty cage cleaning area. We also found large concentrations in situations when working directly with the animals, such as when changing cages and preparing for surgery.

Fortunately, we could not find allergens in areas like personnel rooms, in corridors etc. This is good because it tells us that our preventive initiatives work as they are expected to. However, it is important that everyone who works in the Lab Animal Facility complies with our procedures to avoid the spread of allergens.

In the following part, we will focus on these procedures and how you are expected to behave in the Lab Animal Facility.

### **Protection against allergy to fur bearing rodents**

When you visit the Lab Animal Facility, you are exposed to allergens from the animals.

**It is of high importance that you use personal protective equipment provided properly.**

When you are working with rodents, you need to change from your private clothes and into the uniform you can find in the wardrobes; blue or white trousers, blue or white t-shirt and shoe covers. This is important to protect yourself as well as others. Preferably, bring comfortable and clean shoes for use in the Lab Animal Facility only.



When you work in direct contact with animals in the animal room or in the laboratories, you shall also wear a protective gown, hair cover, gloves and a facemask with dust filter (P2 category).



Lifetime of the dust mask depend on consecration of allergens in the working environment but never more than one working day. For high allergen concentration areas, like emptying dirty cages, dust mask should be replaced after the end of the operation and never be used for more than one working day. Always record how much time each mask has been used and never use a mask for more than 7 hours.

Make sure the mask covers well over the nose back (use the metal in the mask and adjust)

- Place the mask well under the chin
- If there are adjustable straps, pull so that the mask is comfortable
- If the person is bearded, it may cause the mask to be bad / does not cover properly
- Dust masks or other masks to be used several times must be stored in a sealed bag outside the area where exposure is
- Replaceable filters should be stored in a closed container in an area without exposure.

A fit test should be performed for all employees to be sure that everyone use a mask that fits the shape of their face.

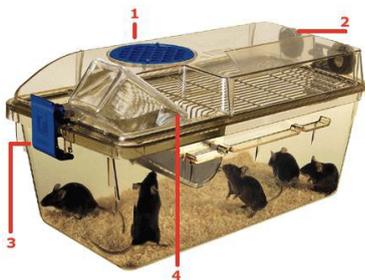
Follow the instructions provided by the producer.

You can find the personal protection equipment in the rooms. Change gloves frequently and never take the coat or the gloves out of the animal room as they belong to the barrier.

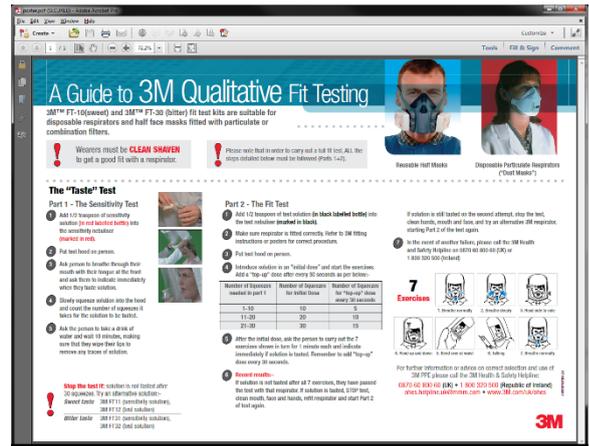
Beside the personal protective equipment, the Lab Animal Facility is equipped with other means to prevent exposure to allergens and spread of infections.

IVC are closed cages that are connected to a closed ventilation circuit. All air in and out of such a cage is filtered through a HEPA- filter so that no allergens will escape into the room.

*IVC cage with a closed lid*



The IVC cage is only protecting you as long as the animals are within the cage and the lid is closed. When you are going to handle the animals and open the cage, you must do this in a ventilated bench such as a cage changing station or a laminar airflow cabin.



After working in the Lab Animal Facility, you are recommended to take a shower before you put on your private clothes. As an alternative to a water shower, there is also available an air shower. An air shower is equipped with fans that blow away most allergens within 90 seconds. This is much faster of course than taking a water shower. Studies have shown that there is a larger compliance among people to include this step when air showers are installed.



Where air showers are installed, as a consideration to your colleagues and your own health, we encourage you to use the air shower after you have worked with animals or dirty cages, before you enter offices, lunchrooms or any other area we want to keep free of allergens.

One study showed that allergens could be found in the home of persons who work in a Lab Animal Facility! This underlines the importance of complying with the rules and use of protective equipment.

Despite all preventive action, some students or researchers become allergic. In such cases, we recommend you to consult your family doctor or the occupational health service.

If you have to continue to work with animals, you must comply very strictly with the rules of personal protective equipment, with special focus on protecting your airways, skin and eyes. Use of a fresh air mask can also be considered. Always include a shower after work in the Lab Animal Facility.

In case you become allergic, consider an alternative research career that do not involve the use of animals.

### **Monitoring allergy development**

Because allergy to laboratory animals is such a common and severe problem, the University of Bergen has a special health-monitoring program for all students and employees who work with animals

more than 1 hour per week or 40 hours per year.

This service is organized by the occupational health service and it includes a consultation with the university's nurse and medical doctor. They perform lung function testing and take blood samples to test for allergy.

**You must have the first consultation before you start working with animals, and then have follow-up consultations after 6 months, 1 year and 2 years.**

If they are at risk, most people will develop allergy within the first 2 years. However, if you do not develop allergy within 2 years, this does not mean that you never will, so it is important that you continue to comply strictly with the rules of using protective equipment that are made to protect yourself as well as others.

The program at the occupation health service at the University of Bergen also includes vaccination against Tetanus. Other vaccination can be relevant for certain projects, like vaccination against Hepatitis or Tuberculosis. Contact your occupational health service.

For more information:

<https://www.uib.no/en/hr/77102/hse-section#>

We have summarized most of this information in a document. You will receive this folder when you ask for access to the Lab Animal Facility. You can also get this folder by request to the Lab Animal Facility.

If you want to read more about allergy, we have posted links to some publications at

<https://www.uib.no/en/rg/animalfacility/65236/allergy-laboratory-animals>

## Protection of contamination between species is important.

If you are going to work with large animals at Vivarium's ground floor, use green scrubs (trousers, t-shirt) and separate shoes for use at this floor only.



If you are only in the large animal surgery room for a short visit without contact with the animals, you shall wear a green protective coat over your own clothes, and shoe covers.



## Gas anesthesia

Gas anesthetics are volatile agents that are used to anesthetize animals. It must not affect the operator of the equipment!

Exposure to anesthesia gas raises some health and safety concerns. Some anesthesia gases cause reproduction problems, and are a special concern for young people in reproductive age, especially during early pregnancy. Exposure to gas anesthesia cause tiredness and headache. Work with gas anesthesia therefore needs careful attention to equipment and how to operate it correctly.

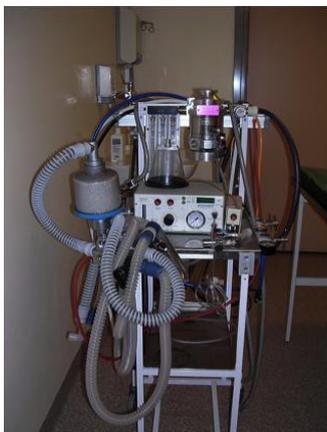
Exposure to anesthesia gas can occur when there are failure on anesthetic equipment causing leakage through tubes and connections.

Exposure can also be caused by user mistakes. User mistakes can happen due to lack of knowledge about anesthetic equipment and when ignoring routine maintenance.

When you plan to use gas anesthesia, also pay attention to the ventilation. It is important to check that the ventilation have been regularly checked and functionally tested so they work properly.

Sometimes you see very complicated setups of anesthesia machines like in fig 3.

### *Complicated setups*



In such cases, it can be difficult to search for leakage along the tubes. All places where there are

connections, like where the tube enters the cage, are special risk areas for leakage. Such connections should be extra carefully checked. When you are using an anesthesia mask there is always a risk that the cone is not 100% tight around the nose so this is another place where there is risk of leakage.

#### *Anesthesia mask*



As a standard routine, **you should always search for leakage before you use an anesthesia setup.**

Beside visual inspection, you can test the equipment for leakage by use of a “sniffer”. Our “sniffers” are sensitive to halogenated hydrocarbon, like isoflurane and sevoflurane. It is important that you test the system with anesthesia circulating in the anesthesia circuit. If not you can get a false negative result and start to use equipment that is out of order! Ask the staff at the Lab Animal Facility to show you how to use the sniffer.

#### *Leakegetest by use of a sniffer*



### Test of Anesthesia work stations

Because there are many concerns about exposure to gas anesthesia, we have done testing of leakage in cooperation with the occupational health service at UiB. We made measurement of anesthesia gas environment by use of a special sniffer. The measurements were made on "nosetip" level as we thought this gave a good representation of a typical work situation.

A typical workstation for work with anesthesia gas for rodents consists of a chamber, an anesthesia mask and an under-ventilated table. When you operate this correctly, you always keep distance to the anesthesia gas source. Remember also to use gloves, head cover and dust mask (with P2 filter) to protect yourself against allergens from the animal.

If you are doing surgery or other procedures where you need a good view, use magnifying glass with a light source to get a good sight and still keep distance. Pay attention to the point ventilation close to the anesthesia gas source (chamber or mask).

In fig 6 to the right, you see the work position you should avoid. You will be in risk of exposure to anesthesia gas and you will get a pain in your back, neck and shoulders after a while.

*Safe work position (left) and wrong work position (right)*



It is important to keep the work place in order so the protective equipment can work properly. Avoid covering the ventilated bench. Covering the bench significantly reduces the effect of the ventilation,

increase the concentration of anesthesia gas and the risk of exposure. On the figure below, you see a ventilated bench covered with different stuff. This reduces the effect of the ventilation and increases the concentration of anesthesia gas in the room.

*Properly organized work bench (left) and crowded work bench covering the ventilation (right)*



We tested the effect of covering the bench. When a heating mat covered the ventilated bench, anesthesia gas concentration doubled from 0,2 ppm to 0,4 ppm. Wrapping the animal in isolating material can maintain the animal's body temperature in anesthesia without interfering with the ventilation.

Some workstations are equipped with an under-ventilated table with integrated hot water. Then the use of a heating mat is unnecessary. In addition, the ventilated table is made in a material that is easy to clean so covering the table with absorbing paper should not be necessary. If a point-ventilation is also available, keep it close to the anesthesia gas source.

Some places you can still find flowmeters that are made for large animals. These flow meters can deliver up to 15 liter per minute of fresh gas. This is not a problem as long as you know how to operate it correctly. When fresh gas flow is increased from 1 liter per minute to 12 liter per minute, the anesthesia gas concentration in the room increased from 0,2 ppm (which is below the critical threshold) to 40-50 ppm, which is far beyond the critical threshold.

For an anesthesia machine for rodents a flow meter delivering 1 liter/min is enough, and this is why we recommend this when purchasing new anesthesia machines to reduce the risk of user mistakes.

To avoid leakage caused by failure of equipment all anesthesia machines belonging to the University of Bergen are regularly checked. All machines shall have a unique ID and a maintenance log or journal. Here you can check when the machine was maintained or checked last. You can also find information about ownership and responsibility for the anesthesia machine. This includes information on who to report failure and problems too.

The plan for maintenance and checking equipment is as following:

- Leakage tests every time before start, the single user is responsible for the test.
- Tubes and connections must be regularly checked and defect items must be replaced
- Simple setups make it easier to check the equipment so avoid too many unnecessary connections.
- Service and maintenance log must be continuously updated, and it is your responsibility to only use equipment where all services has been followed up
- The vaporizer has to be regularly checked and calibrated. The vaporizer must be sent to the producer for service.
- Ventilated benches and hoods must also be regularly tested.

Gas anesthesia is among the alternatives closest to the ideal anesthetic. However, there are some occasions where gas anesthesia cannot be used, mainly due to health-environment-safety issues.

**Gas anesthesia should only be used when local ventilation is adequate. At the University of Bergen, the policy is that pregnant women should not work with gas anesthesia. N<sub>2</sub>O (Laughter gas) has proved adverse effects on reproduction.**

This is not as clearly documented for halogenated hydrocarbon like isoflurane. However, exposure, anesthesia gas causes tiredness and unconsciousness, an unfortunate situation for both pregnant and not pregnant staff. For all people we therefore recommend the following:

- Organize the workday so you can take a short break every hour.
- Do some stretching.
- Rise from your chair and leave the room.
- Get some fresh air and daylight.
- Drink a small glass of water every hour.
- Make sure you get a proper lunch break during the day.
- Do not work alone, or have someone checking in on you regularly.

Other means to reduce exposure to anesthesia gas are:

- Use injectable agents as alternatives to gas anesthesia.
- Rotation work reduces exposure for the single fellow worker.
- Training in use of gas anesthesia equipment and keep the competence in the research group when new students.
- Regular maintenance of equipment. Improve room ventilation and local ventilation.

### **Responsibility**

The University of Bergen has made instructions for work with gas and these include responsibility and duties.

- Institute/department management is responsible for implementation of procedures and is responsible for work safety of their staff.
- Owners of equipment are responsible for maintenance of equipment (service manual), have user manual available for users and training of personnel.
- You as a user are responsible for checking equipment before use and never to use equipment that are out of order. You are also responsible for reporting failure or problems to the responsible person.

## Risk evaluation

Before approval, all experiments must be risk evaluated. This is a requirement of the Norwegian Labor Safety Authority.

A risk evaluation includes both an evaluation of consequences of an event as well as of the probability of an event.

The overall risk is a product of consequences and probability. Colors codes can be used to indicate the severity of an event, where red commonly are the most severe and green commonly are the least severe. Then there can be different shades in between. Individual projects may need to create their own risk matrix.

### Some examples

Allergy to laboratory animals can cause allergic reactions and in severe cases severe asthma. In worst cases, this can cause chronic work related disease and sick leave. This corresponds to a degree 3 in our scale.

#### Example of risk evaluation

Unwanted event	Causes	Possible consequences	Cons.	Prob.	Risk	Risk reducing means
Allergy to fur bearing animals	Work related exposure Ignorance in use of Personal protective equipment Spread of allergens by clothes, persons or equipment's	Allergy Asthma	3	3	9	Information education Use and availability of PPE
Exposure to gas anesthesia	Leakage User failure	Dizziness, tired Fainting	2	3	6	Regular maintenance of equipment Education of user of equipment

Probability

1. < 1 per year
2. 1-2 per year
3. 3-6 year
4. > 6 per year

Consequence

1. Temporary discomfort
2. Sick leave
3. Chronic disease/ work related disease
4. Chronic, severe disease/Death

The occupational health service reports 3-6 new allergic persons every year, which give a three also for probability. The overall risk is three multiplied by 3, which give nine. This is not the most severe outcome; however, it is still so severe that preventive actions must be used actively.

Exposure to gas anesthesia can cause tiredness and headache and this can lead to sick leave, which give a grade 2. Despite all actions to maintain, equipment and train people we believe that people are exposed maybe 3-6 times per year, which give a grade 3. The total risk is six.

By this way of systematically evaluating different risks, we are able to identify severe outcomes and activities that need extra preventive means or maybe that activity should be avoided or replaced by an alternative method.

You find more information on Risk assessment on

<https://www.uib.no/en/rg/animalfacility/66356/risk-assessment>

### **Registration of chemicals and drugs**

All chemicals that you use in research must be registered in a common register, where you also have access to safety data sheets. At the University of Bergen, the system we use is called ECO online. (<http://www.ecoonline.no/> )

More information about chemicals on

<https://www.uib.no/en/hms-portalen/74051/chemicals>

In all research groups, there shall be responsible persons for chemicals who can help you with the registration as well as finding important information related to health and safety.

Drugs and substances for use in animals in research that are not chemicals registered in ECO online must be registered in the medical register. This document must be provided as an attachment together with the ethical application.

Drugs must be locked in when they are not in use. Drugs must be used before expire date. The opening date must be written on the container. Outdated drugs or drugs stored in wrong places will be removed.

## Needles and sharp objects

Needles and sharp objects must be handled carefully. The needle cap protects you from piercing yourself. Be careful when you put the needle cap on the needle.

Using the technique in the figure below there is minimal risk of self-injury. By lifting the needle cap by one hand as illustrated to the right there is a risk of self-injury.



Remember to put all sharp objects in the special yellow boxes when finished. If you cannot find a box, please ask the staff for one.



## Work with Gene Modified Organisms

Work with Gene Modified Organisms is regulated by the Gene technology act, the law on production and use of gene modified organisms.

The most relevant regulations for animal experiments are:

- The regulation on gene modified animals and
- The regulation of enclosed use of gene modified microorganisms.

Gene modified organisms are defined as microorganisms, plants or animals where the genetic composition is changed by use of gene- or cell technology. This also applies for plasmid-transferred

bacteria for propagation of DNA, or DNA-transfer from bacteria to for example plant cells.

A microorganism is defined as every cellular or non-cellular microbiologic unit that is capable of multiplying or transferring genetic material.

Enclosed use includes activities using GMO in an enclosed system where physical enclosures are used to limit the organisms' contact with humans and the environment.

Activities with enclosed use of GMO is only allowed in facilities approved by The Norwegian Directorate of Health (Helsedirektoratet).

Activities with enclosed use of GMO must be reported to or applied for approval from the Norwegian Directorate of Health (Helsedirektoratet).

Use of GMO outside approved enclosed facilities must be approved by The Norwegian Directorate for Nature Management (Miljødirektoratet).

All activities with enclosed use of GMO must comply with the regulations on Systematic Health, Environmental and safety activities in enterprises.

<https://www.helsedirektoratet.no/tema/genteknologi>

### **Project startup meeting**

When the authority approves a project, the Lab Animal Facility requires a project startup meeting with the research group. The Lab Animal Facility wants to ensure that the research groups get the best possible cooperation with the Lab Animal Facility from the start.

Our aim is to ensure that quality of animal welfare is implemented from the beginning, that the safety of the personnel involved is taken care of and, finally, the quality of the research results.

## Reporting accidents, incidents and other divergent events (“Avviksskjema”)

UiB has an electronic reporting system for accidents and incidents.

HSE non-conformities are all adverse events and/or matters that have resulted or may result in harm to people, the environment and property, such as:

- fires and explosions
- break-in, theft, robbery and unauthorized access to buildings and areas
- damage to property and structural conditions in buildings
- personal injuries
- harmful emissions to the environment
- incorrect handling of chemicals, gas, biological agents and sources of radiation
- third party violence and threats (students reports in the Speak-up system (Si fra))
- Breaches of the health and safety legislation, guidelines and routines.

Log in with your username and password on <https://avvik.app.uib.no/apex/f?p=692:1:9154648965103::NO::>

Notification of accidents, incidents and other divergent events is a tool for systematic improvement in the Lab Animal Facility.

Notification concerning

- Animal welfare
- Equipment
- Noncompliance with the Animal facility’s routines and procedures

Must be reported on this link

<https://www.uib.no/en/rg/animalfacility/89293/reporting-unwanted-incidents#incidents-and-animal-welfare-concerns-for-animals-nbsp->

## **Radiation**

Biological molecules can be marked and tracked by use of radiating agent. Work with ionizing radiation is strictly regulated and such activities demands special facilities and approval by the authorities.

<https://www.uib.no/en/hms-portalen/74149/radiation-and-radiation-protection>

## **Biological health hazards**

<https://www.arbeidstilsynet.no/tema/biologiske-faktorer/>

## **Other links**

More shortcuts at the UiB HSE-gateway

<https://www.uib.no/en/hms-portalen/74307/shortcuts>