WAGENINGEN UR
For quality of life

Safety instructions for students

Facilitair Bedrijf

DATUM
17 december 2012

AUTEUR
Veiligheid en Milieu

STATUS
concept

Inhoudsopgave

1	Safety and health for students	5
1.1	General	5
1.2	Basic rules	6
1.3	Fire and accidents during practicals	7
2	Working in a laboratory	9
2.1	Handling chemicals	11
2.2	Working in fume cupboards	13
3	Working in a special laboratory	15
3.1	Biological safety	15
3.2	Working with biological agents	17
3.3	Working with genetically modified organisms	18
3.4	Working with laboratory animals	20
3.4.1	Transfer of disease by laboratory animals	21
3.4.2	Accidants with laboratory animals	22
3.5	Allergies	23
3.6	Working with (human) blood	23
4	Working with special materials or equipment	25
4.1	Radiation	25
4.1.1	Non-ionising radiation	25
4.1.2	Ionising/radioactive rays	26
4.2	Working with gases	28
4.3	Working with lasers	30
4.4	Working with centrifuges	31
4.5	Working with microwave ovens	31
4.6	Working with pesticides	32
5	Fieldwork, excursions and practicals	34
5.1	Allergens	34
5.2	Brown tail moth	34
5.3	Bee stings and wasp stings	35
5.4	Oak processing caterpillar	36
5.5	Exotoxins and Endotoxins	37
5.6	Placements and undergraduate projects abroad	38
5.7	Tick bites	40
5.8	Fieldwork and UV radiation	41
5.9	Bird flu/fowl pest	42
5.10	Zoonoses	43
6	Personel protective equipment	45
6.1	Eyes and face protection	45
6.2	Protection of hearing	45
6.3	Gloves	45
6.4	Protective clothing	46
6.5	Respiratory protection	46
6.6	Safety footwear	46

1 Safety and health for students

Wageningen University is providing safety instructions for students (VIS) on this site. The purpose of these safety instructions is to inform and instruct BSc students (and MSc students and graduates) about safety and working conditions at Wageningen University.
Illustrations: Henk van Ruitenbeek
Photographs: Katinka van Roij
Disclaimer
While all due care has been taken in compiling the content of this web site, it is possible that over time given information will become out of date or cease to be correct or complete. Wageningen UR does not therefore guarantee the topicality, correctness and completeness of the information appearing on this web site and under no circumstances is it liable for any direct or indirect damage arising from the use of, reliance on or action taken as a result of the information appearing on this web site.
This web site contains links to web sites of other organisations and establishments. At the same time there are links to this web site from numerous other web sites. Wageningen UR does not accept any liability for the content of the linked web sites since they are not provided, checked and/or maintained by Wageningen UR.

1.1 General

It is important for you to be able work and study in safe and healthy conditions. It is the University that decides some of these conditions. But students themselves also have some influence on these conditions through their approach to work and study. It is the University that provides for proper accommodation, furniture and equipment. It is then the students' responsibility to use the accommodation, furniture and equipment responsibly and safely. Both students and the University comply with a number of rules in this regard.

The Forum-building in Wageningen

Rights and duties
Students do not have the same rights and duties as the staff of Wageningen UR, but in general the University is responsible for the safety and health of her students.

Students are entitled to healthy working conditions, individual information, preventive measures and appropriate protective equipment. The University makes clear rules and advice in this regard, in conformity with the government guidelines. With this information The University makes these general rules available to the students. As a student or trainee you are obliged to familiarise yourself actively with these rules and this advice, to follow the information provided and to obey the rules.

Health & safety management at Wageningen UR

The direct management in the different parts of Wageningen UR rests with the decentralised health, safety and environment organisation. Health, safety and environment officers have therefore been appointed in each of the six parts of the Wageningen UR organisation. They are the first points of contact for health, safety and environment issues in the different parts of the organisation.

Questions and complaints

During their class education (lectures and practicals) students with general questions about working conditions and safety can get help from tutors and practical supervisors. While working on a thesis students with such questions can get help from their supervisor, the health, safety and environment contact of the group or the health, safety officer of the part of the organisation to which the group belongs. If it is a matter of more general problems at policy level, students can exert influence on policy through the student council (SR).
For practical problems students can get help from the training coordinator or the building manager. Students with questions, suggestions or problems can also approach one of the student organisations (PSF, CSF, Veste). You can also take complaints to the Wageningen Students Organisation WSO.

Liability

In principle Wageningen UR is liable for the damage that students suffer during the educational programme. This is not however the case if Wageningen UR has complied with all the relevant rules and laws or if the student has deliberately broken rules and this is demonstrated by Wageningen UR. Wageningen UR is also responsible for trainees. Conversely, students of our university who are undergoing practical training fall under the responsibility of the trainee post. But since practical training is undertaken for Wageningen UR, Wageningen UR has a responsibility to keep the working conditions of its trainees under review. If you are going on practical training, you can therefore ask your group or supervisor to look at the working conditions at your trainee post.
Risk analysis and evaluation (RI&E)
For the purposes of the Working Conditions Act Wageningen UR is obliged to assess the risks as regards safety, health and welfare in every part of its organisation. It does so by carrying out a risk analysis and evaluation (RI&E). Such an RI&E results in a series of recommendations and advice that it is mandatory to follow. One of the recommendations may be that a separate assessment must be carried out for a specific risk. You can ask the health, safety and environment officer for them.

1.2 Basic rules

Working in a laboratory requires you as a user to adopt a watchful, responsible attitude. As a laboratory user you must be aware that potentially there are quite a lot of risks to health and safety lying in wait. Not only to your own health and safety, but also to that of your fellow students. 80% of accidents in a laboratory are caused by the people *themselves* in the lab. To keep these risks to a minimum working in a laboratory comes with a great many rules. Still more important than knowing all the rules is understanding the background to them. This will help you develop the awareness you need to identify potential risks independently.

The following basic rules apply in all Wageningen UR laboratories:

1. The practical tutors/laboratory managers direct and manage the daily supervision of the activities of students in the laboratories.
2. Students who are working in a laboratory must be aware of the rules of behaviour applicable to that laboratory and behave in accordance with these rules.
3. Each student is required to familiarise him/herself with the location and effect of fire extinguishers, fire blanket, eye shower, emergency shower and of the escape routes.
4. Damage or defects found while working must be reported immediately.
5. Students are obliged to wear a lab coat and (safety) goggles. The wearing of contact lenses is discouraged.
6. Eating, drinking, smoking and running around are prohibited in the laboratory.
7. Students may only conduct experiments directed by the tutor or in consultation with the tutor. Before conducting an experiment, you must familiarise yourself with the properties of the chemicals to be used.
8. Before using equipment students are required to familiarise themselves with how it works and possible risks. The student must satisfy him/herself that the apparatus with which he/she is working is safe and that there is no risk to the surrounding area. In case of doubt the student is obliged to consult the tutor.
9. Every Wageningen UR laboratory has a laboratory waste system. This system is to be used for the disposal of all chemical waste. Chemical waste may not be flushed away in the sink nor be deposited in the waste bin. If necessary check with the tutor whether the solutions or substances used are to be regarded as chemical waste. Place broken glassware straight into the specially provided waste bins.
10. All spilled chemicals and liquids must be cleared up immediately, including those spilled on the floor (slipping!).

1.3 Fire and accidents during practicals

In case of fire or accident during a practical the following general rules apply:

- REMAIN CALM;
- PUT YOUR OWN SAFETY FIRST!
- ALERT YOUR SUPERVISOR.

Your supervisor is best acquainted with local conditions. He will take the necessary action and give you instructions. In the absence of the supervisor you will of course take action yourself.

In case of fire:

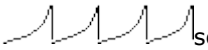
- Look to your own safety, take no unnecessary risks.
- During working hours call the alarm number (see green card in the building where you work). The number given is usually the building's reception desk number. The receptionist will then contact the relevant authorities, such as the fire brigade.
- Outside working hours call 0-112.
- Remove injured party(ies) from the danger zone.
- If you are yourself on fire, go and stand under the fire shower straightaway. If there is no fire shower, roll back and forth on the ground.
- Cool burns for at least 15 minutes under running water!
- Never try to escape through smoke.
- Never use the lift.

In case of accident:

- Look to your own safety, take no unnecessary risks.
- During working hours call the alarm number (see green card in the building where you work). The number given is usually the building's reception desk number. The receptionist will then contact the relevant authorities, such as the emergency response team manager of that building;
- Outside working hours call 0-112.
- Stay with any victim and await the arrival of the emergency response team member. Put your own safety first and try to ensure that the situation does not get any worse.
- Otherwise follow the instructions of the emergency response team member.
- Afterwards the accident must be reported using the accident form. While anyone is allowed to complete the electronic accident form, it is best done by one of the emergency response team members in the building.

Evacuation procedure:

In an emergency everyone in the building is alerted by alarm signals. The instructions that you must then follow can be found on the green card on the wall in each room. Read through these instructions so that you know what to do if your supervisor is not present.
If the alarm signal you hear is a two-tone sound, this is a warning, if for example there is a fire or toxic gases have escaped somewhere in the building.

If the alarm signal you hear is a so-called "slow whoop"  sound, leave the building as quickly and as calmly as possible and go to the assembly point. Use the route indicated by the escape route signs and follow the instructions of your supervisor or the emergency response team member. Never try to escape through thick smoke and never use the lift. Because of the roll call by the fire brigade for example you must remain at the assembly point until further notice.
It is of course a good idea to check the possible escape routes at the beginning of a practical. There are instructions for this at the entrance to each building.

2 Working in a laboratory

Brief description
Order, tidiness and good organisation in a laboratory are very important if we are to work safely with toxic substances for example. A number of the aspects of working in a lab are therefore strictly controlled.

Risks
When working in a chemical laboratory you have to assume that the substances with which you are working can be corrosive, toxic, flammable and harmful to humans and the environment. In a biological laboratory you have to assume that the biological organisms you are working with might harm you or the environment.

Measures
The most important measure is working in a safe environment and with the safest working methods. Normally laboratories are ventilated 5 times an hour so that possible chemicals in the air will be diluted and will disappear rapidly. If you work in a fume cupboard, vapours will disappear even faster.

Personal protection
The wearing of a lab coat and (safety) goggles is mandatory. Wageningen UR is not liable in cases of damage to your clothing. Use gloves or safety glasses where indicated in a regulation.

The wearing of a lab coat and (safety) goggles is mandatory

Dealing with glassware
A lot of glassware is used in a laboratory. The disadvantage of glass is that it breaks easily. After breakage, chemicals that were contained in the glassware can cause problems and the glass fragments can cause cuts. Cutting accidents are the most common accidents in a laboratory.

The fragments may also be contaminated with chemicals, allowing toxic substances directly into the blood.
To prevent glass breakages the following advice applies:

- Never work with broken glassware. Ask your supervisor for a replacement.
- Be extremely careful when introducing a glass tube or thermometer into a cork or a hose. Use water or glycerol as a lubricant.
- Do not just grip larger bottles and flasks with chemicals by the neck but also support them underneath.
- Clamp glassware in apparatus (for example suction flasks).
- Always ensure an even distribution of heat when heating glass equipment, by using a flame diffuser for example.
- Remember that glassware from the refrigerator or cold room may be slippery because of misting up and so slip out of your hands.

Finally, never throw broken glassware in the waste bin. Use the special glass waste bin or glass bucket provided.

Spills and leaks
Spilled chemicals can cause major problems such as contamination of your fellow students' environment. You must therefore immediately mop up spilled chemicals with a piece of paper towel or any absorbing granules specially designed for this purpose. Ensure that you protect yourself properly by using gloves for example. Consult your supervisor on how to dispose of the soiled paper or the absorbing granules.

Internal transport of chemicals
The risk of glass breakage as a result of falls or knocks for example is greatest during the transport of substances to and through the laboratory. For the transport of bottles larger than a litre the following rules apply:

- Use a basket or a bucket for the transport.
- Use a transport cart if you want to transport several bottles at a time.
- If transporting without a basket, always use two hands to hold the bottle.

Eye showers and emergency showers
Despite all the safety precautions accidents can still happen. You may for example get acid on your clothing, on your skin or in your eyes. It is important in such a case to rinse the affected skin or eyes with (plenty of) water. For this purpose there are taps, emergency showers and eye showers (or eye rinse bottles) in every laboratory. When using the emergency shower first remove the clothing contaminated with acid if necessary. If you wear contact lenses, you must remove them before you use an eye shower.

Emergency shower, eye shower, fire blanket, first-aid kit and fire-extinguisher in a laboratory.

Storage
For practical reasons a number of chemicals will always be stored at or by the workplace. There will only be small quantities of chemicals on the lab table, the "day's stock". The rest are stored in (ventilated) safety cupboards (chemical cupboards). When clearing up at the end of the day be sure to put the chemicals back in the right cupboard.

Chemical waste
The basic principle in Wageningen UR laboratories is that the minimum possible quantities of the chemicals used should find their way into the environment and their disposal must be correct and safe. For this reason there are specific waste regulations in every laboratory that you must follow carefully. Incorrect mixing of certain waste types can give rise to risk in some cases. In addition, their processing can cost a lot of money as a result. A further general rule is that you never use more of a chemical substance than necessary. Anything left over in an experiment is waste.

2.1 Handling chemicals

Brief description
Is this substance harmful to my health? Do I have to use the fume cupboard? Is this substance harmful to the environment? Important questions, because no one wants to fall ill or suffer injury during a practical and no one is happy about a fire or explosion in the laboratory.

Risks
Exposure to chemicals can be harmful to your health. Exposure can occur by absorption through the skin, by inhalation or by swallowing.

A number of chemicals are so toxic and/or corrosive that damage to the skin or for example the eyes can occur directly on contact. Direct contact with chemicals must therefore always be prevented.

Safety cupboard for chemicals

Measures

You can limit the risks of working with chemicals by handling them expertly. There are different sources of information for acquiring this expertise:

1. labels on the packaging;
2. chemical cards;
3. safety information sheets (MSDS sheets);
4. GROS chemical registration system.

Labels on the packaging

The easiest way to obtain information is from the label on the substance's packaging. The labels provide the following useful information for hazardous substances:

- hazard designation and so-called `R' phrases;
- safety advice and so-called `S' phrases;
- hazard symbols;

Labels on chemical packings with 'R' and 'S' phrases and danger symbols

'R' and 'S' phrases

The 'R' phrases (R for Risk) warn the user of hazardous or harmful properties of a substance. The `S' phrases (S for Safety) give instructions for working safely with a substance.

The full list of `R' and `S' phrases appears at: Overview R- and S-phrases...

Hazard symbols
Graphic symbols are used to indicate the main risk characteristics of a substance. A list of the hazard symbols can be found at: Overview hazard symbols...

Chemical cards
Information about for example physical properties and the toxicity of a large number of chemicals (> 1,300) is given for each substance on a chemical card. The chemical cards can be found on http://www.cdc.gov/niosh/ipcs/icstart.html in several languages.
On a chemical card you will find the MAC value of the substance for example. This is a measure of the concentration of a substance in the air which, as far as we know, be it over an extended period or even one covering an entire working life, does not give rise to any risk to health. While you cannot determine the concentration of a particular substance in the workplace, the MAC value, in combination with the volatility of a substance for example, does give an indication of how careful you must be with a particular substance.

MSDS-sheets
An MSDS (= Material Safety Data Sheet or safety information sheet) goes into the prevention of risks to safety, health and environment in greater depth than a chemical card for example (see example...). Suppliers are obliged to supply an MSDS with a first order.

GROS chemical registration system
Wageningen UR uses a chemical registration system (GROS). This is a system that gives you the option of requesting a complete information sheet for all registered chemicals. There is however the limitation that GROS is not installed by default on every PC and that only the chemical manager has access to GROS.
Ask about it! GROS has now become operational in parts of the University.

2.2 Working in fume cupboards

Brief description
A fume cupboard is a largely enclosed work space with strong air extraction to prevent the spread of the chemicals used in the fume cupboard into the work space.

Risks
The inhalation of volatile substances (gases and vapours) can cause (serious) damage to health. Volatile vapours and gases can also give rise to the risk of fire and explosion. There is also a splash risk when working with corrosive liquids.

Measures
To protect staff and students from inhalation of hazardous gases and vapours and from splash risk fume cupboards have been installed in the laboratories. All users of the laboratory are obliged to use the fume cupboard when using the following groups of chemicals and undertaking the following activities:

- volatile liquids such as solvents;
- corrosive liquids such as (strong) (undiluted?) acids and bases;
- some toxic chemicals in powder form;
- heating of substances;
- the mixing and grinding of solids where dust is released.

A fume cupboard only works properly when the following rules are followed:

Do not use fume cupboards for the storage of chemicals or equipment

- Keep chemicals in safety cupboards or the chemical store.
- Preferably place necessary equipment or other items to one side and/or on an open raised area, so that the exhaust slot to the rear is not blocked.
- Keep the fume cupboard as empty as possible.

wrong

wrong

right

Work safely and hygienically

- The window serves as a splash screen. Set it as low as possible when working in the fume cupboard. In this way you will at least be protecting your face. At every fume cupboard a WORKING POSITION in front of the window is indicated on the side.
- Never leave your head inside the fume cupboard.
- Keep the fume cupboard window closed when not in use.
- Clean the fume cupboard after spills and working with toxic substances.

Cause as little air disturbance as possible

- Air disturbances can give rise to gases and vapours finding their way out of the fume cupboard.
- People walking past also give rise to air disturbance in the fume cupboard.
- As far as possible close the doors (and windows) in the vicinity of the fume cupboard. A false draught can cause exiting air.
- Place apparatus as far back in the cupboard as possible. As a rule of thumb leave the front 15 to 20 cm of the work top unused.

Don't forget the environment

- Use drip trays, so that in the event of an accident environmentally harmful substances cannot find their way into the sewer (drains).
- Where gases and vapours are released use the gas washer (if available).
- Allow only the minimum possible amount of solvent to evaporate freely.

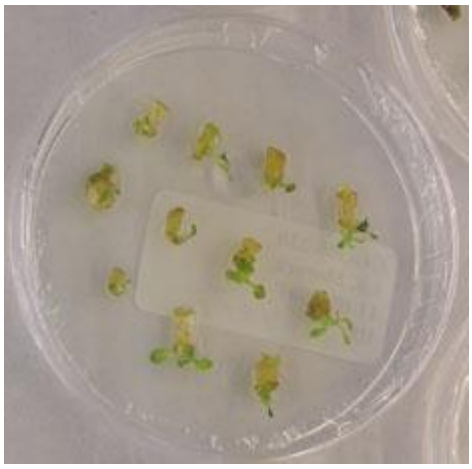
3 Working in a special laboratory

3.1 Biological safety

Brief description
Biological safety is the overall package of measures that have been implemented to keep damage to the environment and humans, when you are working with biological material, to the absolute minimum. Three different groups of biological material can be identified in this regard:

- **Biological agents (BAs)**
  Microorganisms, parasites and vegetable, animal and human material (blood, cells, urine, faeces) possibly containing microorganisms and parasites, which entail risks if humans are exposed to them.
- **Genetically Modified Organisms (GMOs)**
  Organisms whose genetic material has been altered in a way that is not naturally possible by propagation and recombination. These GMOs also have the capability of reproducing or transferring this genetic material.
- **Plant pathogens/quarantine organisms (PPs/QOs)**
  Plant pathogens are organisms (microorganisms, but also parasites, nematodes, insects and mites) that are harmful to plants. The quarantine organisms include those plant pathogens that do not occur in the Netherlands and that may be harmful to native plants. This also includes exotic vegetable material that may be contaminated with these organisms.

Of course combinations also occur: for example PPs or BAs that have been genetically modified in the laboratory.



Vegetable matter on shoot-inducing medium following treatment with GMOs

Risks
Harmful effects can occur at two levels when working with or in the event of exposure to BAs, GMOs and PPs/QOs:

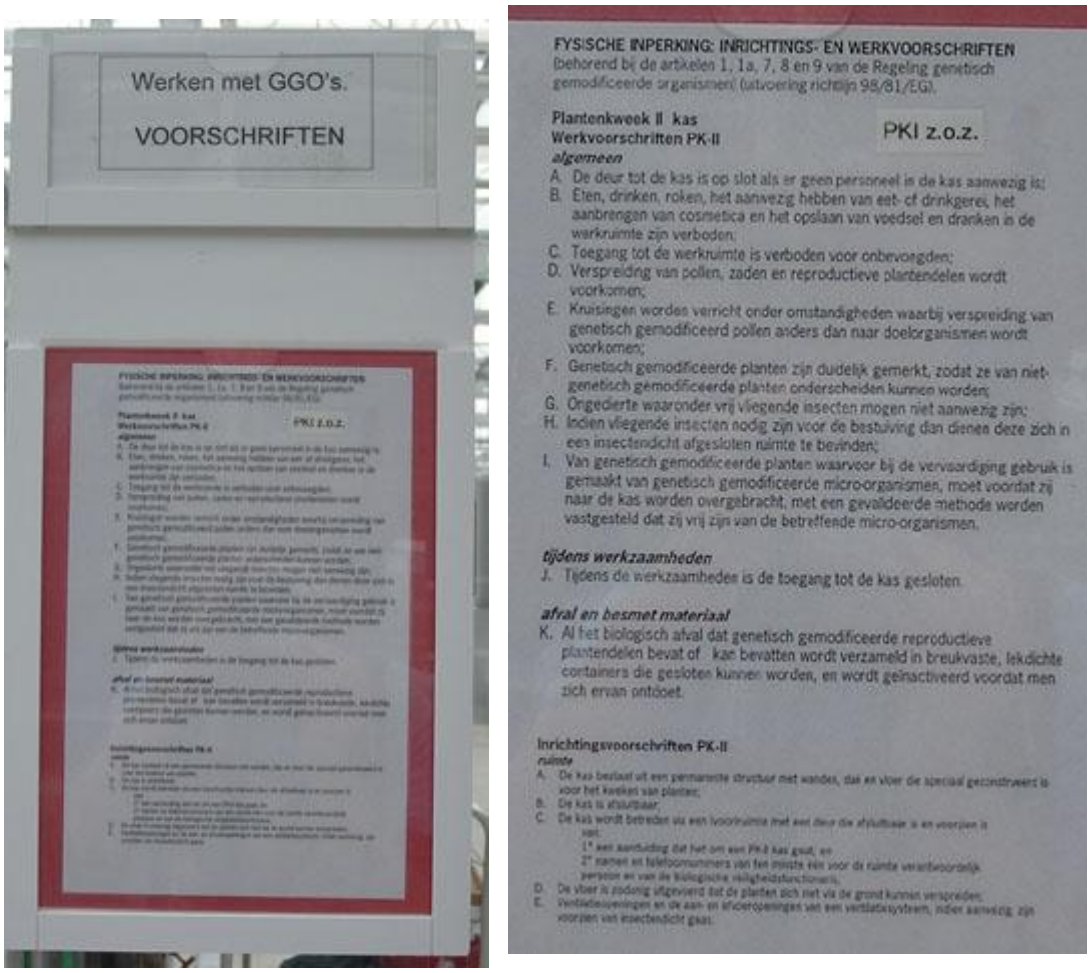
1. **Health effects on the laboratory worker**
   Examples: infection, allergy or poisoning. The effect depends for example on the pathogenity, the exposure route and the immunological condition of the worker. This is especially true of BAs.
2. **Effects of the organism on the environment**
   Every area has a natural balance in the level of different organisms. The introduction of GMOs, BAs and PPs/QOs must be assessed for the chance of transfer of genetic material to other organisms, for the chance of survival and for the speed of spread of the organism in the environment outside the laboratory. In the case of PPs the potential spread of pathogenic organisms amongst susceptible (cultivated) crops in particular is important.

Measures

Working with BAs, GMOs and PPs/QOs is subject to strict statutory safety requirements. For example, there is the Working Conditions Act for the protection of people who work with BAs, the Housing, Spatial Planning and Environment legislation for the protection of the environment from GMOs and the rules of the Plant Pathology Department for the import of and working with PPs/QOs. The practical implementation of the statutory requirements that apply to Wageningen University are described in the '*Wageningen University Biological Safety Handbook*'.

The control measures to make safe working possible are:

- **biological curtailment:** the modification of the organisms in such a way that the pathogenity is lowered or the chance of survival outside the laboratory is reduced;
- **physical curtailment:** using special laboratory spaces, special equipment and specific layout of the spaces to ensure that BAs, GMOs and PPs/QOs cannot spread outside this space;
- **use of work instructions:** indicating which operations you are and are not allowed to carry out and which protective equipment you must use.



Containment regulations for a greenhouse with GMOs

Organisation

When as a student you start work on a project, one of your first points of contact will be the responsible official or ***Verantwoordelijk Medewerker*** **(VM)**. This person is responsible for requesting the necessary licences and for assessing and instructing the project workers and students.

There is also, per study group or building (where several VMs may work), a **section representative BVF** (*biologische veiligheidsfunctionaris* or biological safety officer) appointed, who arranges the appropriate rooms and equipment that will provide the required containment. Together with the VM, the assistant BVF makes up the work instructions for the section and the specific projects.

3.2 Working with biological agents

Brief description
Biological agents are divided into four classes based on increasing pathogeny and decreasing potential for preventing infections.

Class	Risks
Class 1	Microorganisms and parasites, which are unlikely to cause disease
Class 2	Microorganisms and parasites, which can cause disease, but which, however, is unlikely to spread and for which an effective prophylactic or treatment is available
Class 3	Microorganisms and parasites, which can spread and can cause serious diseases, but for which an effective prophylactic and treatment is available
Class 4	Microorganisms and parasites, which are likely to spread and can cause a serious disease for which no effective prophylactic or treatment exist

To find out in which class a microorganism falls, you can consult the European Guidelines, which form the basis of Dutch legislation. The legislation is set out in the Health & Safety Executive information sheet AI-9: Biological agents, and in the booklet `*Veilig werken met micro-organismen, parasieten en cellen in laboratoria en andere werkruimten*' [Operating safely with microorganisms, parasites and cells in laboratories and other work areas] by the *Nederlandse Vereniging voor Microbiologie* [Dutch Microbiology Association]. This information is available from the responsible official (VM) of each study group where work is carried out with BA, GGOs and PP.

Risks
The risks concerned here are mainly risks to humans. Exposure to biological agents can result in infections, allergy and poisoning.

Measures
With biological agents, protection of humans is a priority. The control measures have been set up based on the way in which the agent can enter the body and the category to which it belongs.
As regards exposure, three routes are distinguished:

1. Absorption via the digestive system
2. Direct absorption via broken or unbroken skin
3. Absorption via air passages.

Absorption via these routes can be prevented by, respectively:

1. Not eating or drinking in the laboratory and not putting fingers or any other matter in the mouth
2. Wearing gloves, safety goggles or mask and protective clothing
3. Preventing build-up and breathing in of aerosols by working at a safety bench where a free air flow protects the laboratory from the agents.

When you work with class 1 biological agents, employing the safe microbiological techniques (see: SMT operating instructions...). The laboratories are easily kept clean and the work instructions allow for the prevention of spreading.
When you work with class 2 biological agents, it is compulsory to work at a safety bench (laminar flow cabinet) to restrict any aerosol spray.

A safety cabinet is mandatory if you are working with class 2 biological agents

For working with class 3 or higher, besides the safety bench, it is also necessary to work in a special laboratory with underpressure, where leakage to the outside is restricted and the air in the room is expelled via Hepa filters. There are only a few rooms in Wageningen UR where you can work with class 3 pathogens. As a student you are not likely to come in contact with them at an early stage.
All the rooms in which work is carried out with class 2 biological agents or higher can be recognised by the biological risk sign on the door:

Warningsignal for biorisc

For every research project with a particular class of agent, control measures and work instructions are created appropriate to the section. Ask the local ***VM*** for them. It is also indicated on the door of the containment room which agent is being worked with, the particular risks involved, protection requirements and procedures for entering and leaving the location.

3.3 Working with genetically modified organisms

Brief description
Genetically modified organisms (GGOs) are organisms, the genetic material of which has been changed in a way that is not possible in nature (by reproduction and recombination). They also possess the capacity to propagate that genetic material or to transfer it. Change is brought about, for example, through recombinant DNA technology, cell fusion technology and direct introduction of genetic material (micro-injection)

Risks
Genetic modification involves the following risks to humans and the environment:

- Changes in genetic material can render an organism dangerous, or more dangerous, and so, for example, pathogenic to humans
- A GGO may possibly damage the natural balance if the organism is introduced into the environment with extra genes
- The genetic material of GGOs could possibly be transferred to other organisms.

Shrouded genetically modified plants to prevent the spread of seed

Measures
The control measures for GGOs are mainly based on physical restriction. To this end, we have workrooms with a series of codes, which indicate the GGOs you are permitted to work with there. The restriction levels are determined here by the class of the microorganism as indicated for biological agents.(see: Codes used in laboratories...).
The first introduction to GGO operations is usually during practical training (e.g. Gene Technology). Here you learn to apply safe microbiological technology (VMT) in an ML-I laboratory.
Besides this you have to comply with a number of standards before you can work with GGOs.
If you are going to work with GGOs during an undergraduate project, it is necessary to register yourself and take instruction from the VM. You discuss the project you are going to work on with the VM (and the BVF). You will be asked for information on previous training, knowledge and experience. This information is assessed by the VM and the BVF. In the event of insufficient prior knowledge, the BVF may require you to obtain supplementary knowledge.

- To be able to begin, you are also requested to sign a statement in which you declare, among other things:
- To be familiar with microbiological technology and the educational requirements attached to the work
- To be familiar with the licence under which you are going to work
- To be aware of the restriction level that has been set for the project on which you are going to work
- To be aware of the operational rules and regulations that apply to the room in which you work
- To be familiar with the contents of the *Handboek Biologische Veiligheid Wageningen Universiteit.*

Work with GGOs also has to take place in accordance with a number of strict rules and regulations. General rules for this are, for example:

- All experiments should be registered in a logbook
- All tests should be carefully and comprehensively described in lab journals, which should also be retained by the chair group after completion of the study
- All constructs created should be accurately described; the location where they are stored should also be registered.

Working with plant pathogens/quarantined organisms

Brief description
The importation and use of certain harmful organisms, harmful organisms in combination with specific plant material and other plant material as described in the EC Phyto Directive (2000/29/EG) is prohibited. The Plant Pathology Department (PD) may issue an exemption and specifies the restriction levels, work instructions and training levels, under which the operations may be carried out.
(See also `*Handboek Biologische Veiligheid Wageningen Universiteit*') [Wageningen University Biological Safety Handbook].

Risks
The risks involved are mainly to the environment.
Escaping plant pathogens and quarantined organisms can be harmful to domestically cultivated crops owing to their exotic character.

Measures
The operations are carried out under the restriction levels mentioned under 4.1.2 and under the work instructions contained in the notification and the licence.
For every study of a plant pathogen/quarantined organism, there are control measures and work instructions laid down. Go to the relevant VM to register and to obtain the instructions specific to the location. It is also indicated on the door of the containment room which pathogen/organism is involved and what the specific risks are. It is further indicated what the required protection is and which procedures apply to entering and leaving the room.

3.4 Working with laboratory animals

Brief description
During various types of practical training and graduate courses within Wageningen UR, as a student you may come into contact with various types of (vertebrate) laboratory animals. Aspects of care for the animals' welfare are attached to working with laboratory animals, and also aspects of care for the health of those who are working with them.

Mice and rats at the Centre for Small Experimental Animals

Fish farming

Risks

- Working injudiciously with laboratory animals can cause them unnecessary suffering
- While working with laboratory animals, you can harm your own health through the transfer of pathogens, exposure to allergens or through an accident caused by the animal.

Measures

Under the Experiments on Animals Act (art. 14) supervision of work with laboratory animals is compulsory. In order to safeguard the welfare of the animals and to restrict the risks during the work, a ***laboratory animal expert*** has been appointed within Wageningen UR: Rob Steenmans, Tel 84206.
The test animal expert advises, among other things, on the purchase, quality of accommodation and the use of the animals. The underlying principle is that unnecessary pain and suffering must be prevented as much as possible.
The laboratory animal expert also supervises the control measures that are intended to restrict damage to health to a minimum while working with animals. You can also consult the laboratory animal expert for information on the animal science course. This course is obligatory for those who wish to work with laboratory animals after graduating, and can lead to greater independence while working with laboratory animals during undergraduate studies.

Within Wageningen UR, an ***animal experiments committee*** (DEC, for *dierexperimentencommissie***)** has also been set up. The DEC assesses research with laboratory animals on ethical aspects, in order to make a responsible judgement between the importance of the research and the welfare of the animals. In this, the committee uses criteria that are laid down in the Experiments on Animals Act. For more information on the DEC, contact Marijke Dohmen, Tel 48 1516.

The Food and Consumer Product Safety Authority (VWA) is responsible for the (external) supervision of compliance with the Experiments on Animals Act. You can make a complaint or report a transgression by telephone to the *VWA*: Tel 0800-0488 (free).
NB If you become ill or are injured through working with animals, this should be reported to the relevant tutor/training leader .. The latter is ultimately responsible for reporting the incident.

3.4.1 Transfer of disease by laboratory animals

Brief description

Infected laboratory animals can transfer diseases to people and other animals. Animals that do not display any symptoms themselves can be carriers of a transferable infection (zoonosis). There are five

categories of disease triggers, namely: viruses, bacteria, parasites, protozoa, and moulds. (See: List of common zoonoses and their characteristics...)
There are several ways of coming into contact with a zoonosis. For example, when looking after an animal or by being present in areas where there are animals or where animals have been. But also with fieldwork, such as catching animals in traps for research purposes.

Risks

- Via contact with animal products such as urine (Leptospirosis), blood or dung (Salmonellosis), you can contract zoonosis.
- Through handling animals or with aggressive animals there is a possibility that you will be bitten or scratched. This can cause you to contract a wound infection (tetanus) or rabies, among other things.
- With various types of animals, zoonoses can cause minor infections in humans, such as ringworm in cows. Zoonoses can also cause serious symptoms, such as parrot disease in parrot types, Hantavirus with (wild) mice and TB with chickens, pigeons and fish. The risk of transfer varies per disease.
- Following animal bites - even specifically pathogen-free animals - infections can occur, such as with *Streptobacillus.*

Measures

- Take appropriate hygiene measures. Do not eat and drink during contact with animals and wash your hands afterwards.
- Where small laboratory animals (rodents) are concerned, specific pathogen-free animals are purchased and regular serological checks are carried out on them.
- When working with animals, you should ensure that you are well protected against tetanus. Victims of bites who are inadequately vaccinated should be given a tetanus inoculation.
- Appropriate training is given to those working with (deliberately) infected laboratory animals.
- When working with infected animals, use a safety cell or isolation room for physical containment.
- There are protocols for the various situations that arise while working with laboratory animals. Ask the trainer about these.

Measures for proper hygiene

NB If you become ill following contact with animals, it is important to consult the GP or student doctor and point out the possibility of a zoonosis. With early treatment, many zoonoses are relatively easy to deal with. However, if the disease has been going on for some time, it is often very difficult to get rid of it.

Links

Further information on symptoms that may be caused by a zoonosis from the type of animal worked with can be found at: http://www.vetmed.wisc.edu/pbs/zoonoses/

3.4.2 Accidants with laboratory animals

Brief description

Accidents can happen while working with laboratory animals, e.g. bites, scratches or kicks.

Risks

- With small laboratory animals such as a mouse, rat or rabbit, there is a risk that the animal will bite or scratch you.
- With larger animals such as a cow, pig or horse, apart from the risk of being bitten, there is also the possibility that they might kick or that you get trapped between the animal and the wall or fence.

Measures

- In general, work is carried out in the presence of a qualified and competent supervisor.

- There is always someone within calling distance.
- When working more independently with laboratory animals, there should always be adequate knowledge available of the behaviour and the handling technique of the relevant animal type.
- White coats and gloves should be worn when working with small laboratory animals.
- When working with animals, you should be well protected against tetanus. Insufficiently vaccinated bite victims should be inoculated against tetanus.

NB If you become ill or injured through working with animals, this should be reported to the relevant tutor/trainer and to the AMD [Occupational Health and Environmental Service] via the (electronic) accident report form.
You can complete this yourself, or have it done by the tutor/trainer. The latter is ultimately responsible for reporting the incident.

3.5 Allergies

Brief description
Through contact with allergens (materials that cause allergy) originating from (small) laboratory animals - such as mice, rats and rabbits - students and laboratory assistants or researchers can develop an allergy: laboratory animal allergy

Risks
Problems resulting from laboratory animal allergy can vary in nature and are divided into three groups:
- Irritation of nose and eyes (blocked nose, sneezing fits, itching eyes)
- Skin problems (red or itching skin)
- Asthmatic problems (shortness of breath, constriction, wheezing in the chest).

Research has shown that the degree of exposure to allergens determines the development of laboratory animal allergy. Briefly: the greater the exposure, the greater the chance of contracting laboratory animal allergy. It is therefore important to keep the exposure level as low as possible.

Measures
The measures taken are mainly aimed at keeping exposure to allergens as low as possible:
- Using surface material that causes less dust
- Containment of allergens, or preventing allergens from escaping from cages into the work space
- Keeping the work space clean
- Working with laboratory animals in well ventilated flow cabinets
- Limiting the time of contact with laboratory animals
- Expelling allergens through adequate ventilation
- Wearing protective equipment such as mask, overalls and gloves.

NB Within Wageningen UR the laboratory animals are cared for by animal carers, thus limiting the students' contact with the animals. Even this limited and irregular exposure to allergens presents a certain risk.

3.6 Working with (human) blood

Brief description
In the course of various types of practical training and undergraduate studies, you will work with human blood.
This blood is possibly contaminated with e.g. viruses such as the hepatitis B, hepatitis C virus or the AIDS virus, and can therefore pose a risk to your health. Direct blood-to-blood contact is particularly risky.

Risks

While working with blood:

- You could prick or cut yourself accidentally on needles, knives or glassware. This can cause (possibly contaminated) blood to enter the bloodstream.
- Possibly contaminated material could come into contact with broken skin, such as minor wounds, chaps, eczema patches, etc.
- Possibly contaminated material could come into contact with mucous membrane, e.g. through a splash in the eye or mouth.

Measures

In order to prevent infection, you should handle blood very hygienically:

- As a student in practical training, you work with your own blood only
- You avoid contact with mucous membrane and minor wounds by e.g. covering wounds with a waterproof plaster
- You carefully avoid direct contact with blood, therefore you wear surgical gloves and safety goggles if necessary
- You should discard used needles immediately in the appropriate container provided without first replacing them in the wrapper
- Sharp items of waste (glass shards, needles, etc.) should never be left lying in waste containers
- When working with the blood of others, e.g. on an undergraduate project, it may be necessary to be vaccinated against Hepatitis B. In that case, contact the student doctor for advice.

What to do in the event of pricks or cuts

- Let the wound bleed freely
- Rinse with water
- Disinfect with 70% alcohol or another disinfectant.

In the event of splashes:

- Rinse with water
- Disinfect with 70% alcohol or another disinfectant.

Procedure for all accidents:

- If possible, keep the source material.
- Contact the student doctor as quickly as possible to discuss policy procedure to be followed. The doctor will make a risk assessment and perhaps have the source material tested (with permission from the source user) for HIV and hepatitis B and C. The doctor will also ask whether you have been vaccinated against hepatitis B. If he considers it necessary, you will start on HIV inhibitors within 8 hours.
- Outside office hours, you should contact your GP or casualty department (EHBO) of the hospital.

NB A prick or cut should always be reported to the relevant tutor/trainer and to the AMD [Occupational Health and Environmental Service] by means of the (electronic) accident form.
You can complete the form yourself or have it completed by the tutor/trainer. The latter is ultimately responsible for reporting the incident.

Websites - Student facilities...
- Student Counselling Service (DSB)...

Links

Further information on the hepatitis virus can be found at: http://www.hepatitis.nl.

4 Working with special materials or equipment

4.1 Radiation

Brief description
Electromagnetic radiation is categorised by ionising radiation (including X-ray radiation) and non-ionising radiation.
Ionising rays have frequencies of over $3*10^{15}$ Hz (X-ray, gamma ray, cosmic ray) and non-ionising rays of only Hz to 10^{15} Hz.

Type of radiation		**Wavelength**	**Frequency**
Non-ionising	Microwave rays	1-1000 mm	300-0,3 GHz
	IR-straling	0,78-1000 mm	385-0,3 THz
	Visible light	400-780 nm	750-385 THz
	UV rays	100-400 nm	3000-750 THz
Ionising radiation		< 100 nm	< 3000 THz

4.1.1 Non-ionising radiation

Brief description
Various types of equipment in the laboratory emit non-ionising rays. This electromagnetic radiation does not contain enough energy to ionise atoms. Electromagnetic rays can, however, depending on the energy content, influence chemical reactions and break connections. This concerns ultraviolet (UV) radiation, visible light, infrared (IR) radiation, microwaves and radio waves.

The table below shows the sources and the various applications of different types of non-ionising radiation.

Radiation Type	**Sources**	**Processen**
Ultraviolet	Sun, light bulbs, fluorescent tubes, welding arcs, lasers	Welding, killing bacteria, industrial photosynthesis, polymerisation
Light and Infrared	Sun, flames, light bulbs, hot objects, fluorescent tubes, welding arcs, lasers	Welding, projection, steam boilers, fire, boiling and baking
Static fields	NMR equipment, electrolysis equipment	Electrolysis, galvanisation techniques
Microwave radiation	Microwave oven	Heating, boiling, baking

Risks
Non-ionising radiation can harm the eyes and parts of the body that have a low blood supply. High levels of exposure can cause damage (burning) owing to the heat of radiation. When body parts are exposed directly to non-ionising radiation, this causes them to heat. Since body parts with low blood supply cannot quickly disperse this heat, it can have harmful consequences. Severe effects following exposure to UV radiation are sunburn and inflammation of the cornea and conjunctiva of the eyes (welder's eye). Symptoms become apparent over a period from a few hours to a few days after exposure. Long-term effects are skin cancer and cataracts. Moreover, excessive exposure accelerates the ageing process of the skin.
In practice, the background exposure in the open air is used as a threshold value.
Warning sign for non-ionising radiation

Warningsign for non-ionising radiation

Measures

When using sources of non-ionising radiation, the following rules apply:

- Keep a safe distance away from the radiation sources
- Screen the radiation sources from the user
- Disconnect equipment when not in use
- Use protective equipment, such as IR safety goggles, UV safety goggles or face masks, welding masks and protective gloves and clothing.

4.1.2 Ionising/radioactive rays

Brief description

Radioactive materials emit ionising rays. Radioactive materials are materials of which the atom nuclei degenerate with emission of ionising radiation into more stable nuclei. Such radionuclides occur in nature (e.g. in uranium), but can also be produced artificially.
Radioactive materials are used for specific research purposes at various sites within Wageningen UR. There is a distinction between radioactive sources in dispersive form (`open' sources) and encapsulated sources (`closed' sources). Open sources may only be applied in isotope laboratories.

Isotope laboratory with the instructions for special risks, required protection and procedures on and next to the door

Risks

Ionising radiation is capable of ionising matter that it comes in contact with. When ionisation takes place in a living organism this can lead to change (damage) in the genetic material. The most familiar effect is the formation of tumours. Sometimes effects only appear in offspring.

warningsign for ionising radiation

Measures

Regulations
Strict regulations apply to the use of ionising radiation sources. These regulations are mainly stipulated in the Atomic Energy Act (*Kernenergiewet*) and established in the `*Regeling Stralingshygiëne Wageningen UR'* [Wageningen UR regulation concerning radiation hygiene] issuing from this law. The work instructions and procedures are intended to reduce as much as possible the radiation hazard for employees, students and the environment.

Radiation course
Students who are going to work with ionising radiation sources should be sufficiently competent in respect of radiation risks and radiation protection measures. They are therefore obliged to follow the basic course in radiation hygiene (Radiation Hygiene level 5B).

Monitoring
The maximum radiation dose permitted to be received by radiology workers is 20 mSv (millisievert) per year. When carrying out activities that involve increased possibilities of radiation emission, the wearing of a Thermoluminescence Dosimeter (TLD) is obligatory. If the radiation dose in C laboratories is not measured by means of personal TLDs then the radiation level in the room is discerned by means of room monitoring. One or more TLDs, placed at relevant positions in the radionuclides laboratories, continuously measure the radiation dose (24 hours per day). The doseage details are retained for at least 30 years, in connection with any claims of (ex)employees/students.

Isotope laboratory
You may only work with radioactive materials in an isotope laboratory (B, C or D level).
In every isotope laboratory a site radiation expert is appointed. The radiation expert supervises compliance with the safety regulations and guidelines. An important regulation is that radioactive sources may only be purchased by, or with the permission of, the site radiation expert via the AMD [Occupational Health and Environmental Service]. The safety regulations and guidelines may be read in what is known as the `Kew dossier' kept by the site radiation expert. The AMD also supervises radiology activities and carries out regular inspections.

Workplace in isotope laboratory

Waste container for "short-life" radioactive waste

Radioactive waste
Radioactive waste is separated as much as possible into short-lived radionuclides (half-life < 25 days: e.g. ^{32}P), medium-lived radionuclides (e.g. ^{35}S) and long-lived radionuclides (half-life > 100 days: e.g. ^{3}H, ^{14}C). The site radiation expert co-ordinates the disposal of radioactive waste See: Radioactive waste guidelines... (dutch).
You can obtain further information on radiation from the site radiation expert (or his deputy) at the laboratory. You can contact Wim Koops, Wageningen UR General Radiation Expert, at Tel 0317 - 48 41 75.

4.2 Working with gases

Working with gas bottles
In a laboratory you may use gases for various activities. Gases are usually contained in metal gas bottles, whereby the gas is stored under pressure. The pressure level can be as high as 200 bar. Depending on the type of gas, a dangerous situation can arise if gas is allowed to escape unintentionally, e.g. through leakage.

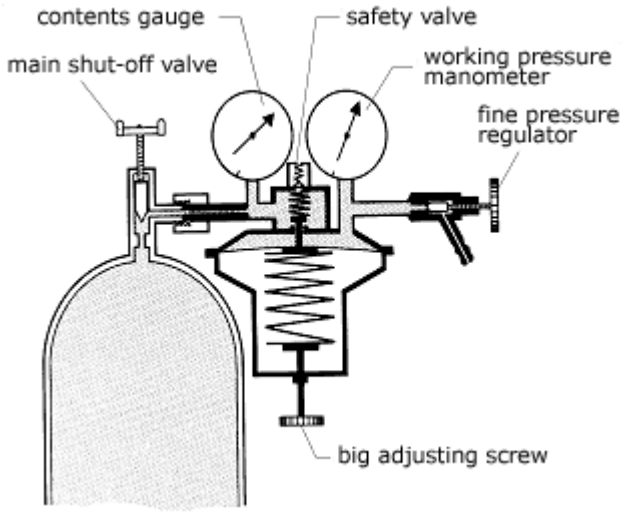
Gas bottle with pressure reducer

Great care should therefore be taken when working with gas bottles. Important points to bear in mind are:

- Always fix gas cylinders firmly, e.g. with a clip on the table
- Never place gas cylinders near a source of heat (including sunlight)

You regulate the gas pressure by the main shut-off valve and a pressure reducer

- Check first whether the big adjusting screw is completely turned outwards
- Open the main shut-off valve; the contents gauge now indicates the pressure in the cylinder
- Now screw in the big adjusting screw until the required working pressure has been reached, e.g. one atmosphere (see working pressure manometer)
- You now regulate the gas rate of flow with the fine pressure regulator
- When turning off, first screw the main valve shut and when the pressure on both valves is zero, turn the fine pressure valve shut and the big adjusting screw off



Working with cryogen gases
Cryogenic materials are in a state of extreme cold. Most of the materials are condensed into liquid gases with very low temperature of between -273 ºC and -130 ºC. If these liquids come into contact with the external air they boil into gaseous form.
Contact with the material, or material cooled by it, can cause injury that looks like a burn. The gases can also lead to suffocation in closed spaces (as they displace the oxygen in the air).

Burn wounds and skin friction hazards
Besides the dangers already mentioned, liquid nitrogen can cause severe burns after contact. Under normal atmospheric conditions, liquid nitrogen boils, which can lead to splashing of the liquid. Because of the very low temperature of liquid nitrogen, there is also the danger of skin sticking to the supply pipe or other cold surface. To avoid these dangers, the following safety measures may be taken, among others: isolate cold surfaces and wear temperature-resistant gloves and safety goggles.

Suffocation
Besides the familiar dangers of liquid nitrogen such as burning and sticking, nitrogen also presents another serious hazard, namely suffocation. Condensation of liquid nitrogen can reduce the percentage of oxygen in the air to such an extent that suffocation results. Nitrogen is odourless, colourless, tasteless, inert and non-toxic. The presence of nitrogen in the air is around 78%. Even so, it is not totally hazard-free. Condensation of nitrogen in a closed or poorly ventilated room can reduce the oxygen level so far that suffocation can occur. The reduction of oxygen in the air is not immediately noticeable, and dangerous situations can arise, among other ways, through: poor ventilation in rooms where gases are stored or where gases are worked with; slow or fast condensation of liquid nitrogen during tapping; in freeze tunnels or storage vats or with cryogenic crushing or cutting. Ensure, therefore, that there is adequate ventilation of the area where nitrogen is worked with.

The "drawing off' of liquid nitrogen

4.3 Working with lasers

Brief description
Another application of electromagnetic radiation is the laser. A laser (**L**ight **A**mplification by **S**timulated **E**mission of **R**adiation) is a radiation source that emits a very intense bundle of electromagnetic rays. The diameter of the bundle can be extremely small. It is characteristic of lasers that they can deliver a large amount of energy to a limited surface. Because of this, they are often employed in laboratories. As regards wavelength, laser frequencies are within those of infrared, visible light and ultraviolet light.


Warningsign for laser

Risks
When a laser beam, or a reflection of this, hits the eye or skin, a risk to health can arise. The intensity of the beam can be so high that eye reflexes do not react quickly enough and the eye may be damaged by heat. Lasers can also damage skin through the creation of heat.
Besides risks to eyes or skin, there are other risks involved in working with lasers:

- The presence of open voltage and high voltage within the housing
- X-rays (emitted with voltages higher than 5 kV)
- Emission of harmful vapours or gases while working on materials

Measures
Rooms where lasers are used are indicated by the warning sign shown above. Special safety regulations apply when working with lasers. Before commencing, the operators are given information on the risks involved with the laser used and the adopted safety measures. Personal protection is provided by safety laser goggles, which only offer protection from laser beams emitted by the type of laser for which the goggles are designed. Each type of laser requires different types of laser safety goggles.
Lasers are categorised by class.

The classification is based on the maximum emission capacity and the wavelength. A class 1 laser is not dangerous (intrinsically safe). Class 4 lasers are the most dangerous.
There are also established exposure limits (MPE values = Maximum Permissible Exposure). These limits are based on damage thresholds.

4.4 Working with centrifuges

Brief description
A technique used in various laboratories is centrifugation. With this, fast spinning creates a centrifugal force so powerful that materials of varying densities are separated from each other. Depending on the materials to be separated, a greater or lesser centrifugal force is required. The higher the revolution speed, the greater the separating capacity.

Risks

- Reaching a hand into a still-spinning rotor can cause serious injury to fingers, wrist and arm
- A rotor knocked off balance owing to incorrect loading can become damaged. This can lead to e.g. breakage of the rotor, with the risk of flying rotor parts causing serious harm to both machine and operator.

As a general rule: the greater the revolution speed used, the greater the risks and the stricter the protocols.

Measures

- It is only permitted to work with centrifuges in accordance with a prescribed protocol specific to the centrifuge concerned. This protocol should always contain an instruction on how the centrifuge is to be loaded and balanced and which tubes and reducers may be used. Ask the laboratory supervisor for this protocol, read it through in advance and follow all the instructions carefully.
- Centrifuges have a number of inbuilt safety precautions. For example, most centrifuges - particularly the faster ones - will only work when the lid is closed

4.5 Working with microwave ovens

Brief description
Laboratory microwave ovens are used in a number of laboratories in the university. For example, plant samples can be very effectively dissolved with the addition of HF, HNO3 and H202. The energy required for decomposing the samples is supplied by the magnetron's microwaves. Another application of the microwaves is the fast boiling of agar media.

The boiling up of media in a microwave

Risks
A build-up of pressure often takes place with the laboratory applications of microwaves. With injudicious use, the containers, capsules or even the microwave itself could explode. Flying debris and aggressive chemicals could then cause serious injuries.

Measures
Working with laboratory microwaves should take place in accordance with an established protocol. The exact content of this protocol will depend on the application and the chemicals required for this. Ask for these instructions from the laboratory supervisor, read the protocol through in advance and follow all the guidelines very carefully.

4.6 Working with pesticides

Brief description
Pesticides are used to combat causes of disease in plants and crops, and are classified according to the effect they have. The most common groups are insecticides (against insects), herbicides (against weeds) and fungicides (against moulds).
Commercial pesticides take various forms. They are available in liquid form, powder for scattering, granules, etc. Under the law on pesticides, the form in which a pesticide is put on the market is called: the formulation.

Risks
Damage to health owing to pesticides can consist of acute effects and long-term effects. Symptoms can vary from skin or eye irritation and vomiting, to neurological damage and even death. Insecticides are most dangerous following absorption, owing to their effect on the central nervous system and the metabolism. Herbicides and fungicides, however, can also cause serious symptoms of poisoning.
Pesticides can enter the body in three ways: via the skin, via the airways and via the mouth. Contrary to popular belief, absorption via the skin is by far the most significant route of exposure. The main occasions when you are likely to be contaminated with pesticides are:

- While making up the liquid for spraying and filling the equipment
- While applying (spraying) the substance
- On re-entering and walking among recently sprayed vegetation
- While cleaning and repairing the used equipment

Pesticides can also present a fire hazard as the substance itself, or the formulation, is flammable

Measures
Working with pesticides is regulated under the 1962 Law on Pesticides, and the pesticides decree based on this law. The rules within Wageningen UR are similarly based on this. The underlying principle of these is to restrict exposure to pesticides to the absolute minimum.
The most important rules are:

- Students are obliged to follow all rules and instructions issued by the supervisor and to use protective equipment recommended and provided by the supervisor
- The application (spraying/scattering) of pesticides on vegetation may only be carried out by employees/students with a spraying licence
- Strict rules apply to the (re) entry into a planted area/greenhouses that have been treated with pesticides. These rules are determined by the manager/responsible official/supervisor
- While working among vegetation that has been treated with pesticides, eating, drinking and smoking are prohibited
- After working with or among vegetation that has been treated with pesticides, you should wash your hands, arms and face thoroughly with soap

Protective equipment for the spraying of pesticides

You will also always find information on the pesticide packaging concerning the hazards and safety recommendations together with the hazard symbols (see: Danger symbols that may be present on pesticide and herbicide labels...).

NB Within the greenhouse complex, Wageningen UR concentrates on prevention at source: this means reduced application of pesticides, fewer toxic substances, or other formulations. We also aim towards increasing use of biological methods instead of chemical treatments.

5 Fieldwork, excursions and practicals

Brief description
In the course of work in the field, such as the sampling of ditchwater, the collection of dead animals, the collection of droppings, cataloguing and the collection of vegetable matter, you may be exposed to a series of risks. The health effects of these risks can vary from the contraction of an infection and the presentation of an allergic reaction to the suffering of a poisoning.

5.1 Allergens

Brief description
In the course of fieldwork you may come into contact with sensitising substances (allergens) that can be harmful to health. If a foreign substance enters the body, the immune system reacts by creating antibodies to this substance. Once an individual has become (over)sensitive to a substance (sensitised), very low concentrations may be sufficient to provoke an allergic reaction. Examples in fieldwork include pollen from all kinds of grasses and trees and spores and mycelium particles from fungi.

Risks
- Skin allergy: rash, eczema, itching and irritation
- Airway allergy: symptoms include coughing, shortage of breath, wheezing, gasping and breathlessness, sneezing fits, a runny nose or blocked nose, itching and inflamed red eyes, fever and muscle and joint pain.

Preventive measures
The best solution is to avoid exposure to allergens as far as possible. Allergens can cause an allergic oversensitivity in concentrations that are lower than the traditionally determined limit values for occupational exposure. Even the exposure to a very low level of inhalation allergens can cause allergic symptoms in the airways of workers who have become sensitive over time.
- Try to limit outdoor activities at times of high pollen concentrations.
- Keep an eye on teletext for the weather forecast for hay fever sufferers.
- Look at www.lumc.nl for the latest pollen levels or look at the pollenkalender.

What to do in case of allergic reactions
- In case of rash try not to scratch and in case of irritated eyes do not rub the eyes. This can exacerbate the allergy or cause infections.
- There is a range of effective eye and nose drops and antihistamines on the market. Do not self-medicate but first seek advice from your company or family doctor.
- Take an allergy test. There are around 500 different allergens on which the blood can be tested, such as fungal spores, pollen from trees, grasses and herbs, animals, insects and insect venom.

Your family doctor can also prescribe the right medication.

5.2 Brown tail moth

Brief description
From June to August the caterpillar of the brown tail moth can be found on common oak, hawthorn, sea buckthorn, birch, elm and fruit trees. The caterpillar has stinging hairs. These stinging hairs spread into the surrounding area from empty nests and by blowing about. You can encounter the brown tail moth anywhere in the Netherlands.

Risks

- Following contact with the stinging hairs a painful, very itchy red rash (small welts, small pimples or fluid-filled blisters) can develop within eight hours;
- Where stinging hairs enter the eyes, they can cause a violent reaction of the conjunctiva and/or cornea with swelling, redness, itching and sometimes infection within one to four hours;
- Following inhalation stinging hairs can cause irritation or inflammation of the mucous membranes of nose, throat and upper airways. The symptoms resemble a cold in the nose. People may also complain about a sore throat and may experience swallowing difficulties. Sometimes they suffer from shortage of breath;
- General symptoms can also occur, such as vomiting, dizziness, fever and general malaise.

The reaction can be allergic. People with allergies and hay fever sufferers are extra sensitive. Even after a number of years the hairs and the venom remain active. Places contaminated with stinging hairs can therefore give rise to discomfort for a long time.

Preventive measures

- Find out about the current situation beforehand by contacting the manager of the area or the municipality;
- Avoid all contact with the caterpillars and their remains, such as released stinging hairs and empty nests;
- When visiting an area with caterpillars make sure your neck, arms and legs are well covered and do not sit on the ground;

What to do following contact with the brown tail moth caterpillar

- After coming into contact with the caterpillars or hairs do not scratch or rub, but wash or rinse the skin or eyes thoroughly with water;
- Immediately after the exposure it may be worthwhile covering the skin with strips of adhesive tape to remove all the stinging hairs;
- If necessary wash clothes very thoroughly with soap and water;
- A gentle cream with camphor or menthol may provide relief;
- The symptoms will usually disappear spontaneously within a few days or weeks. Where symptoms linger or are severe consult your family doctor or company doctor.

5.3 Bee stings and wasp stings

Brief description

During the spring and summer there is a chance of being stung by a wasp or bee in the field. It can happen that a wasp or bee will sting if it feels trapped. It will inject venom into the skin through the stinger. Bees are mainly active in the spring and early summer and wasps in July, August and September. Bees lose their stingers once they have stung and then die. Wasps do not usually lose their stinger and can sting several times.

Risks

People can react to a sting in very different ways:

- After the sting there is usually a slight reaction. There is a short-lived, sharp pain. At the entry point a small red welt appears that can itch a lot. The welt usually disappears fairly quickly, after a few hours or days;
- It can happen that an insect will sting you on the tongue, in the pharynx or even in the eye. In such cases very unpleasant to dangerous situations can occur;
- If you are stung a great many (10-50) times, bee or wasp stings can be dangerous;
- The sting can cause a serious allergic reaction. Symptoms include a spotty rash, swelling of the lips and face, difficulty in breathing, irregular heartbeat and falling blood pressure.

Preventive measures

There are a number of things you can do to avoid being stung by a bee or a wasp:

- If you are surrounded by a swarm of wasps or bees, try to withdraw slowly. Do not hit out at the insects, violent movements make them aggressive and more likely to attack;
- Never hit a beehive or wasps nest and do not throw it – the insects will attack at once;
- Be extra careful when you are eating or drinking outside;
- Avoid perfumed creams and strong perfumes during fieldwork (they attract insects).

If you know that you react fairly violently to a sting, you can discuss whether you should take an antihistamine with your family doctor or company doctor. Antihistamines reduce the reaction of the venom on the body.

Anyone who knows that they are allergic to bee or wasp stings can ask their doctor if they should carry a syringe of adrenaline with them. They can inject themselves with it in emergencies. Colleagues must also learn how to inject the adrenaline, in case the person concerned can no longer do so himself.

What to do having been stung

- Immediately after a bee sting the stinger is usually still visible. It is a hairy protuberance with a small sac at the end. Remove the stinger by exerting light pressure on the skin in the direction of the stinger so that it comes up. You can do this with a nail for example. Try not to touch the stinger or to pull on it. Nor should you use tweezers. Pressure on the sac can cause more venom to be released under the skin;
- The pain can be eased by laying a cold, wet cloth or a face cloth with ice cubes on the site of the sting. There are also remedies available at the chemist's that can alleviate the problems of a sting;
- The swelling will normally subside after a few hours. However, if the swelling has not subsided after a day or has even increased, then you will do best to consult your family doctor;
- If you have been stung in the mouth or neck, the swelling can impede breathing. If this happens, it is advisable to seek medical attention as soon as possible. In anticipation of such attention it is a good idea to suck an ice cube. People who are allergic to bee and wasp stings run an extra risk if they are stung in these places.
- It can happen that an insect will sting you on the tongue, in the pharynx or even in the eye. As the consequences of a sting in such sensitive places are not always harmless, a visit to a doctor is always necessary.
- If the sting causes a severe allergic reaction, you are best to seek immediate medical attention.

5.4 Oak processing caterpillar

Brief description

The oak processionary caterpillar lays its eggs in the tops of oak trees. Once the eggs have hatched, at night the caterpillars go out in groups – in procession – in search of food (oak leaves). After the third shedding the caterpillars acquire stinging hairs (mid-May to June). These stinging hairs spread into the surrounding area from empty nests and by blowing about (July-September). Oak trees with oak processionary caterpillars are often eaten bare and can be recognised by the specific nests on the trunks or thicker branches: dense webs of shed skins, with stinging hairs and droppings.

The caterpillar is mainly spotted in common oaks in towns and villages. Owing to the presence of natural enemies the oak processionary caterpillar rarely leads to problems in woodland areas. The area of distribution of the oak processionary caterpillar in the Netherlands has now extended from the south into Gelderland, Utrecht, Zeeuws-Vlaanderen and large areas of northern and central Limburg.

Risks
From mid-May to mid-June the caterpillars develop stinging hairs. With their barbs the arrow-shaped hairs easily penetrate the skin, eyes and airways on contact. In July to September the hairs can be spread from the nests by the wind.

- Following contact with the stinging hairs a painful, very itchy red rash (small welts, small pimples or fluid-filled blisters) can develop within eight hours.
- Where stinging hairs enter the eyes, they can cause a violent reaction of the conjunctiva and/or cornea with swelling, redness, itching and sometimes infection within one to four hours.
- Following inhalation stinging hairs can cause irritation or inflammation of the mucous membranes of nose, throat and upper airways. The symptoms resemble a cold in the nose. People may also complain about a sore throat and may experience swallowing difficulties. Sometimes they suffer from shortage of breath.
- General symptoms can also occur, such as vomiting, dizziness, fever and general malaise.

People with sensitive airways (asthma) will often react more quickly and more violently. On renewed contact with the stinging hairs or in the event of exposure that is maintained (for example by the wearing of contaminated clothing), a far stronger reaction often occurs (pseudo-allergic reaction). Stinging hairs can still be active after six to eight years. Places contaminated with stinging hairs can therefore give rise to discomfort for a long time.

Preventive measures

- Find out about the current situation beforehand by contacting the manager of the area or the municipality.
- In the period mid-May to the end of September avoid all contact with the caterpillars and their remains, such as released stinging hairs and empty nests.
- When visiting a (wildlife) area with caterpillars make sure your neck, arms and legs are well covered and do not sit on the ground.

What to do following contact with the oak processionary caterpillar

- After coming into contact with the caterpillars or hairs do not scratch or rub, but wash or rinse the skin or eyes thoroughly with water.
- Immediately after the exposure it may be worthwhile covering the skin with strips of adhesive tape to remove all the stinging hairs.
- If necessary wash clothes very thoroughly with soap and water.
- A gentle cream with camphor or menthol may provide relief.
- The symptoms will usually disappear spontaneously within a few days or weeks. Where symptoms linger or are severe consult your family doctor or company doctor.

5.5 Exotoxins and Endotoxins

Brief description
Poisoning can be caused by excretion products or remnants of bacteria or fungi (exotoxins and endotoxins). Exposure can take place during the processing and production of vegetable organisms through inhalation of fine particles. Examples include work on pig farms, chicken farms, in agriculture and composting businesses, such as processing hay, straw, grass seed and grain (products).

Risks

- An example of an exotoxin is aflatoxin. Aflatoxin can lead to severe liver disorders, including liver tumours.
- Exposure to endotoxins can result in fever, breathing difficulties and general malaise.

Measures
The main measure is to prevent the inhalation of (fine) particles (aerosol). This can be done by:

- preventing the occurrence of particles;
- the targeted installation of extraction systems;
- the wearing of face masks;
- doing the work required in an area separate from the employee, by encasing machines, for example.

5.6 Placements and undergraduate projects abroad

Brief description
Many Wageningen University students go abroad on placement or for undergraduate projects. A lot of them come back with health problems, which are usually typical traveller's complaints, such as diarrhoea or a range of stomach bugs. However, in a number of cases there is an occurrence of malaria or other serious illnesses. In short, working abroad, often under conditions of poor hygiene, presents a real risk to health.

Risks
The four most significant risks are:

- Stomach and intestinal complaints (diarrhoea, food poisoning, dysentery)
- Infectious diseases transferred by insects, humans or animals (malaria, TB)
- Traffic accidents
- Sexually transmitted infections (STIs, or SOAs in Dutch)

Measures
In principle, as a student you are responsible for your own health. The university provides you with information and supervision. For example, the university provides the course `Analysis and prevention of health risks in tropical countries'. This course is a pre-condition for applications for travel grants. You are also strongly advised to make an appointment with the student doctor well in advance of your trip and immediately upon your return. The student doctor is aware of health issues relevant to your destination and provides information on subjects such as malaria and AIDS. You can also buy from the doctor the booklet `*Gezond in de Tropen*' [Healthy in the Tropics] (published by the Dutch Royal Tropical Institute). Via the student doctor, you can obtain the required vaccinations, mosquito nets and health certificates, and he can also determine your blood group.

Preparation
Students who go on placement are responsible for arranging the necessary insurance policies. For example: health insurance, liability insurance and accident insurance. Also safety in the receiving country can be an important issue. Useful information, advice and protocols can be found in the "field manual" of Disaster Studies.

General health advice for trips abroad
It takes easily 4-6 weeks from arrival to acclimatise to a tropical country. Your body has to adapt to the climate, the humidity, the food and the time difference. During this initial period you are extremely sensitive, e.g. to infections. It is important to take things gradually in the beginning. Take time to acclimatise and take things slowly at first.

- Drink only water that is safe (boiled or bottled)
- Open stretches of (fresh) water are often not suitable or safe to swim in. Enquire about this locally before swimming
- Avoid insect bites by using mosquito nets or mosquito repellent (DEET)
- If you have sex, take precautions

Websites - Student facilities …
- Student Counselling Service (DSB) …

Links - Wijs op Reis (Know Before You Go) (Ministry of Foreign Affairs)
- Health tips for travellers
- Travel and health at http://www.tropenzorg.nl

5.7 Tick bites

Brief description
During field practice, you may suffer a tick bite. Ticks look like small brown-black spiders and are between 1 and 3 mm in size. They are found where the relative humidity is at least 80%, such as areas of wild vegetation, low undergrowth in forests, dunes and old beech avenues on country estates. In the Netherlands, ticks are active mainly from April to October, but it is also possible to be bitten at other times.

Risks
Ticks can pass on Lyme's disease. They feed on the blood of both animals and humans, fastening onto the skin and sucking until they are full of blood. While doing so, they may pass on a Borrelia infection. On average, around 15% of ticks are infected with the Borelia bacterium and the number of infected ticks can vary per region. Once you've been infected, you will not necessarily become ill. The bacteria cause Lyme's disease in only 6% of cases (see: Effects of Lyme's disease on health...).
Infections caused by tick bites can also take place outside of the Netherlands. The effects may be different in other countries, since different bacteria are found in ticks abroad and therefore other diseases may be transferred.

Measures
The best ways to avoid an infection of Lyme's disease are:

- Prevent a tick bite by avoiding contact with vegetation and high grass: wear clothes that cover you and rub on and insect repellent cream
- Remove the tick from the skin within 24 hours.

It is therefore important after field practice to check that no ticks have attached themselves to your skin. Check in particular the neck, behind the ears, the groin, the hollows of the knees, armpits and abdomen. If the tick is removed within 24 hours, the chances of an infection are zero. However, the removal must be done in such a way that the tick is not able to pass on the bacteria. For this purpose, the foundation SAAG (http://www.saag.nl/) has developed special tweezers and provides a description of the correct method of removal:

1. Use pincers with which you can grasp the tick without flattening it, e.g. eyebrow tweezers or tick tweezers.
2. Grip the skin in such a way that it bulges out. Place the pincers over the tick as close as possible to the skin. Ensure that the body does not come between the pincers.
3. Pull the tick carefully out of the skin with a lightly twisting movement. Do not flatten the tick in doing this.
4. Disinfect the wound with alcohol or iodine.
5. Note the date of the bite in your diary and inspect the skin around the bite over the following weeks.

NB NEVER apply oil, alcohol or a burning cigarette to a tick before removing it. This can make the tick take shock and react by emptying its stomach contents, including the bacteria, into your skin.

If, following a tick bite, you display any of the symptoms (see: Effects of Lyme's disease on health...) or if you have any doubts about this, you should visit the student doctor or your GP. It is important to tell them the exact date on which you were bitten. If it appears that you have indeed contracted Lyme's disease through a tick bite, this should be reported to the relevant tutor/trainer and to the AMD [Occupational Health and Environmental Service] via the (electronic) accident form.You can complete this yourself or have it completed by the tutor/trainer. The latter are ultimately responsible for reporting the incident.

5.8 Fieldwork and UV radiation

Brief description
In this country 20,000 cases of skin cancer are diagnosed each year. Research shows that people who spend much of their time working outdoors are a group with a higher risk. Research also shows that there is a clear link between exposure to sunlight (UV radiation) and the contraction of skin cancer.

Risks
Health effects from UV radiation can be divided into acute effects and chronic effects. Acute effects include burning of the skin (sunburn), inflammation of the cornea (actinic conjunctivitis), allergic reactions and weakening of the immune system. Acute effects occur on exposure to a given amount of UV radiation (threshold value).
Chronic effects in the skin are ageing and the formation of melanomas (skin cancer). There is no threshold value for skin cancer, any amount of UV increases the chances of it.

People who work outdoors have to process two to three times as much UV radiation as the average Dutchman. The Health Council estimates that people who work outdoors have a four to five times greater chance of contracting skin cancer than people who work indoors.

Preventive measures

- Work in the shade during periods of high radiation intensity.
- Protect the eyes by wearing sunglasses with glass that does not allow any UV radiation through at the side of the head.
- Protect the skin by wearing long trousers, shirts with long sleeves, a hat or cap with peak and neck flap.
- Apply sun creams with a sufficiently high protection factor (10 and above) regularly. This is mainly a matter of the ear edges, the neck, the face and the back of the hands. The cream must be re-applied every two hours, or more frequently if you perspire a lot in the course of your work.

What to do where the said effects occur

- If you suffer sunburn, give the skin a few days to recover. Use an after-sun product or cool, wet compresses (wet cloths, slices of cucumber, etc) and drink plenty. If large blisters appear, you are probably suffering from second-degree burns. In this case go to your family doctor or company doctor.
- If you have suffered sunstroke, make sure you cool down by laying wet cloths on your head and drink plenty. Then go to your family doctor or company doctor.
- Likewise if you are having trouble with a sun allergy (small itching welts, small blisters and scales on the parts of the body that are exposed to the sun), it is a good idea to consult your family doctor or company doctor.
- Go to your company doctor or family doctor if a mole changes or a sore on the skin does not get better.

5.9 Bird flu/fowl pest

Brief description

In the course of work in the field such as picking up dead birds or collecting droppings of birds or when visiting poultry farms, Wageningen UR students can come into contact with the bird flu virus. Bird flu (avian influenza) is a highly contagious viral disease for birds that can be transmitted to poultry and to a number of other bird types. As with other flu viruses there are many different variants of the virus. The most recent variant is the H5N1 type. People can be sensitive to the H5N1 variant and from this point of view there is a certain risk to health.

Risks

The main ways of contracting an infection with the bird flu virus are intensive direct contact with birds or raw meat, blood or droppings of birds, raw eggs, feathers/down material and inhalation of infected particles (e.g. dried droppings or parts of feathers). The contagiousness of birds one to another however is many times greater than from bird to human. This is because the virus can penetrate into the nose or pharynx of the bird. In humans infection only takes place when particles find their way deep into the lungs or when infected meat or blood is eaten.

Preventive measures

- Do not touch dead birds, bird droppings, feathers/down material with your bare hands.
- As far as possible avoid direct contact with living water birds and poultry.
- After contact wash hands with soap and water.
- Avoid rubbing in eyes, nose or mouth while you are working.
- It may be, if direct contact with birds is expected, that a flu vaccination is worthwhile. This is mainly to prevent the mixing of human flu virus and bird flu virus with the possible formation of mutations that are harmful for people. Consult your company doctor about this.
- Use personal protective equipment such as: face masks (P1 or P2), water-repellent disposable overalls, gloves and safety goggles with a good seal.

What to do after possible infection with the bird flu virus

- If you have any flu-like symptoms having had contact with infected material, contact the company doctor or your own family doctor as soon as possible.
- A number of rules of behaviour (gedragsregels...) have been drawn up to prevent further spread, keep to them!

Rules of behaviour for staff and students of Wageningen UR with regard to bird flu

1. Staff/students who have been in an infected area in the last 72 hours may not enter the practical/laboratory animal areas of Wageningen UR. NB: this applies even if you have not been on a poultry farm in such an area.
2. Staff/students who have been in the sheds on other poultry farms in the last 72 hours may not enter the practical/laboratory animal areas of Wageningen UR.
3. All visitors (including researcher/students) to practical centres/laboratory animal areas of Wageningen UR must sign a declaration to confirm that they have not been on a poultry farm or in an infected area in the last 72 hours. They must also change their clothes/footwear and wash their hands before entering the area.
4. Persons (for example vets) for whom it is impossible to meet the 72-hour requirement and for whom it is nonetheless necessary to enter the sheds must, in addition to the change of clothes regime, shower if possible.
5. Poultry laboratory animal keepers who have hobby poultry at home are asked to leave the care of these animals to others as far as possible. If this is not possible, it is recommended that the care of the animals be done after working hours. It is obligatory to shower and to change clothes/footwear before and after working hours.
6. Staff/studentswho go on different practice farms with poultry for their work are advised not to go from one farm to another within 72 hours.
7. Staff/students who go to countries where bird flu has been found for their work, and who go to work with (possibly) infected animals, must contact the Wageningen Health, Safety and Environment Office (AMD). Contacts are Wim Koops (tel 0317-484175) or Fred Hoek (0317-482212). Depending on the personal situation various protective measures are necessary.
8. Staff and students who go to countries where bird flu has been found for work or privately, but who do not go to work with (possibly) infected animals, are asked to adhere to the guidelines of the Ministry of Agriculture, Nature Management and Fisheries (LNV) (create link to LNV): http://www9.minlnv.nl/servlet/page?_pageid=1004&_dad=portal30&_schema=PORTAL30
9. No advice is given to staff/students to vaccinate their hobby poultry as soon as this is possible. Wageningen UR experts do not think vaccination is all that worthwhile because the chance of hobby poultry becoming infected with bird flu is very low (the animals are after all in coops). The chance of bird flu occurring through mutual contacts is far greater, and therefore hygiene measures are far more important.
10. It is of course assumed that all staff/students comply with the national obligation to keep hobby poultry in coops.

5.10 Zoonoses

Brief description

Animals can, even without exhibiting disease symptoms themselves, be carriers of an infectious disease that can be transmitted to humans (zoonosis). In the course of work such as the collection and examination of dead animals, the catching of animals in traps and the collection of droppings, feathers or blood samples, Wageningen UR students can be exposed to zoonoses.

Risks

- When laying traps it is possible that you will be bitten or scratched. As a result you may for example suffer a wound infection (tetanus, streptobacillus) or, in the case of (wild) mice, the hantavirus, resulting in fever and muscle pain, nausea, vomiting or diarrhoea;
- Through contact with the urine of cows and rats you can be infected with leptospirosis, resulting in fever, muscle pain, headache, oversensitivity to light, nausea and vomiting (Weil's disease, milker's fever);
- Through contact with blood or manure you can be infected with salmonellosis, resulting in vomiting, nausea, diarrhoea, fever, dehydration);

- In the case of workers with reduced resistance or fitness an infection can more easily lead to illness.

Preventive measures
Each biological agent has its own specific preventive measures, but the following is generally true: minimisation of exposure by complying with recommended rules of behaviour, avoidance of contact and the use of personal protection such as gloves, face masks and protective clothing. Consult your manager and the Health, Safety and Environment Coordinator for your part of the organisation on specific measures.
Take appropriate hygiene measures such as not eating and drinking in the course of the contact with animals and washing hands after the contact with animals;
When working with animals you must ensure you have good protection against tetanus. Incompletely vaccinated bite victims must be vaccinated against tetanus;

What to do in case of a suspected infection with a zoonosis
If you fall sick after contact with animals or animal material, it is important to consult your family doctor and/or company doctor as soon as possible and to mention the possibility of a zoonosis. With early treatment many zoonoses are relatively easy to treat. But if you have been coming down with the disease for some time, it can often be very difficult to get rid of it.

Links
Further information about disease symptoms that may be caused by a zoonosis for the type of animal with which you work can be found at the web site of RIVM,
http://www.rivm.nl/Thema_s/Infectieziekten/Zoönosen

6 Personel protective equipment

Brief description
Despite all attempts at keeping the work environment clean and safe, personal protection equipment (known as `PBMs' in Dutch) is sometimes necessary. In such cases, Wageningen UR ensures that the appropriate personal protection equipment is available in sufficient quantities. Students themselves are responsible for using the equipment provided in the appropriate manner.

Risks
Personal protection equipment never totally excludes the possibility of harmful effects, but only reduces the effects and/or exposure. The effectiveness of personal protection equipment is dependent on, among other things:

- Correct use;
- Correct storage and maintenance
- Quality of the equipment

Measures
PBMs can be roughly divided into six different types of protection:

6.1 Eyes and face protection

When glassware breaks, splinters or aggressive chemicals can get into the eye. In this type of situation, safety goggles provide protection.
It is compulsory to wear these e.g. when working with corrosive and/or irritant materials or when there is a danger of explosion or implosion.

6.2 Protection of hearing

Noise-related deafness is one of the most common industrial injuries. People who are regularly exposed to excessive noise levels in their working environment appear to become less sensitive to it over time. In fact, their hearing deteriorates and the risk of noise-related deafness only increases. That is why it is important to do everything possible to prevent this damage.
The use of hearing protection is compulsory when working with a noise level above 85 dB (A) and in areas where work is carried out with ultrasonic sound. Wageningen UR has to make sufficient and appropriate hearing protection equipment available in these cases. Students are obliged to wear these hearing protectors. Hearing protection equipment may consist of earplugs, ear protectors or (made-to-measure) otoplastics.


Ear muffs

Ear plugs


Otoplastics (individually moulded hearing protectors)

6.3 Gloves

It is compulsory to wear gloves when you work with materials that can penetrate the skin, but also to prevent further infection. You also wear gloves when working with corrosive or degreasing materials, rough or sharp materials or with very hot or cold materials or objects. When working with hazardous materials, you should bear in mind that disposable gloves only provide temporary protection.
Among other kinds, latex, vinyl and neoprene gloves are available for working with hazardous materials (further information on various types of gloves is available at the ARBO website...).

In the more recent issues of the chemical chart, a table is included that indicates the most suitable type of gloves for use with many of the materials.
Most gloves are intended for a single use. You must also take care when removing the gloves that you don't get any of the chemicals on your hands. See: Tips for the use of safety gloves...

6.4 Protective clothing

It is necessary to wear protective clothing, such as a lab coat, while working in a laboratory. A lab coat protects the skin as well as the clothes from harmful materials.
To avoid contamination elsewhere, you should remove the protective clothing when leaving the laboratory.

6.5 Respiratory protection

Respiratory protection equipment protects you against inhaling hazardous materials. You should wear this equipment in the areas where this is indicated by the safety signs. Depending on the circumstances, you use various types of breathing protection. Examples are cellulose masks (a "snout") for working with (non-toxic) material and gas masks (Nose-and-mouth mask or full face mask) with various filters for working with hazardous materials or gases and vapours.


'Snuitje"


Half face mask


Full face mask

6.6 Safety footwear

Depending on the risk, various types of safety shoes are worn. There are, for example, shoes with high resistance to the penetration of aggressive materials, or shoes with a steel cap for working with heavy materials.



Various safety shoes

Links
http://www.groeneveld-intersafe.nl/ (look under catalogue).