HSE at IBT

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

Martin Gimmestad,

16.09.19

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What is HSE?

- Health:
  protection of health
- Security:
  security for workers and users
- Environment:
  protection of natural and working environment

- HSE laws and regulations – systematic work required

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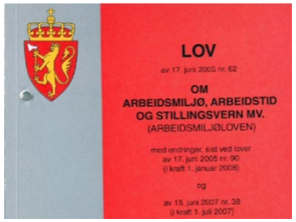
The working environment act



Section § 3-2. Special safety precautions

(1) I……the employer shall ensure:…that employees are **informed of accident risks and health hazards**.....[ensure] they receive the necessary **training, practice and instruction**…

(2) …….the employer shall ensure that satisfactory **personal protective equipment is made available** to the employees……**that the equipment is used**.

Employees (and students) students must comply

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To work in an IBT lab

- Guided tour in lab

- Lab rules

- Risk assessment

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

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Risk assessment

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Risk assessment = «speed limit»

Plan first - do after!

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Definition:
Risk = probablility x consequence

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

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Risk = probablility x consequence

Likelihood

Minimal 1	Low 2	Medium 3	High 4	Very high 5
Once every 50 years or less	Once every 10 years or less	Once a year or less	Once a month or less	Once a week

Consequence

Grading	Human	Environment	Financial/material
E Very critical	May produce fatality/ies	Very prolonged, non-reversible damage	Shutdown of work >1 year.
D Critical	Permanent injury, may produce serious serious health damage/sickness	Prolonged damage. Long recovery time.	Shutdown of work 0.5-1 year.
C Dangerous	Serious personal injury	Minor damage. Long recovery time	Shutdown of work < 1 month
B Relatively safe	Injury that requires medical treatment	Minor damage. Short recovery time	Shutdown of work < 1week
A Safe	Injury that requires first aid	Insignificant damage. Short recovery time	Shutdown of work < 1day

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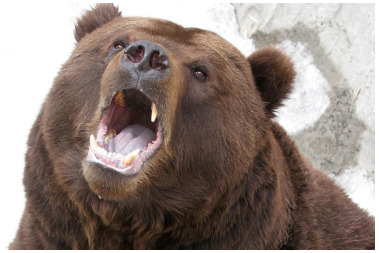
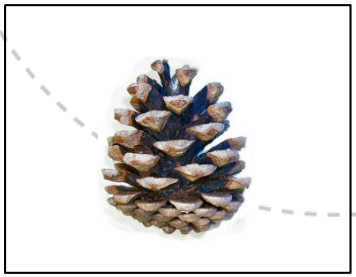
Risk = probablility x consequense





- Undesired incidents?
- Risk values?

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

Mosquito bite

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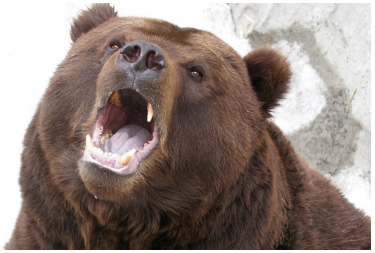
Risk = probablility x consequense



Attacked by

Serious health injury

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

Hit on head by

Mosquito bite

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Systematic HSE: risk assessment

Identification

Identify *activities* involving risk

↓ *For each activity*

Perform risk evaluations

↓ *For each activity*

Safety measures (= Lab rules)

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Hazardous activity identification form

- Download form from from IBT-wiki «HSE at IBT»

NU HSE	Hazardous activity identification process	Prepared by	Number	Date
		HSE section	HMSRV-2601	01.12.2006
		Approved by	Page	Replaces
		The Rector	1 out of 1	15.12.2003

Unit: **Date:**
Participants in the identification process (including their function):

Short description of the main activity/main process:

Student/employee/guest		Supervisor/leader	
Name (Capital letters)	*Signature*	*Name (Capital letters)*	*Signature*

Names, date, signatures, description

ID nr	Activity/process	Existing documentation	Existing safety measures	Working alone allowed? (Y/N)	Registration in exposure registry (E) or medical examination (M) required? (E/M)	Comment, Laws, regulations etc.

ID number

What are you going to do?

Manuals, protocols, etc.

Protective equipment, routines, substitutuion of chemicals etc.
=
LAB RULES

Possible to get help?

H340, H350, H350i-chemicals?

Extra information

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Risk assessment form

NTNU HSE/KS	Risk assessment	Prepared by	Number	Date
		HSE section	HMSRV2603	04.02.2011
		Approved by	Page	Replaces
		The Rector	2 out of 2	01.12.2006

Unit: **Date:**
Line manager:
Participants in the risk assessment (including their function):

ID nr	Activity from the identification process form	Potential undesirable incident/strain	Likelihood:	Consequence:			Risk value	Comments/status Suggested measures
			Likelihood (1-5)	Human (A-E)	Environment (A-E)	Economy/ material (A-E)		
1	Activity 1	Incident 1						
1	Activity 1	Incident 2						
1	Activity 1	Incident 3						
2	Activity 2	Incident 1						
2	Incident 2	Incident 2						

Likelihood, e.g.:
1. *Minimal*
2. *Low*
3. *Medium*
4. *High*
5. *Very high*

Consequence, e.g.:
A. *Safe*
B. *Relatively safe*
C. *Dangerous*
D. *Critical*
E. *Very critical*

Risk value (each one to be estimated separately):
Human = Likelihood x Human Consequence
Environmental = Likelihood x Environmental consequence
Financial/material = Likelihood x Consequence for Economy/materiel

CONSEQUENCE					
Very serious	E1	E2	E3	E4	E5
Serious	D1	D2	D3	D4	D5
Moderate	C1	C2	C3	C4	C5
Small	B1	B2	B3	B4	B5
Very small	A1	A2	A3	A4	A5
	Very small	Small	Moderate	High	Very high
	PROBABILITY				

from identification form

Separate incidents on rows

Cosequences and likelihood

Udesired incidents. Separate on each row

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Digital risk assessment?

- Risk manager – same principle
  https://innsida.ntnu.no/wiki/-/wiki/English/Risk+assessments

- Does not work well – do not use!

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«Mickey Mouse» example

CONSEQUENCE	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

What is the activity?
What is undesired incident (mouse perspective)?
What is the risk (probability x consequense)?
How reduce risk?

(1) Do another experiment
(2) personal protective equipment!

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Risk assessment example - work with liquid N2

Temp: -196 C

Undesired incidents

- Frost bite
- Suffocation

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Identification of activites

NU HSE	Hazardous activity identification process	Prepared by	Number	Date
		HSE section	HMSRV-26/01	01.12.2006
		Approved by	Page	Replaces
		The Rector	1 out of 5	15.12.2003

Unit: IBT **Molecular Genetics and Microbiology**

Date revised: **04.06.2018**
Date signed:

Participants in the identification process (including their function): You (M.student/PhD/PostDoc/researcher), Supervisor (Professor)

Student/employee/guest		Supervisor/leader	
Name (Capital letters)	*Signature*	*Name (Capital letters)*	*Signature*

Short description of the main activity/main process: Molecular genetics and microbiology

ID nr	Activity/process	Existing documentation	Existing safety measures (status as lab rules!)	Working alone allowed? (Y/N)	Registration in exposure index (E) or medical examination (M) required? (E/M)	Comment
5	Work with liquid N_2	Regulation for filling and transport. NTNU HSE guidelines for work with chemicals and gasses	Glasses, thick gloves. Easily removed footwear. Avoid shoes with wide opening to avoid spilling N_2 into the shoes. Suitable containers for transport.	Y*		Training necessary. *Requires sufficient ventilation. See following point regarding transport of N_2

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Risk assessment – liquid N2

NTNU HSE/KS	Risk assessment	Prepared by	Number	Date
		HSE section	HMSRV2603E	04.02.2011
		Approved by	Page	Replaces
		The Rector	7 out of 5	01.12.2006

Unit: **IBT - Microbial biotechnology** **Date: 04.06.2018**
Line manager: Kjetil Rasmussen

Participants in the identification process (including their function): You (M.student/PhD/PostDoc/researcher), Supervisor (Professor)

ID nr	Activity from the identification process form	Potential undesirable incident/strain	Likelihood:	Consequence:				Risk value	Comments/ status Suggested measures
			Likelihood (1-5)	Human (A-E)	Environment (A-E)	Economy/ material (A-E)	Reputation (A-E)		
5	Work with liquid N_2	Frostbite	2	C	A	A	B	C2	Follow regulations for filling/transport. Oxygen measurement?
5	Work with liquid N_2	Suffocation	1	E	A	A	E	E1	Follow regulations for filling/transport. Oxygen measurement?

CONSEQUENCE						
	Very serious	E1	E2	E3	E4	E5
	Serious	D1	D2	D3	D4	D5
	Moderate	C1	C2	C3	C4	C5
	Small	B1	B2	B3	B4	B5
	Very small	A1	A2	A3	A4	A5
		Very small	Small	Moderate	High	Very high
		PROBABILITY				

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Documentation of risk assessments at IBT

Institute archive

IBTs **archive** of risk assessments

Lab archive

Lab archives
Mol. gen og microbiology

1.Mapping of activities
2. Risk assessment

Food chemistry

1……..
2. …….

blabla

1…….
2. ……

……
……

With supervisor:
- **Find relevant activities**
- **Copy into your form**

Personal archive

Mol gen student 1
Mapping activities
Risk assessment

Mol gen student 2
……..
……

……
……

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Risk assessment of master thesis summarized

- Write risk assessments with your supervisor

  - **You may copy** relevant risk assessments from archive
  - **write new** risk assessments

- Make sure that the any new risk assessments are included in the archive (supervisors job).

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IBT lab rules

Wiki «Lab management at IBT»

us Literature Student life

Intended for: Employees Students

Lab management at IBT

Details Print

WIKI UNDER CONSTRUCTION

This page covers information, procedures and routines for laboratories at the Department of Biotechnology and Food Science.

General information

Purchases for labs

Chemicals and equipment for the labs must be ordered by e-requisition [ENG/NO].

E-requisitions for chemicals must have attached an order form [ENG] and relevant SDSs for planning of reception and handling [NO/ENG]. E-requisitions without these attachments will be returned.

Instrument responsibility

List of instrument responsibilities [NO] and role description [NO].

Access to laboratories

- Contact the lab coordinator of the relevant lab (see below) to make an appointment for lab/HSE training.
- Download and read the lab rules and routines for the relevant lab before the lab/HSE training (see below).
- Fill out receipt for training (included in the lab rules) and hand in to the lab coordinator.
- Download risk assessments and go through with supervisor. Add any relevant procedures and sign before handing in to the lab coordinator.
- Access to the laboratories will be granted by the lab coordinator after completion of training and handing in receipt for training/risk assessments.

HSE

For general HSE information for IBT see wiki HSE at IBT. For lab specific info see below.

IBT laboratories Gløshaugen

Molecular genetics and microbiology

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1. General information
   a. Purchases for labs
   b. Instrument responsibility
   c. Access to laboratories
   d. HSE
2. IBT laboratories Gløshaugen
   a. Molecular genetics and microbiology
   b. Microbial physiology
   c. Biopolymer chemistry
   d. Mass spectrometry
   e. NMR
   f. Analysis and control of microbial systems
   g. Food science
   h. Common resources
3. IBT laboratories Akrinn (Food science)
   a. Microbiology
   b. Analytical chemistry
   c. Food processing
   d. Common resources

IBT laboratories Gløshaugen

Molecular genetics and microbiology

Key information

- Location: Kjemi 3, 1st floor
- Lab coordinator: Hanne Jørgensen
  - E-mail: hanne.jorgensen@ntnu.no
  - Phone: 91351279
- Operation support: Tove Enmo Bugge

Facilities and equipment

- General microbial molecular biology laboratories (Biosafety Level 1)
- Laboratories for work with genetically modified organisms (GMO)
- Laboratory for work with biological agents classified as Risk Group 2 (Biosafety Level 2)
- Cold storage room (-20 °C)

HSE

- Lab rules for the general microbial molecular biology laboratories: [ENG]
- Lab rules for the Risk Group 2 laboratory: [ENG]
- Risk assessments [ENG]

Routines

- Autoclaving and washing - work description [ENG]

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Access to IBT lab

Hand in:

- Tour in lab – sign «lab rules»
- Hand in risk assessment
- Lab coordinator will give access

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Working in labs outside NV-faculty

Declaration for work in laboratories outside the NV-faculty (NTNU)

This declaration must be filled out by employees and students at Department of Biotechnology and Food science (IBT), NTNU, before undertaking work in laboratories outside the NV faculty. This declaration documents that the working environment at the external laboratory is "thoroughly sound". The working environments in external laboratories must comply to safety standards comparable to those required by Norwegian legislation (Working Environment Act). A risk assessment for the work must be attached to this declaration. The attachment will document that the activities are risk assessed and that the necessary safety measures have been established. Employee/ student is obliged to comply to the safety measures.

Declaration

It is confirmed that the working environment at the external laboratory is " thoroughly sound". This includes that:

- External activities meet relevant HSE requirements according to Norwegian legislation or equivalent (abroad). Students / employees should not be exposed to danger.
- Employee / student gets the necessary local HSE training at an external laboratory
- Necessary protective equipment is available
- The activities of the external laboratory are risk assessed and the risk assessments are documented

The student / employee is obliged to report to his/her leader/supervisor if the working environment is not "thoroughly sound" or if this is questionable.

☐ Risk assessment for work at external laboratory is attached to the statement (tick box)

External laboratory:		
Adress:		
Name (Capital letters)	**Place/date**	**Signature**
Employee/student who will work in external laboratory:		
Supervisor/Leader IBT		
Representantative external laboratory		

- Declaration of thorougly sound working environment

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Accidents: Examples

versitas.no/nyhet/55562/krever-full-forsikring

Universitas og Norsk studentorganisasjon (NSO).

HUDEN FLERRET AV HENDENE

Tirsdag 26. januar jobber Hjelmås på et av laboratoriene ved Farmasøytisk institutt. Han står ved en rotasjonsfordamper og damper en prøve av et plantestoff han skal undersøke i forbindelse med masteroppgaven. Dette er en rutine han har vært gjennom flere hundre ganger i løpet av fire og et halvt år som student ved instituttet.

Klokken nærmer seg halv fire på ettermiddagen, og Hjelmås skal akkurat til å runde av arbeidsdagen. Motoren kjennes uvanlig varm. Han skrur av apparatet og skal akkurat til å åpne for vakuumet i kolben, da apparatet eksploderer.

– Smellet var så høyt at det eneste jeg hørte etterpå var meg selv som brølte. Jeg så ingenting annet enn flammer og blod.

Nye apparater: Instituttet har byttet ut de gamle rotasjonsfordamperne i etterkant av ulykken.

Ødelagt øye: Stig Øyvind Hjelmås er blitt blind på høyre øye etter at regnbuehinnen og linsen ble knust av glassprut fra en eksploderende rotasjonsfordamper. FOTO: Hanne A. Hjelmås

Undervisere som holdt til i rommet ved siden av kommer løpende da de hører eksplosjonen. Glassbiter fra kolben og apparatet har truffet ham i ansiktet og det høyre øyet. Men det første Hjelmås oppdager er hendene.

– All huden var flerret av hendene, og blodet pumpet ut i takt med hjerteslagene. Fingrene klistret seg sammen på grunn av alt blodet.

Rotavapor felt warm, when shutting down it exploded violently
-glass shards in eye and face -- permanently blinded in one eye.
- Skin on hands torned off

sitas.no/nyhet/55562/krever-full-forsikring

– Hvis jeg skulle bli uhør eller sykemeldt over lang tid, trenger jeg ikke bekymre meg for a

«It was pretty stupid of me not to wear safety glasses but even so these kinds of accidents should not happen»

BLODSPOR PÅ LABBEN

Etter tre måneder med sykehusopphold, jevnlige legebesøk og sykemelding, vendte Stig Øyvind Hjelmås tilbake til universitetet. Han tok et krafttak og fikk levert masteroppgaven bare få uker etter resten av kullet. I dag jobber han i et apotek i hjemkommunen Karmøy – et arbeid han kan utføre uten nevneverdig tilrettelegging.

Det så lenge ut som det var mulig å redde noe av synet på det høyre øyet, men etter at netthinnen løsnet for andre gang rundt påsketider har det sett mørkere ut. Nå har han innstilt seg på å være blind på det ene øyet resten av livet.

– Jeg tenker at det er ganske dumt at jeg ikke hadde på meg vernebriller. Samtidig tenker jeg at dette i utgangspunktet aldri skulle skjedd. Sånne briller er laget for å beskytte mot væskesprut, ikke mot glasskår. Glasspruten lagde i tillegg hull i glassruter én meter bak meg, så jeg tror ikke vernebriller ville stoppet glasskårene.

IBT example 27.10.18: Implosion of flask connected to freeze drier

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HSE-course at NV ("part 4"), *Local issues and routines*

Department of Biotechnology

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Overview

1. Sources of HSE-information
2. Chemicals
3. Protective equipment
4. Biological factors
5. Radiation
6. Gas, high temperatures, electrical hazards

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Sources of HSE-information

1. NTNU (wiki)
2. Faculty (wiki)
3. Institute
   - IBT-wikies
   - HSE coordinator
   - HSE-responsible in lab
   - Your supervisors!

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Sources of HSE-information - IBT

u.no/wiki/~/wiki/Norsk/HSE+at+IBT

profile Topic

HSE at IBT

Information about Health, Safety and Environment (HSE) for employees and students at the Department of Biotechnology and Food Science (IBT)

Additional information: HSE guidelines - summary page | HSE for employees

Key contacts

Institute manager

- Kjetil Rasmussen

HSE coordinator

- Martin Gimmestad

Radiation protection coordinator

- Randi Utgård

Gas coordinator

- Torun Margareta Melø

Safety representatives

- **Gløshaugen:** Hanne Jørgensen Deputy: Gerd Inger Sætrom
- **Akrinn:** Trond Viggo Pettersen Deputy: Atle Hannisdal

Emergency preparedness

General

In case of acute emergencies immediately contact emergency and rescue services (Fire department: 110; Police: 112; Ambulance: 113). In other emergencies contact your leader.

The room cards (see below) contain information that is relevant for emergency situations and must always be updated.

- Emergency preparedness at NV [NO]
- Emergency preparedness at NTNU [NO/ENG]

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1. Key contacts
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   c. Radiation protection coordinator
   d. Gas coordinator
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   d. Release of GMO
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Chemicals

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Handling of chemicals

Purchase → Storage → Use → Disposal

Purchase

Planning of use: SDS!
Chemical properties

Storage

Ventilation?
Fire safety?
Locked in?

Use

Risk assessment!
Labelling
Personal protective equipment?
Exposure index?
Health examination?

Disposal

Risk assessment!
Dangerous waste?
Risk waste?
Chemical reactions?

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Check potential hazards and safety precautions for chemicals in the safety data sheet!

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Substance index (SDS)

Safety data sheets

NTNU's substance index is an electronic archive containing safety data sheets and information sheets on hazardous chemicals, substances and biological materials.

Norsk versjon - Stoffkartotek

Topic page about HSE | Pages labelled with HSE

Log into the substance index

Log into the substance index.

Please note that you need to use VPN to log on to the substance index outside NTNU's network.

If you are a new user, a user account will be created automatically the first time you log in. You will have read access. The substance index is available to all staff and students at NTNU. **Please note that most of the safety data sheets and information sheets are in Norwegian**.

In the substance index you may also access NTNUs exposure index: Log into the substance index, click 'Administration' in the menu on the left side, and click 'Exposure'.

Responsibilities and tasks

See Stoffkartotek - kontaktpersoner (in Norwegian).

Support

Questions regarding functions in the substance index:

- ECOonline Support, **tel. 33 01 68 20, email: support.no@ecoonline.com**. ECOonline Support is available by phone from Monday to Friday at 08:30 p.m. - 3:30 a.m. Email received before 3 a.m. is normally answered the same day.

Questions regarding work with the substance index at your unit and if you need additional rights in the substance index:

- Contact the SDS database contact at your unit.

Other questions:

- See Contact.

- Records of chemicals: safety data sheets (SDS)
- MSDSs are available in paper copies in the laboratories (iPads soon)

https://innsida.ntnu.no/wiki/-/wiki/English/Safety+data+sheets

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Safety data sheet

The SDS follows a 16 section format which is internationally agreed

- SECTION 1: Identification of the substance/mixture and of the company/undertaking
- SECTION 2: Hazards identification
- SECTION 3: Composition/information on ingredients
- SECTION 4: First aid measures
- SECTION 5: Firefighting measures
- SECTION 6: Accidental release measure
- SECTION 7: Handling and storage
- SECTION 8: Exposure controls/personal protection
- SECTION 9: Physical and chemical properties
- SECTION 10: Stability and reactivity
- SECTION 11: Toxicological information
- SECTION 12: Ecological information
- SECTION 13: Disposal considerations
- SECTION 14: Transport information
- SECTION 15: Regulatory information
- SECTION 16: Other information

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Pictograms/Hazard symbols

Gas under pressure
Symbol: Gas cylinder

Explosive
Symbol: Exploding bomb

Oxidising
Symbol: Flame over circle

Flammable
Symbol: Flame

Corrosive
Symbol: Corrosion

Health Hazard
Symbol: Exclamation Mark

Acute toxicity
Symbol: Skulls and Crossbones

Serious health hazard
Symbol: Health hazard

Hazardous to the environment
Symbol: Environment

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Example: sulfuric acid

Example -important information regarding risk factors not given in primary hazards READ WHOLE SDS!

Natriumazid CAS-nr. 26628-22-8

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]
Acute toxicity, Oral (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

Classification according to EU Directives 67/548/EEC or 1999/45/EC
Very toxic if swallowed. Contact with acids liberates very toxic gas. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008 [CLP]
Pictogram

Signal word	Danger
Hazard statement(s)	
H300	Fatal if swallowed.

Does not say anything about reactivity and explosion hazard

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage. Do not store near acids.

Heat sensitive.

Avoid water
Highly reactive!
Explosion hazard!

10.4 Conditions to avoid
An explosion occurred when a mixture of sodium azide, methylene chloride, dimethyl sulfoxide, and sulfuric acid were being concentrated on a rotary evaporator.

10.5 Incompatible materials
Halogenated hydrocarbon, Metals, Acids, Acid chlorides

Storage requirements for chemicals

- Volatile and toxic substances should be stored in ventilated rooms/cabinets
- Flammable substances should be stored in fire safe cabinets
- Toxic substances should be stored unavailable to unauthorized personnel
- Reactive substances must be kept apart

Check SDS!

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Labelling of chemicals in unoriginal packing

Label with:

1. Content (chemical or mixture)
2. concentration
3. CLP-pictogram
4. date and
5. «owners» name

Check SDS!

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Chemical and biological waste

Must not be mixed with other categories of waste:

1) Risk waste (biological)
2) Dangerous waste (chemical)
3) Explosive waste*
4) Spontaneously combustible waste*
5) Radioactive waste

- See SDS, normally section 2, 10, 13 and 14 – ask supervisor!

Category 3-5 must not be sent to the normal waste recipient (Norsk Gjenvinning) –contact HSE department!

Innsida-wiki «Hazardous infectious and radioactoive waste»

Ask if you don't know where to put waste!

Check SDS!

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Protective equipment

Check SDS!

Eye protection

Check SDS!

- Eye protection

  Always use eye protection when working with hazardous chemicals

- The faculty has it's own instruction regarding eye protection

  http://www.nt.ntnu.no/innsida-dokumentlager/HMS/oyeverninstruks-12-08.pdf

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Gloves

Check SDS!

- IBT guidelines for use. No glove is “complete”. Does not not offer protection against all substances! Check MSDS
- Use correct type of gloves depending on chemical
- Nitrile protects against chemicals
- Do not leave the lab wearing gloves!

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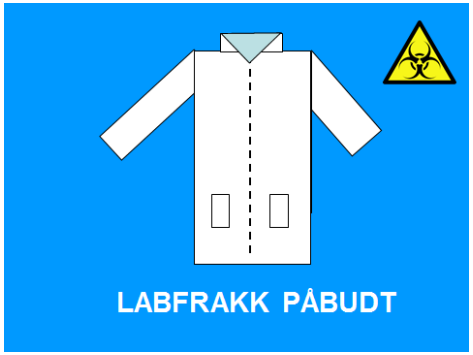
Personal safety precautions continued

Check SDS!

- Laboratory coat and shoes
  - clean and without holes
  - Chemical resistant shoes that cover your feet (risk assessment)



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Fume hood

Check SDS!

- Work with hazardous and/ or volatile substances should be preformed in a ventilated hood

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Transporting chemicals

- Use appropriate containers or trolleys with frame for safe transportation

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Spill of chemicals

- Check SDS!
- Assessment has to be made if area should be evacuated, or if it is reasonable to clean up
- Different material to handle spill
  - Protective gear, absorbents etc

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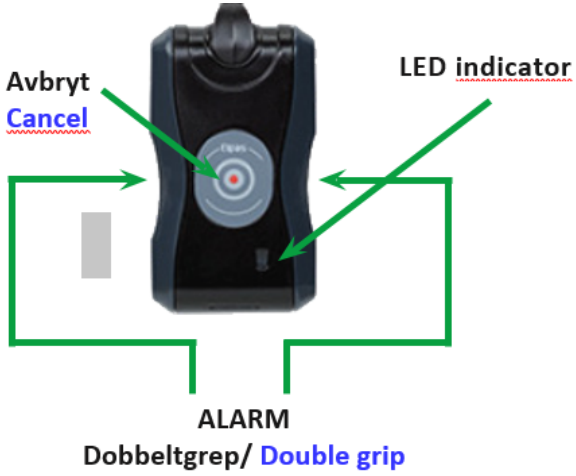
Working alone alarm

- Work alone? Risk assessment
- Never high risk work alone
- Released by tilting or manually
  → Local acoustic alarm (30 sec.)
  → NTNU-guard



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Chemical fire

Check SDS!

- Use fire blanket for small fires
  - keep the workspace tidy
- Preferred extinguisher is CO2 or foam

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Pregnant and breast feeding

Check SDS!

- Inform supervisor or HSE-coordinator as soon as possible if you are pregnant or breast feeding. Alternatively Occupational Health Services

- Information on NVs web page:
  - guideline
  - checklist

(https://innsida.ntnu.no/web/guest/wiki/-/wiki/Norsk/HMS+ved+NT)

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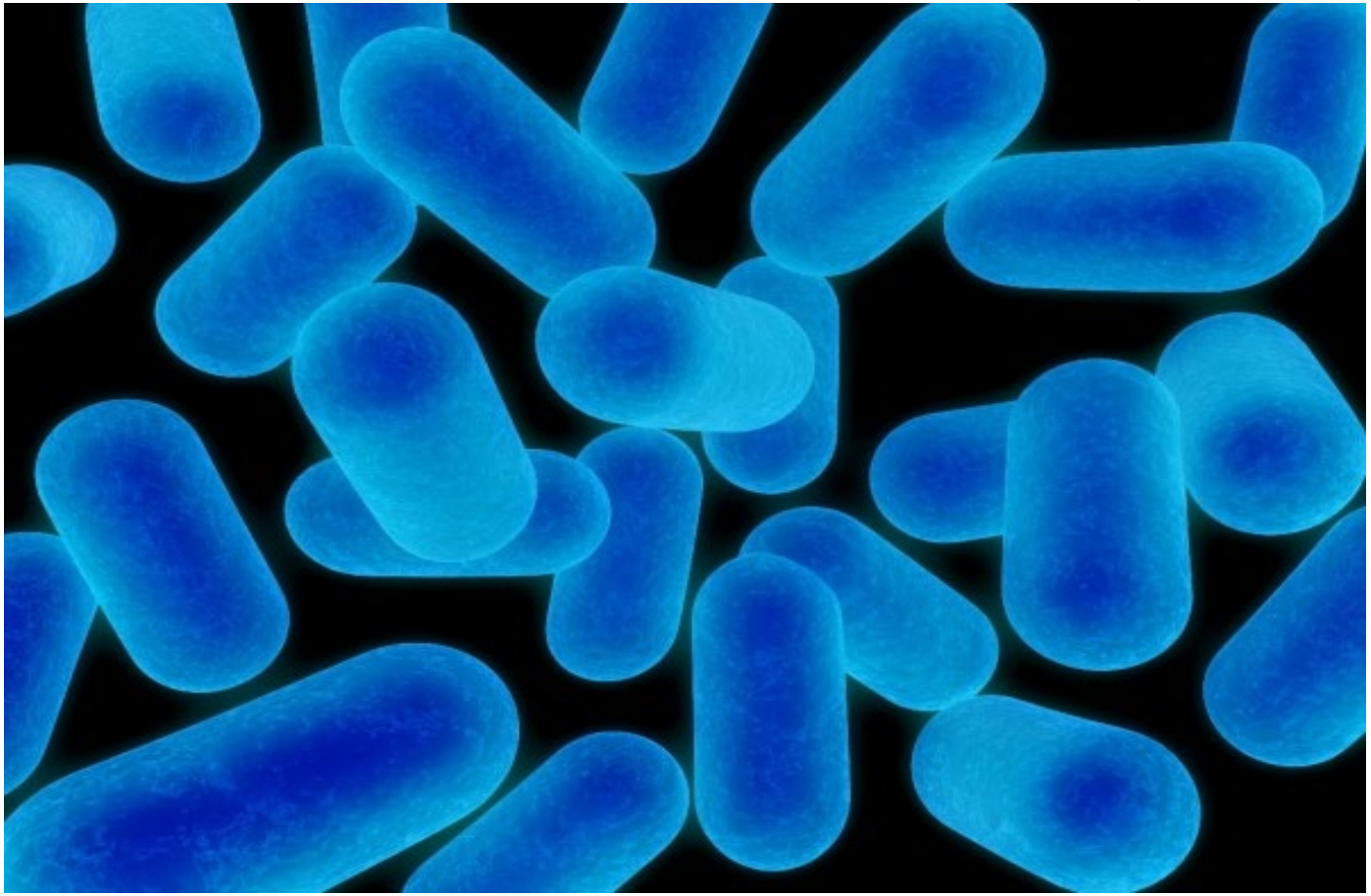
Biological factors



What is «biological factors» in the legislation?

- Living and dead microorganisms or components of micoroorganisms that may be detrimental to human health.

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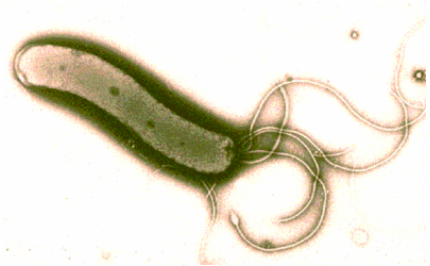
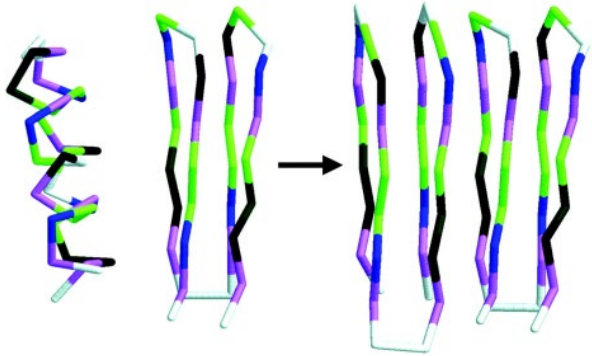
Infections

Bacteria



Helicobacter pylori

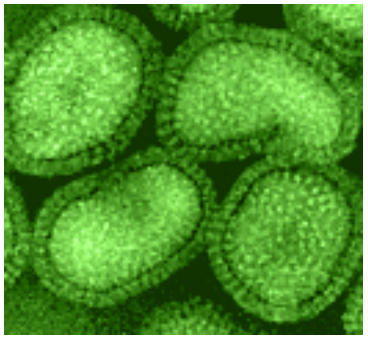
Prions



Fungi

Candida albicans

Virus



Influenza virus

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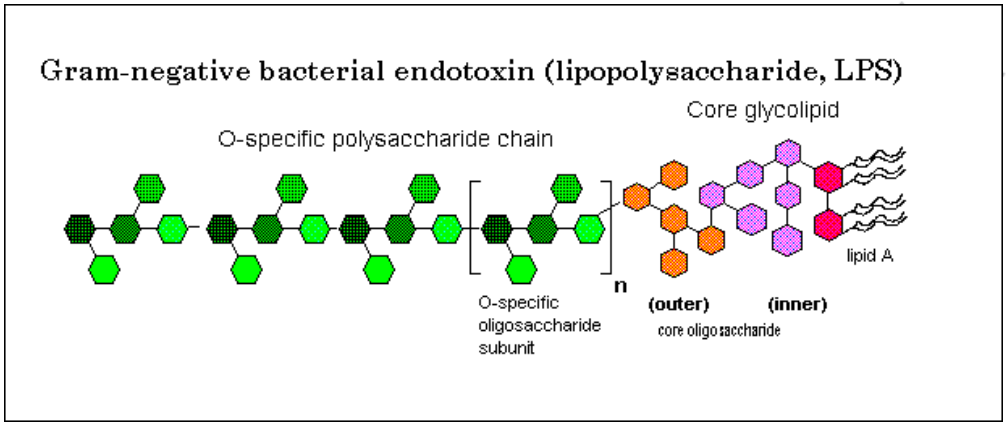
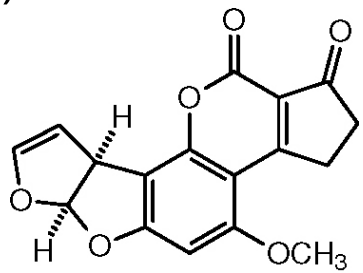
Toxins

- endotoxins



- mycotoxins (fungi)



aflatoxin B_1

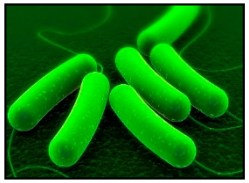
Risk classification of biological factors

a) Risk group level 1: A biological factor that is unlikely to cause human disease

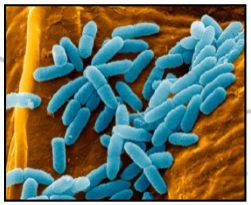
b) **Risk group 2**: A pathogen that can cause human disease but is unlikely to be a serious hazard to laboratory workers or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventative measures are available and the risk of spread of infection is limited.

c) **Risk group 3**: A pathogen that usually causes serious human disease but *does not ordinarily spread* from one infected individual to another. Effective treatment and preventive measures are available.

d) **Risk group 4**: A pathogen that usually causes serious human or animal disease and that can be *readily transmitted* from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.

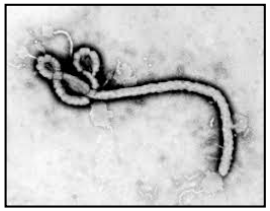


Class 1:
Non-pathogenic *E.coli*



Class 2:
Pseudomonas aeruginosa

Class 3: *Bacillus anthracis* (Anthrax)



Class 4: Ebola virus

Source :Forskrift om tiltaksverdier og grenseverdier (norwegian)

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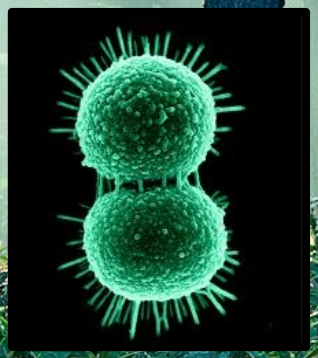
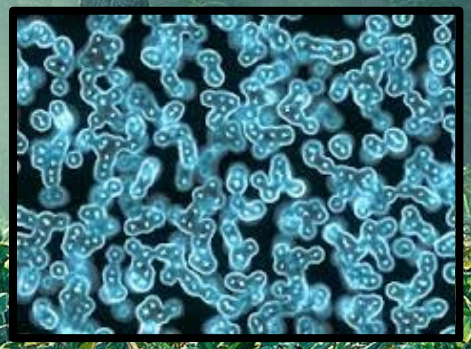
Risk classification of biological factors

There is a list of classified biological factors attached in the law paragraph.





Confinment levels i lab

- Confinement level = the risk group number

Confinment measures risk group 1- and 2-laboratory (difference)

	Infection risk group 1	Infection risk group 2
Working area	No requirement	- Marked with sign for biohazard
Lab bench top	No requirement	- Waterproof - Easy to clean -resistant to water, acid, alkali, solvents, disinfective agents, decontaminating agents
Disinfection protocols	No requirement	- Must be specified
Storage of biological factors	No requirement	- A safe place

Sign Biohazard

Benchtops

Desinfection

Safe storage facilities

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GMO

Legislation for biological factors

+

Legislation for GMO

Genetically modified organisms GMO

Genetically modified organisms are in addition governed by its own regulation

<u>Definitions (gene technology law)</u>

- Genetically modified organisms: microorganisms, plants and animals where the *genetic composition has been altered by the use of gene- or cell technology*
- Gene technology: techniques that involves hereditary material isolation, characterization, modification and insertion into living cells or virus.
- Cell technology: techniques for generation of living cells using new combinations of genetic material by fusion of two or more cells.

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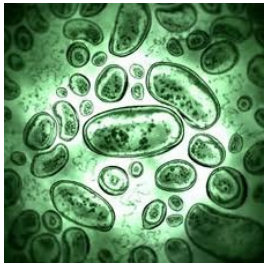
GMO-Legislation



Central regulations

- Regulation on confined use of genetically modified micro organisms (GMM-regulation)
- Regulation on confined use of genetically modified animals (animal regulation)
- Regulation on confined use of genetically modified **plants** (plant regulation)
- Regulation on labelling, transportation, import and export of GMO organisms

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Requirements concerning GMO-work (regulations)

✓Approval of laboratories and facilities

✓Pre-assessment of risk (=> class/containment 1-4)

✓Notification /application → approved confined use of GMO

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Pre-assessment of GMO

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Example: GMO pre-assessment

- Risk group of unmodified organism
- Properties of DNA to be inserted
- Properties of the vector
- Expected properties of resulting GMO organism

↓

GMM-class

↓

Confinement level and safety measures

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Example: confinement- and safety measures for GMM (labscale).

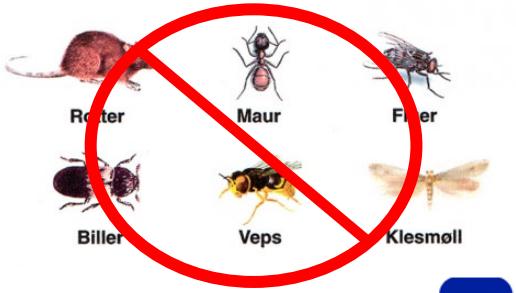
	GMM-class 1	GMM-class 2
Autoclave	Nearby	In the building
Prevention of aerosol transmission	No requirements	Specific measures
Working clothes	Yes	Yes, suitable ptotective clothes
Effective vector control (rodents, insects etc)	No demands	Must be established
Inactivation of GMM in contaminated material and waste	Is required	
Work bench surface	- Easy to clean, resistant to water, acid, alkali, solvents, disinfective agents, decontaminating agents	

GMM-rules are *in addition* to requirements for all biological factors.

Autoclave

Aerosols

Protective coat



Vector control

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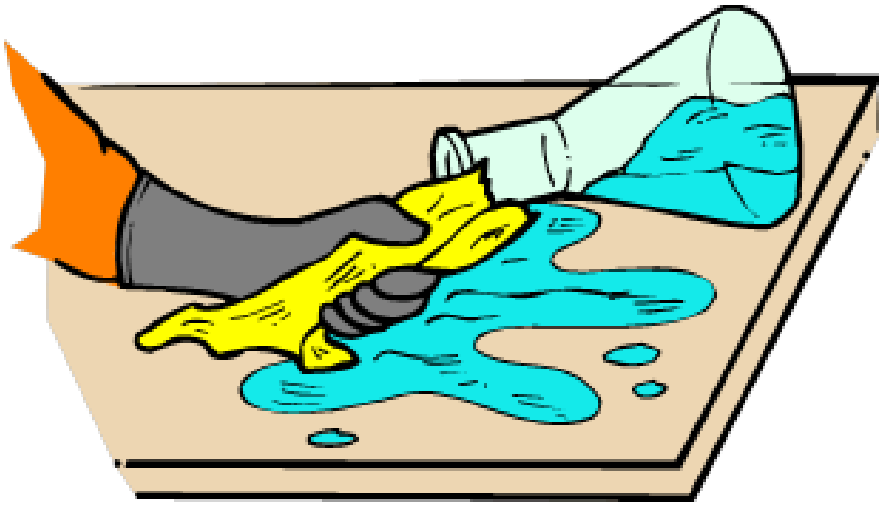
GMO - transport

- Transportation of GMO outside confined space that is approved for GMO must:
  - transport in a closed container



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Emergency plan for GMO contamination

- If contamination/spread of GMO occurs - emergency plan is implemented

  Spread= spill outside the approved confined space (e.g approved laboratory)

- Limit amount of spill
- Close area
- Inform your leader/supervisor

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Waste disposal: GMM

Type waste	Routines
GMM-waste cells (class 1)	Autoclaving. Afterwards handle as normal waste.
GMM-waste which cannot be autoclaved	Thrown in yellow risk waste boxes (solids) or chemically inactivated (liquids)
GMM waste class > 2	Autoclaved and then thrown in yellow risk waste boxes.
«Naked» recombinant DNA encoding antibiotic resistance genes	Autoclaved at low pH (→ fragmentation)

RISIKOAVFALL
Dette har jeg i risikosekk/-esken:
- Smitteavfall
- Stikkende/skjærende avfall
- Cytostatika avfall
- Patologiavfall

Vi har prosedyre for kildesortering som forsikrer at innpakkingen ikke inneholder kvikksølvholdig eller annet farlig avfall.

Kilted
Avfallsleverandør:

Dato:	Inst./avd./post:	Underskrift:

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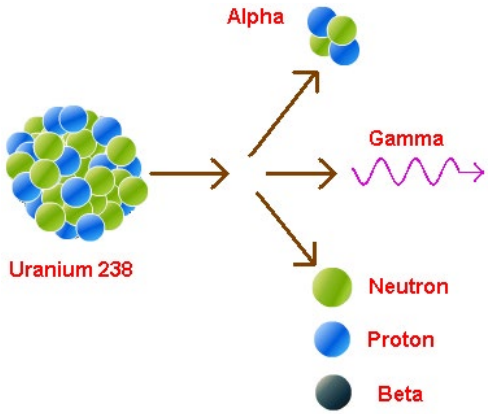
3. Radiation sources



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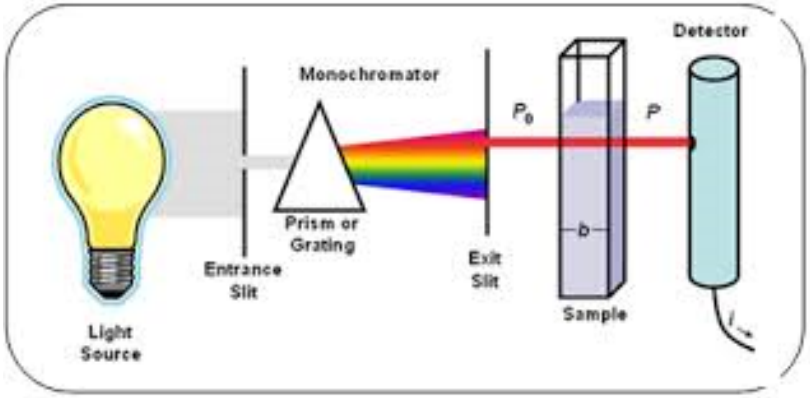
UV-radiation



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4. Gas

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Gas use at the NT-faculty

- Requires training

Pressurized gas bottles

Supercooled liquid gasses

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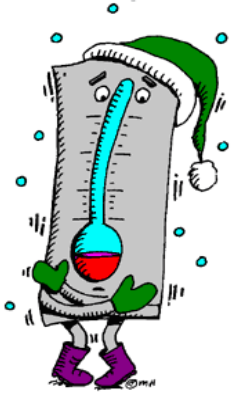
Hazards of gas use

High pressure

Suffocation



Frost bite

Fire and explosion

Poisoning

Oxygen enrichment (fire)

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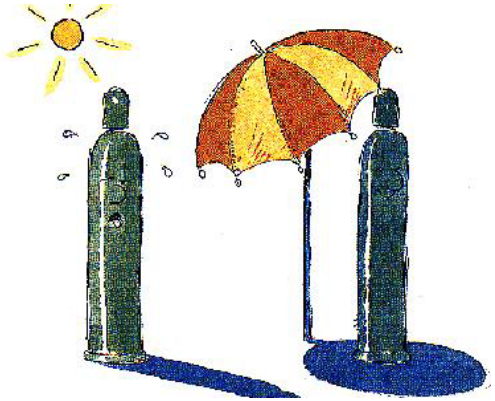
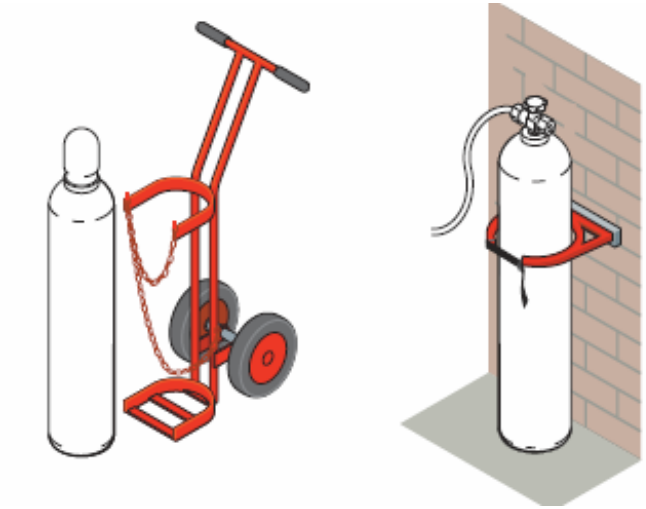
Physical securing of gas containers

Gas containers must not be exposed to temperatures >45 °C

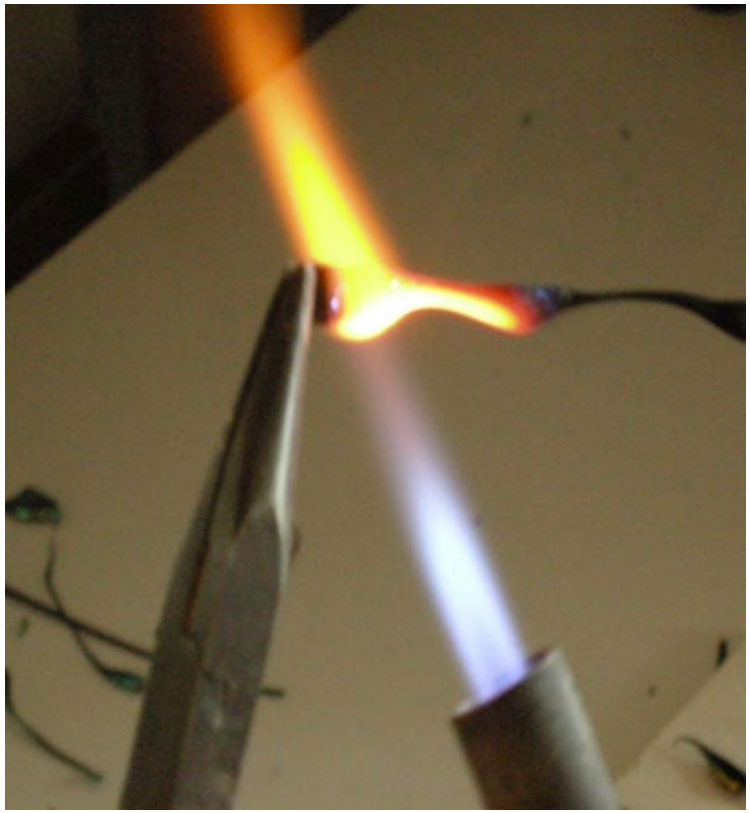
- Explosion risk

Gas containers must be secured against accidents that can damage the valve. The container turns into a <u>lethal rocket</u> if the valve gets knocked off..





5. High temperatures



Open flames - burns

Yes, it happens……!!

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Open fire – make sure that fire-fighting equipment is nearby!

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7. Electrical hazards

Electrical equipment

- Do not use electrical equipment that is not in order.
  Cables, plugs etc.. Report error so that it can be repaired !!

- Use of extension cords should be limited. Do not use extension cords on equipment that draws a lot of power

- If you get the "shock" from the equipment, stop using it immediately!! No open sources!

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HSE – friend or foe?

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