Laboratory & Biological Safety

According to

§ 14 Dangerous Substances Ordinance

§ 12 Occupational Safety & Health Act

§ 4 German Statutory Accident Insurance Rule 1

§ 17 Sect. 4 Genetic Engineering Safety Ordinance (***S1***!)

Signature:
I have attended & ***understood***!

Topics

- Occupational health and safety in general
  - Legal bases
  - Contact persons for safety issues
- Emergency / Accident at work
  - Fire protection
  - Emergency calls
  - First Aid
- Laboratory safety
- Hazardous substances
- Handling of biological materials/gmo's (S1)

Note

- The instruction contains *links* to publicly available laws, regulations, rules and notices, as well as to internal documents of the working groups BCI, II and III at the Chair of Biochemistry (*mostly in German*!)
- Internal documents are only accessible to employees and students of the respective working group.
- The PDF of the instruction (with links) will be stored on a central website of the Department of Biochemistry (all 5 working groups). This website is still under construction.
- Questions: Lab Safety Officer; Tel. 7836

Legal bases, contact persons for safety issues

OCCUPATIONAL HEALTH & SAFETY

Legal bases

- House Rules of the University of Bayreuth, primarily § 4 "Safety and Order", esp. Sect'n (1) – (3), (5), (7)
- Applicable legislation
  - Occupational Health and Safety Act (*ArbSchG*)
  - Ordinance on Hazardous Substances (*GefStoffV*)
  - Genetic Engineering Safety Ordinance (*GenTSV*)
- Accident Prevention Regulations (German Statutory Accident Insurance)
  - *DGUV Rule 1* "Principles of Prevention"
- Guidance (guidelines for the implementation of the rule)
  - *DGUV Information 213-850* "Safe working in laboratories"
  - *DGUV Information 213-026* "Safety and Health in the Chemical University Internship"
- Maternity protection
  - Maternity Protection Act (*MuSchG*)
  - *Special Information from the Institute for Occupational Safety and Health* of the DGUV

Contact persons

- Laboratory (SiBeA) & Biological Safety Officer (BBS) at the Department of Biochemistry
  - Dr. Christian Kambach, NWIII 1.45; Tel. 7836
- *Safety Engineer*
  - Dieter Spörl, ZT 2.07; Tel. 2112
- *Company Medical Officers*
  - Surgery Drs. K. Pietschmann-Berr & K. Schmerberg, Filchnerstraße 2, 95448 Bayreuth, Tel. 0921-51667088
- *Staff Council* of Bayreuth University

Fire protection, emergency, work accident, first aid

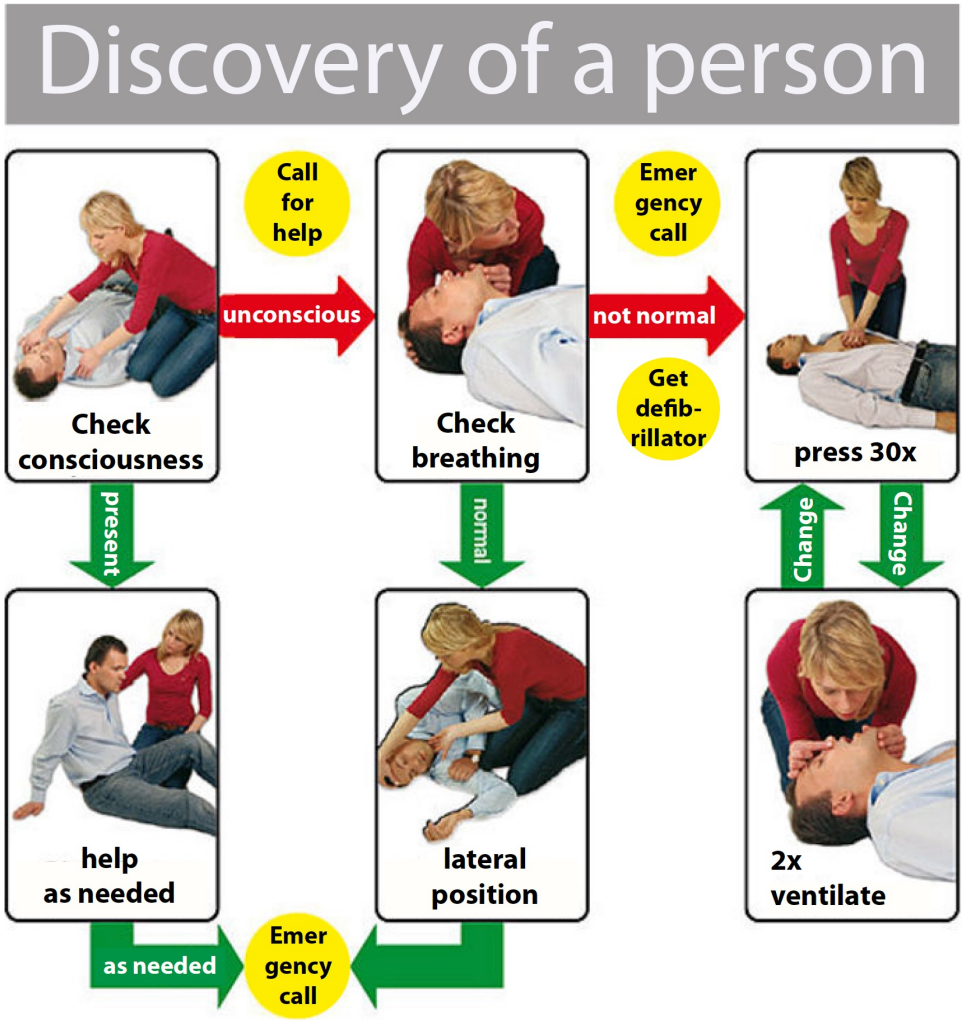
EMERGENCY

Fire safety regulations at Bayreuth university

http://www.sicherheitswesen.uni-bayreuth.de/pool/dokumente/UBT---Brandschutzordnung.pdf

Printed copy (German only!) in Perspex box left to the department entrance

What to do in an accident situation



Assess situation :

- Protect ***yourself***: dangers?
- How many injured? How severely?

Secure accident site:

- Remove hazards!
- Rescue injured person(s)

Call emergency services

- In case more helpers are available: Delegate!
- *Document* all accidents (1.41)
- Report to Safety Engineer!

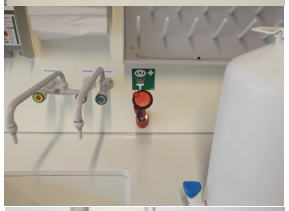
Carry out first aid measures!

https://www.drk.de/hilfe-in-deutschland/kurse-im-ueberblick/rotkreuzkurs-erste-hilfe/

Emergency conduct

First Aid **First-Aid-Boxes** at various points on floor, e.g. corridor 1.61, see escape and rescue plan

Eye rinses: **Eye rinses** at every sink; **emergency showers** at every door



Fire alarm: **Ring tone:** Switch off all equipment, evacuate laboratories quickly, leave building on the shortest possible route (escape route)

Emergency Off: **Emergency:** Press button, then save yourself

How to: Emergency calls

UNIVERSITÄT BAYREUTH

Telefonische Notrufe

Wer ruft an? **Wo** ist etwas passiert? **Was** ist geschehen? **Wie viel** sind betroffen? **Warten** auf Rückfragen?

Unfall – Krankenwagen / Notarzt	☎ 9 – 112
Feuerwehr	☎ 9 – 112
Polizei	☎ 9 – 110
nächster Defibrillator Gerätestandort: Gebäude FAN B Poststelle im EG (Raum 0.15)	

Info- und Sammelpunkt–Nr.: **14**
Gebäude: NW III

Nach Absetzten des Notrufs immer die Leitwarte der Zentralen Technik unter ☎ 2117 (24h) verständigen. Rettungskräfte einweisen, z. B. von dem o. g. Info- und Sammelpunkt aus → siehe Campusplan.

Gift-Notruf München (Informationszentrale) ☎ 9-089-19240

D-Ärzte für Arbeits- und Wegeunfälle in Bayreuth (bei leichten Verletzungen) — Hinweis für Handybenutzer: Vorwahl Bayreuth: 0921

Notaufnahme Klinikum Bayreuth, Preuschwitzer-Str. 101	☎ 9-4003111
MedCenter Bayreuth, Spinnereistr. 7	☎ 9-15126860
Chirurgicum Bayreuth, Friedrich-von-Schiller-Str. 18b	☎ 9-22323
Augenärzte:	
Augenzentrum Kamppeter, Markgrafenallee 3	☎ 9-61111
Prof. Schrems / Dr. Glaab-Schrems, Richard-Wagner-Str. 51	☎ 9-53132
AugenCentrum Bayreuth, Maximilianstr. 66	☎ 9-513344
Außerhalb der Dienstzeiten den zuständigen Augenarzt über Rettungsleitstelle erfragen	☎ 9-112

Störungsmeldungen

bei Ausfall oder Störung der Strom-, Gas- oder Wasserversorgung sowie Lüftungs-, Heizungs- oder Aufzugsanlagen

Leitwarte der Zentralen Technik (24 h) ☎ 0921-55-2117

Die Leitwarte ist Mo. bis Do. von 7:00 bis 16:15 Uhr, Fr. bis 13:00 Uhr dauerhaft besetzt. Außerhalb dieser Zeiten wird der Anruf an den Sicherheitsdienst der Uni weitergeschaltet, die ggf. die Rufbereitschaft der Zentralen Technik informiert.

Sicherheitsingenieur
Dipl.-Ing. (FH) Dieter Spörl
☎ 0921/55-2112
✉ si@uni-bayreuth.de

Oktober 2020
Version: 13
Farbe: orange

Crucial to mention:

- Info point 14
- NWIII

Defibrillator:

- FAN B: Post office on ground floor (room 0.15)

First Aiders at the Department

- Norbert Grillenbeck, office 1.15, tel 7856
- Christian Kambach, office 1.45, tel. 7836
- Susanne Schäfer, lab 1.19, tel. 7859
- Sabrina Wischt, lab 1.12, tel. 7853
- Johanna-Sophie Koch, 2.26, tel. 7886
- Olivier Laprevote, 2.29, tel. 7878
- Katharina Lamm, 2.26, tel. 7886
- ***Others??? Please notify me! Attend aid courses!***

Laboratory guideline, accident prevention, rule of conduct, hygiene

LABORATORY SAFETY

Laboratory Directive (DGUV)

- DGUV-I 213-850 – “Safe working in laboratories”
- Scope
  - Laboratories at risk from hazardous substances
  - Biological agents: Additionally TRBA 100
- Risk Assessment & Substitution Testing
  - Employment restrictions: MuSchG, JuSchG
- General operating regulations
  - Directives
  - Safety Seminar
- Special operating regulations (laboratory-specific hazards)
- Technical protective measures
- Regular checks

Accident Prevention Regulations

- DGUV Regulation 1 "*Principles of Prevention*"
- Scope: Same as Laboratory Directive
- Employer's obligations
- Obligations of insured persons
- Occupational health and safety

Laboratory Regulations

- Laboratory regulations according to § 14 GefStoffV at the Department of Biochemistry
  - Hazardous substances
  - Technical Resources
  - Laboratory-specific hazards
  - Protective measures
  - Print copy in the plexiglass box at the entrance to the department
  - Links to the PDFs:
    - BCI: Krauss Group
    - BCII: AG possible
    - BCIII: AG Höcker

Principles; Clothing; Hygiene & skin protection, working alone

OPERATING REGULATIONS

Basic rules for laboratory work

- The work must be organised in such a way that hazards are avoided or reduced to a minimum. Cleanliness and order in the workplace contribute significantly to safe working.
- Eating, smoking, make-up and drinking are generally prohibited in the laboratory. Food and drink of any kind may not be brought into laboratories.
- Safety equipment (e.g. emergency switches) must be freely accessible at all times.
- Attention and common sense prevent > 90% of all accidents!

Avoiding hazards in the laboratory

- Heat (magnetic stirrer, Bunsen burner, autoclave)
- Cold (lN_2, CO_2)
- Rotating parts (stirrer motors, pumps, centrifuges)
- Pointed/sharp items (scalpels; needles)
- Glassware(→ breakage)
- Chemicals (caustic, toxic, flammable, explosive)
- “Acrobatics” at tall shelves/cupboards

- Keep wo ce free & tidy, bind lon ‹
- PSE! (sa les!!)
- Keep wo ce free & tidy, bind lon ‹
- Caution while handling; correct disposal!
- Wear gloves where necessary; flame sharp edges, repair asap!
- See section “Dangerous substance ordinance” (GefStV)
- Fetch elephant foot or ladder / ask (taller) colleague!

Work and protective clothing

- Appropriate work and protective clothing must be worn in laboratories at all times
  - Long trousers and preferably long-sleeved shirts/sweaters, etc.
  - Sturdy, closed-toe and sure-footed shoes (no cloth shoes or sandals!)
- Lab coat section → "PPE"!
  - At least knee-length
  - Long-sleeved, tight-fitting sleeves
  - Fire retardant; ≥ 35% cotton

Laboratory Hygiene: Skin Care

- Skin care plan (German)
- Hygiene plan (German)
- At each sink!
- Use skin care products regularly (***much*** easier to prevent skin damage / disease than to cure it)!

HAUTSCHUTZPLAN

Universität Bayreuth
Labore und ähnliche Bereiche



	Vor und während der Arbeit	*Vor, während und nach der Arbeit*	*Nach der Arbeit*
Anwendung	**HAUTSCHUTZ**	**HAUTREINIGUNG**	**HAUTPFLEGE**
Zeitpunkt	- vor Arbeitsbeginn - nach Pausen *Hautschutzprodukte sind kein Ersatz für Schutzhandschuhe!*	- im Falle von Verschmutzungen - nach der Arbeit	- nach dem Händewaschen - zwischendurch bei Bedarf - am Arbeitsende
Durchführung	Produkt gründlich auf die sauberen und trockenen Hände einreiben. Dabei mit dem Handrücken beginnen und besonders auf die Fingerzwischenräume und Nagelbetten achten	Die Hände mit Wasser anfeuchten, Produkt entnehmen und aufschäumen. Anschließend die Hände gründlich abspülen und mit Einmaltuch trocknen	Produkt gründlich auf die sauberen und trockenen Hände einreiben. Dabei mit dem Handrücken beginnen und besonders auf die Fingerzwischenräume und Nagelbetten achten
Produkte	**Phsioderm® dualin®**	**ECOLAB® manisoft®**	**Pysioderm® cura soft®** oder **LINDESA®**
		Physioderm® stephalen®waschgel	**Eucerin® pH5 Creme** oder **pH 5 Pflegesalbe**
			ECOLAB® silonda®

Die Empfehlungen sind unverbindlich und ohne Zusicherung. Sie befreien die Anwender nicht davon, die Produkte für den jeweiligen Einsatzzweck im Rahmen einer Gefährdungsbeurteilung selbst zu prüfen und für die Beschaffung geeigneter Produkte zu sorgen.

Hinweise:

- Bei Bedarf ist eine Händedesinfektion durchzuführen, insbesondere nach Beendigung von Tätigkeiten mit biologischen Arbeitsstoffen (z. B. mit Spitacid® von ECOLAB®)
- Je nach Tätigkeit, insbesondere beim Umgang mit Gefahrstoffen, sind geeignete Schutzhandschuhe, ggf. in Verbindung mit Baumwollunterziehhandschuhe, zu tragen
- Bei speziellen Problemen oder wenn eine Hauterkrankung vorliegt, muss die Betriebsärztin der Universität Bayreuth kontaktiert werden
- Alle aufgeführten Artikel können über die Chemikalienausgabe im Gebäude NW I bezogen werden

UNIVERSITÄT BAYREUTH
Sicherheitsingenieur
Stand: Oktober 2011

Rules on working alone (risk assessment)

- Solo work in the laboratory or technical rooms is to be avoided as far as possible.
- Employees are required to be aware at all times whether or not they are currently working alone in the laboratory.
- As a matter of principle, student assistants in training are not allowed to work alone in the laboratory. The supervisor in question is responsible for implementation.
- Activities that go beyond the everyday level of danger, such as handling heavy objects above head height or handling particularly dangerous substances (e.g. very toxic substances, solvents with flash points < 40 °C, highly concentrated, aggressive acids or alkalis) are generally and at no time permitted while working alone.

Classification, labelling, obtaining, storage, handling, disposal

DANGEROUS MATERIALS

Hazardous Substances: Classification, Labelling

- GHS: *H and P label elements*
- *Hazard symbols and pictograms*

- Read access to *DaMaRIS* database (MSDS; Substance Exchange):
  - User ID: AGSteegb, Passwd: on request
  - User ID: possible, Passwd: on request
- Directives; Plexiglass box next to LS entrance
  - Acrylamide (carcinogen 1A)
  - Co^{2+} and Ni^{2+} salts (carcinogens 1B)
  - Compressed gases

Purchasing of Hazardous Substances

- Internal end-use statement for each department
- Transfer of responsibilities document: Only registered personnel may fetch hazardous chemicals
- Procedure:
  - Bring with you a signed form ("transfer book / identity statement") with the list of chemicals you want to fetch to the chemicals store!
  - ***Only*** the person named on the order may fetch the chemicals, and only those listed in the form!
- The links to the aforementioned forms can be found on this *website*

Handling of Hazardous Substances

- **Only keep the amounts for daily usage at your work space**
- Label *content*; clearly label with appropriate warning symbols (GHS)!
- Avoid cross-contamination!
- Avoid breathing in the chemicals, or skin contact
- Dispose of all waste rapidly and appropriately!
- Transport of containers in suitable trays / buckets→ *chemicals store in NWI*!
- Avoid hazard through reactions upon breakage/accident!

Storage of Hazardous Substances

- Information from central services on *hazardous substances in general*
- Technical rules for Hazardous substances in stationary (*TRGS509*) or transportable (*TRGS510*) containers apply!
- Volatile, flammable substances (solvents)
  - Max. 1 l per bay
  - Max. 2.5 l per laboratory
  - Bulk containers: solvent cabinets according to EN 14470-1
- Acids & alkalis
  - Chemical cabinets according to EN 14470-1
- Toxic or very toxic substances
  - Under lock and key (1.22; Crystallography)
- Carcinogens, mutagens, teratogens: see operating instructions!

Safe chemical waste disposal

- Organic waste
  - **Aqueous organics** (10-l plastic canister → fume hood 1.08, 1.12, 1.15)
  - **Pure organics** (5-l plastic canister → fume hood 1.15)
  - **Midori Green waste** (aqueous organics → **Room 1.18**)
  - **Solid organic waste** (blue drum) → **Room 1.18**
  - **Bradford waste** (10-l plastic canister, „acidic waste“ → ventilated cupboard below fume hood in 1.15)
- Heavy metals
  - 10 l plastic canister, separately according to element (Ni, Co) → ventilated cupboard below fume hood in 1.15
  - Crystallography → heavy metal waste drum in 1.21; small amounts, special rules apply!
- *Directives* of central services on disposal of hazardous substances (C. Zehring; tel. 2113)

Cold, Heat, Pressure/Vacuum, Devices, Defects, Checks

LABORATORY-SPECIFIC HAZARDS

General Rules

- Devices
  - No operating without prior instruction!
  - Observe operating instructions!
  - Operating instructions do not replace instruction manuals!
  - Caution! PPE!
- Cold or heat
  - Keep your distance!
  - Use protective equipment!
  - Wear protective clothing!

Cold, Heat, Pressure, Vacuum → Directives!

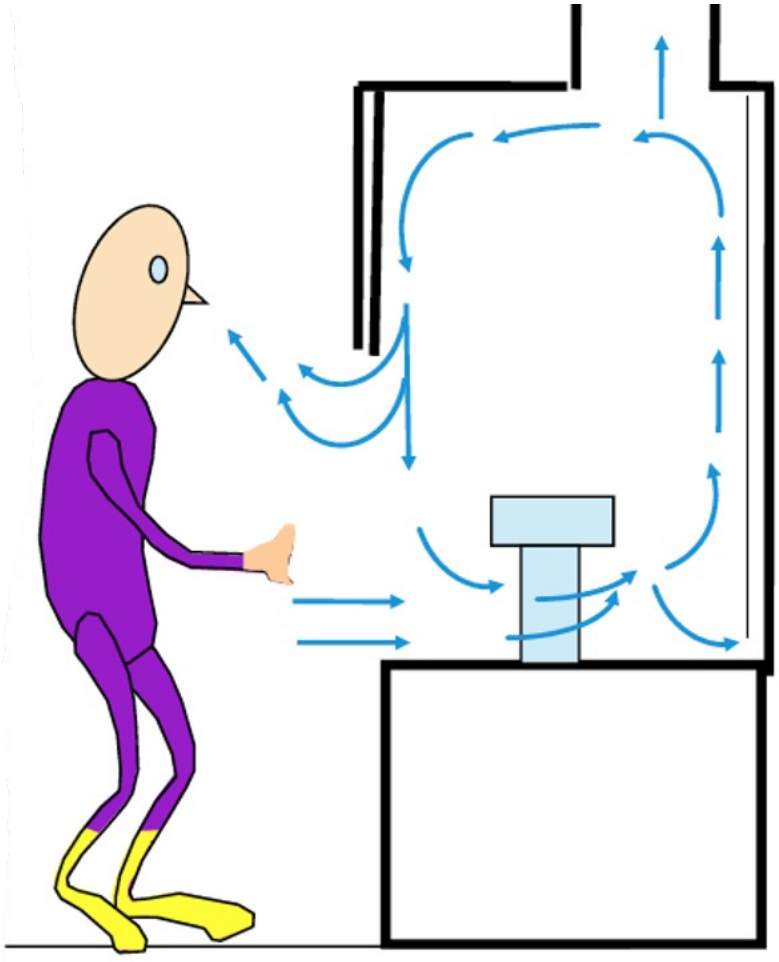
- **Cold**
  - Working in cold rooms
  - (Deep) Freezers
  - Lyophilizer
  - Coolants (dry ice, lN2)
- **Heat**
  - Bunsen burner
  - Hot stirrer
  - Autoclave
- **Pressure**
  - Autoclave
  - Gas cylinder
- **Vacuum**
  - Speedvac
  - Lyophilisator
  - Vacuum pumps

Centrifuges and autoclaves

- Physical hazards: Pressure, heat, mechanical forces
  → Risk of burns and injuries due to mechanical impact
- *Only use suitable vessels and programs!*
- Carefully balance all bottles in centrifuges *before* the run!
- Check rotor for cleanliness, if necessary, *clean* it (corrosion/contamination)!
- Upon opening of the autoclave watch for residual pressure and heat (use gloves)!
- Media autoclaves: Document usage (who, when, what, which program)!

Fume hoods

- Use with closed sash as much as possible!
- Opened sash: Danger of hazardous fumes escaping!
- After finishing work
  - ***Close sash***!
  - Close ***any*** open fume hoods you are passing by!



Defective equipment

- Pull the plug; close line(s); inform responsible person; attach panel “defective”!
- Equipment no longer in working order must be decontaminated properly and removed from the laboratory!
- Defective autoclave:
  - Was the last charge autoclaved properly?
  - If not: Transfer to another autoclave; repeat sterilization process!

Equipment safety checks

- By external specialist personnel (yearly)
  - **Fume hoods** (DGUV Rule 213-850)
  - **Centrifuges** (DGUV provision V.3; Rule 100-500)
  - **Safety cabinets** etc. (BGI/DGUV-I-850-0; ArbStV § 4)
- By university employees
  - Yearly: Electrical equipment (DGUV provision V.3); after initial instruction seminar; yearly refresher course!
  - Every 6 months: Earth leakage circuit breakers → Press test button (FI) → breaker ***must*** be triggered!
    - **Caution**: All equipment on this circuit lose current!
      Shut down and ***plug off*** PCs, HPLC, spectrometers & other sensitive equipment beforehand!
    - **Prior to the test**: Contact person(s) responsible for device; Test to be carried out by each employee at their works space; function rooms: by delegate designated by each work group
    - Test result must be documented (Excel sheet)!

According to laboratory guidelines and regulations

TECHNICAL PROTECTION MEASURES

Safety devices: Where? Operation?

- Escape Plans
- Fire extinguisher
- Emergency showers
- Eye rinsing taps
- First Aid Kits

Personal Safety Equipment (PPE)

- Laboratory coat
  - Fire mitigating
  - Zip or buttons!
- Safety goggles
  - All-round protection
  - Splash guard
- Gloves
  - Nitril (EN 374)
  - Impermeable
  - Chemicals resistant








GenTG & GenTSV:

BIOLOGICAL SAFETY

Legal bases

- Genetic Engineering Act (GenTG)
- Genetic Engineering Safety Ordinance (GenTSV)
- Form AZ-S1 "Notification of an installation for genetic engineering work of safety level S1"
- Approval of the local government (RegUF) for the operation of a genetic engineering facility (S1) at the Department of Biochemistry of the University of Bayreuth, AZ 8791.6.3 of 26.07.2013
- Directive Genetic Engineering S1 (at each work group)

Rules of good microbiological practice

- Keep windows and doors closed
- No eating, drinking, or food storage in work areas!
- Keep work area tidy and clean!
- Sterilise *all* materials having been in contact with GMOs:
  - Cultures/Petri dishes: Autoclave (→ Biowaste!)
  - Plastic/Aluminium ware: Autoclave (→ Biowaste!)
  - Disinfect equipment & work place (70% EtOH)!
  - Wash /disinfect /treat hands (Spitacid; at sink)!

Storage, disposal, disinfection

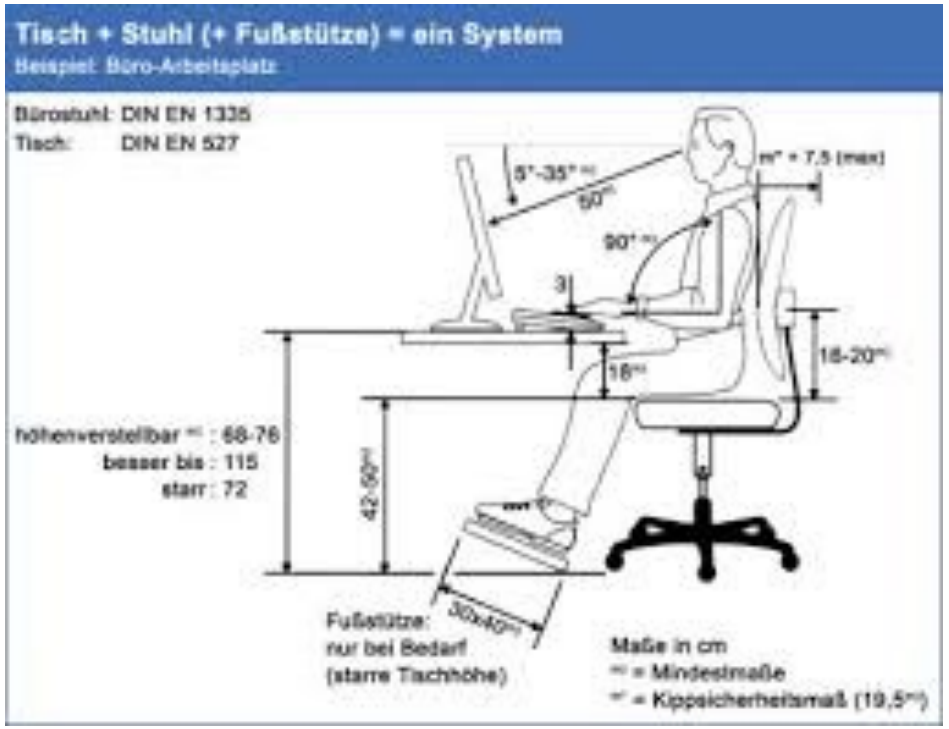
- Handling of GMOs only in designated areas and equipment (e.g. incubators, centrifuges, ...)!
- Handling and storage of GMOs only in clearly labelled containers
- Sterilize all bacterially contaminated material:
  - Cultures/Plastics/Al Goods: Autoclave!
  - Disinfect workplace and appliances (70% EtOH)!
  - Disinfect/wash/protect hands (ointments at sink)!

Special topics: Ergonomy; maternity protection, conflict management

OCCUPATIONAL SAFETY

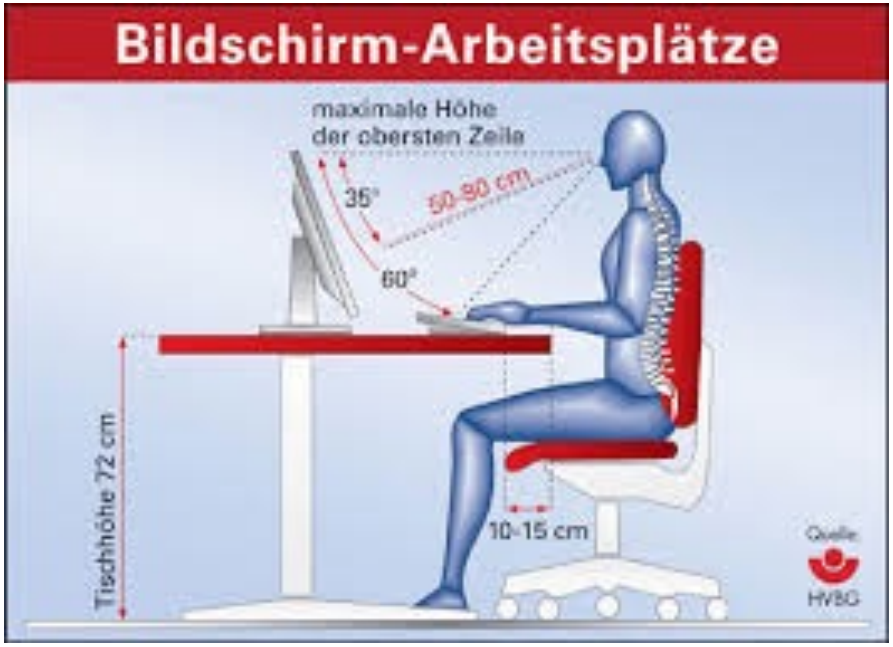
Office - ergonomy

- Chair with suitable adjustment options
- Table at the right height
  Footrest, if necessary
- *DGUV Info 215-410*



Display - ergonomy

- Pay attention to the correct distances and viewing angles
- Set up the screen avoiding glare and reflections
- Use appropriate glasses if necessary!
- Schedule breaks!



Maternity protection

- New version of German maternity protection law since 2018:
  - Occasion-independent risk assessment: carried out & documented!
  - Teaching: cmlife (https://my.unibayreuth.de/cmlife)
  - Pregnancy: Occasion-dependent risk assessment
- Inform your project leader about the pregnancy!
- Discuss & document adaptive measures with your project leader & lab safety officer!
- No handling of radiation sources (X-ray), radioactivity and strong magnetic fields (NMR)!
- Further Information available at (in German only!):
  https://downloadcenter.bgrci.de/shop/index.jsp?query=/m039.xml&field=path
  Note section „embryonic damage – occupational safety“ M 039 of the BG RCI

Occupational safety – voluntary medical assessment

- Employees have gone through a risk assessment of their activities upon signing of contract and have received a medical examination if necessary (depending on the result of the assessment).
- Every employee has the right to let him/herself be medically examined (depending on the above-mentioned risk assessment).
- Medical examinations are offered on a regular basis by the employer.
- There is ***no*** obligation to take the examination.
- The contact person for this request is your supervisor/direct superior
- ***If the risk assessment stipulates an obligatory medical examination, the respective activity cannot be carried out without it!***

Occupational safety – conflicts / stress

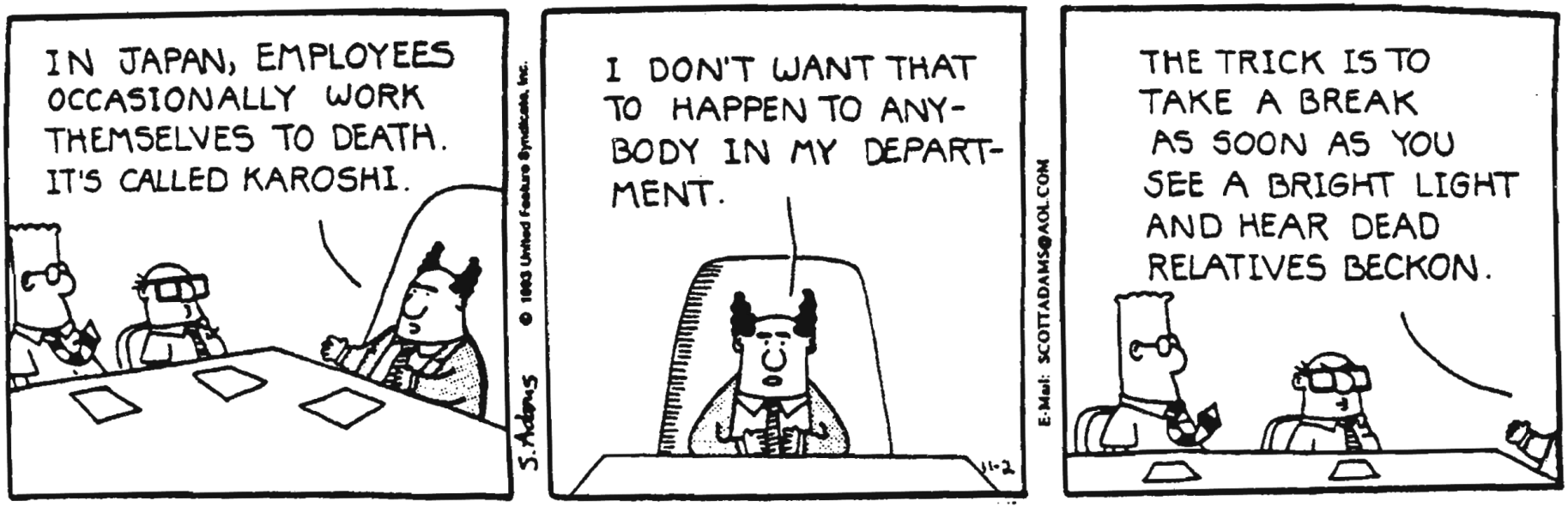
- Conflicts and stress impact on the safety of your working environment!
- Therefore:
  - Respect your colleagues – define and discuss problems
  - Search for solutions together
  - In case of stress : consult a person of trust (e.g. your superior)

Occupational safety – conflicts / stress

- Contacts:
  - In general, your superior at first
  - Furthermore:
    - Personnel department
    - Staff council
    - Women's representative
    - *Ombudsperson*
    - Company medical officer
    - *External conflict mediators*: Appointed by the university
- All information is treated as ***strictly confidential!***

UNIVERSITÄT BAYREUTH

Successful and safe working!



Have fun!

APPENDIX

Risk assessments

- Sheet 1.2 – Summary and Documentation
- Sheet 2.1 – General risk assessment
- Sheet 2.2 – SARS-CoV-2 Occupational Health and Safety Standard
- Sheet 3.1 – Laboratories General Risk Assessment
- Sheet 3.2 – Hazardous Substances in Laboratories
- Sheet 3.3 – Biological Substances in Laboratories
- Sheet 3.4 – Optical and ionizing radiation
- Sheet 3.5 – Practical courses
- Sheet 7.1 – List of work equipment

Directives

- Print copies
  - General: Plexiglass box to the left of the entrance to the chair
  - WG-specific: In the respective laboratories (1.10 – 1.30)
  - Device- or application-specific: Directly on site
- Genetic Engineering (S1)
  - Laboratories of the working groups at the chair (BCI, BCII, BCIII)
  - Practical Course Rooms (1.51 – 1.53)
- Hazardous Substances
  - Acrylamide
  - Ni- and Co-salts
  - Compressed gases

Directives

- Physical Hazards
  - Radiation (UV) → Illuminators
  - Cold → lN_2, Dry Ice, Freezers, Lyophiliser
  - Heat → Autoclaves, Heating Cabinets & Stirrers
  - Electricity → All electrical appliances
- Devices
  - Centrifuges (power ≥ 500 W or E_{kin} ≥ 10,000 Nm)
  - Autoclaves
  - Vacuum pumps
  - Lyophilizer
  - Emulsiflex
  - Incubators (180 °C)

Laboratory Regulations

1. Scope
2. Risk assessment and substitution testing
3. Hazardous substances
4. General equipment
5. Basic rules for safe behaviour in the laboratory
6. Safety equipment
7. What to do in dangerous situations
8. Principles of first aid
9. Emergency call