



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

- This briefing 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 Department of Biochemistry (*some only available in German!*)
- Internal documents are only accessible to employees and students of the respective working group.
- The PDF of the instruction (with links) is stored on the 3 local work groups' homepages and will be stored later on a central website of the Department of Biochemistry (all 5 working groups). This website is still under construction. Status: Separately on each working group's website!
- Questions: Dr. C. Kambach, 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*](#))
 - Hazardous Substances Ordinance ([*GefStoffV*](#))
 - Genetic Engineering Safety Ordinance ([*GenTSV*](#))
- Accident Prevention Regulations (German Statutory Accident Insurance)
 - [*DGUV Regulation 1*](#) "Principles of Prevention"
- Guidance (guidelines for the implementation of the rule)
 - [*DGUV Information 213-850*](#) "Safe working in laboratories"
 - [*DGUV Information 213-027*](#) "Safety and Health in University Chemistry Courses"
- Maternity protection
 - Maternity Protection Act ([*MuSchG*](#))
 - [*Special Information from the Institute for Occupational Safety and Health*](#) of the DGUV

Observe deposited [*links*](#) (some in German)!



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

- “Brandschutzordnung” of Bayreuth University
- Printed copy (German only!) in Perspex box left to the department entrance

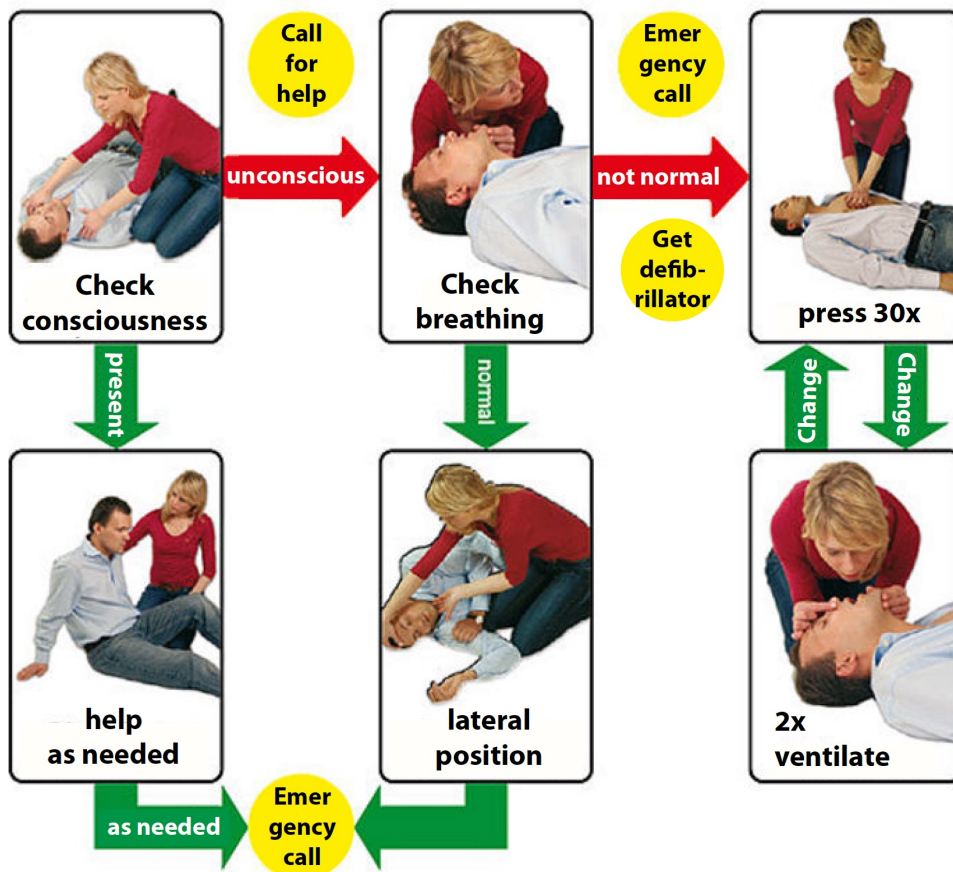


**Brände verhüten**

Keine offenen Flammen; Feuer, offene Zündquellen und Rauchen verboten
Verhalten im Brandfall
Ruhe bewahren
Brand melden
**Handfeuermelder betätigen**
**NOTRUF Tel: (9) – 112**
Verständigen Sie auch die Leitwarte der Zentralen Technik unter Tel. 2117
In Sicherheit bringen
**Gefährdete Personen warnen**
Hilflose mitnehmen
Türen schließen
Gekennzeichneten Fluchtweg folgen
**Aufzug nicht benutzen**
**Auf Anweisungen achten**
Sammelstelle aufsuchen
Löschversuch unternehmen
**Feuerlöscher benutzen**
**Löschschlauch benutzen**
Brandschutzordnung nach DIN 14096 Teil A
Erstelldatum: September 2016

What to do in an emergency

Discovery of a person



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!
- Carry out first aid measures!
- Report to Safety Engineer!
- ***Document*** all accidents (1.41)



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; activate once / week; document function!



emergency showers at every door



Fire alarm:

Ring tone: Switch off all equipment, evacuate laboratories quickly, leave building by 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	Info- und Sammel- punkt-Nr.: 14 Gebäude: NW III	
Feuerwehr	 9 – 112		
Polizei	 9 – 110		
nächster Defibrillator Gerätestandort: Gebäude FAN B Poststelle im EG (Raum 0.15)			
Nach Absetzen 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)			
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 Kampfpeter , 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 Hazardous Substance Ordinance (*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
 - [Link](#) to the PDF not yet active!



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

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- Heat (magnetic stirrer, Bunsen burner, autoclave)
- Cold (N_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 work area free & tidy, keep binders long
- PSE! (safety glasses!!)
- Keep work area free & tidy, keep binders long
- 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 fabric; $\geq 35\%$ cotton

Laboratory Hygiene: Skin Care

- Skin care plan (in German)
- Hygiene plan (in 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 <i>Hautschutzprodukte sind kein Ersatz für Schutzhandschuhe!</i>	- 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 Einmal Tuch 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® Physioderm® stephalen® waschgel	Pysioderm® cura soft® oder LINDESA® Eucerin® pH5 Creme oder pH 5 Pflegesalbe ECOLAB® silonda®

Die Empfehlungen sind unverbindlich und ohne Zusage. 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

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 $< 40\text{ }^{\circ}\text{C}$, 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

- Classification by CLP-regulation
- 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 personnel registered here 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!

Handling of Hazardous Substances

- **Only keep the amounts for daily usage at your work space**
- Label *content*; clearly label with appropriate warning symbols ([GHS Pictograms](#))!
- 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 risk of reactions in the event of a break/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 cupboards according to EN 14470-1
- Toxic or very toxic substances
 - Under lock and key (1.22; heavy metals; crystallography)
- Carcinogens, mutagens, teratogens: see operating directives!

Safe chemical waste disposal

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- 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 → 1.08, 1.12, 1.18)
 - **Solid organic waste** (blue drum) → 1.12, 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) → small amounts, blue drum in 1.22!
- 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 operation without prior briefing by responsible!
 - Observe operating directives!
 - Operating directives do not replace instruction manuals!
 - Caution! Wear Personal Protective Equipment (PPE)!
- Cold or heat
 - Keep your distance!
 - Use protective equipment (e.g., padded gloves)!
 - Wear protective clothing!



Operating Directives

- **Cold**
 - (Deep) Freezers
 - Lyophilizer
 - Coolants (dry ice, IN_2)
- **Heat**
 - Bunsen burner
 - Hot stirrer
 - Autoclave
- **Pressure**
 - Autoclave
 - Gas bottles
- **Vacuum**
 - Speedvac
 - Lyophilisator
 - Vacuum pumps

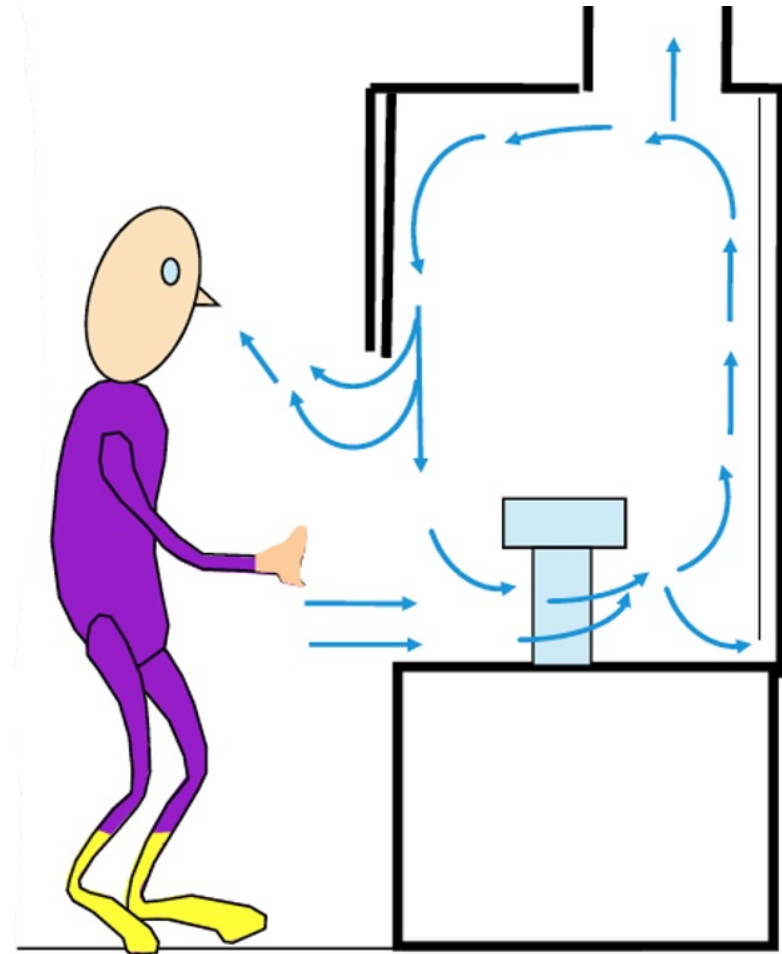
Centrifuges & autoclaves

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- 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 hood sashes 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

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- By external specialist personnel (yearly)
 - **Fume hoods** (DGUV Rule 213-850)
 - **Centrifuges** (DGUV provision V.3; Rule 100-500; ≥ 500 W or torque $> 10'000$ Nm)
 - **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 loses 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 equipment: 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
 - Nitrile (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)

Safety measures & rules of conduct

- Handling of GMOs is only permitted in the areas marked with "Genetic Engineering Working Area S1"
- Access for authorized persons *only*!
- Observe [DGUV Information 213-086](#) with appendix 1: "[Basic rules of good microbiological practice](#)"!
- Keep windows and doors closed while working!
- Wear personal protective equipment!
- Do not eat or drink in the work area; no food storage!
- Clean work, keep everything tidy!
- Observe [hygiene](#) & [skin protection](#) plans!



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)!

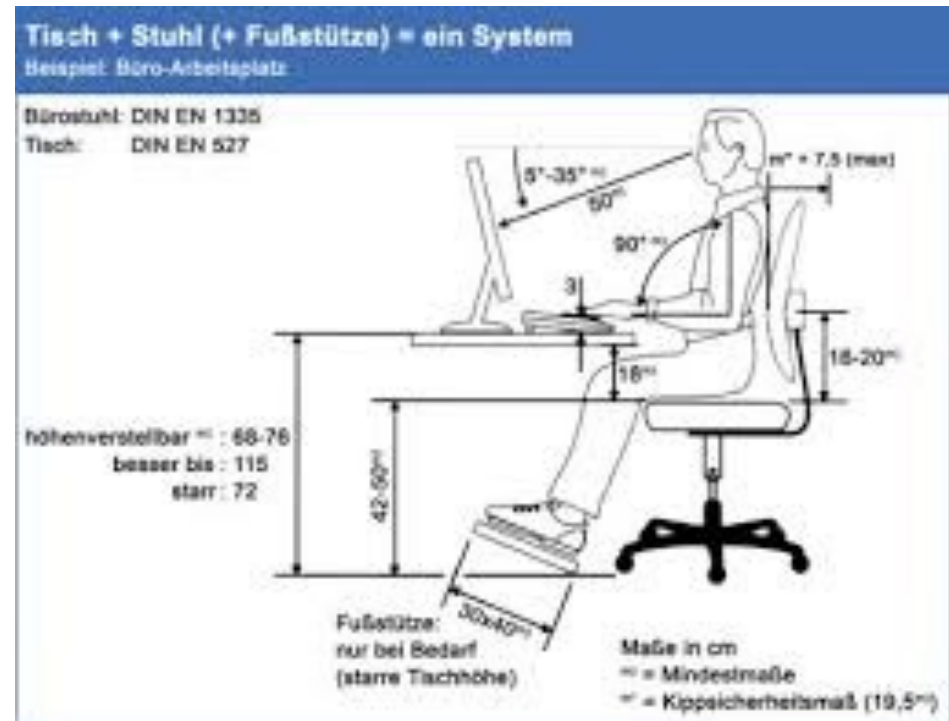


Special topics: Ergonomy; maternity protection, conflict management

OCCUPATIONAL SAFETY

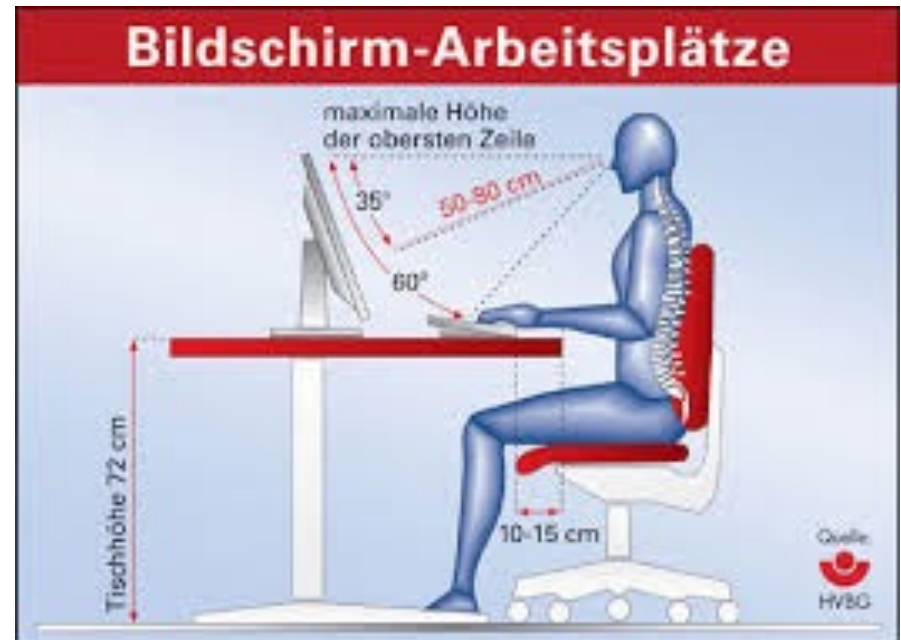
Office - ergonomics

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



Display - ergonomics

- Pay attention to the correct distances and viewing angles!
- Set up the screen avoiding glare and reflections!
- Use appropriate glasses if necessary (these are *working equipment*)!
- Schedule breaks 🏃 🧘 !





Maternity protection

- New version of German maternity protection law since 2018:
 - Obligatory cause-independent risk assessment: carried out & documented!
 - Courses: Risk assessment via [cmlife](#)
 - In case of 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, or strong magnetic fields (NMR)!
- Further [Information](#) available (in German only!); 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).
- ***If the risk assessment stipulates an obligatory medical examination, the respective activity cannot be carried out without it!***
- Further medical examinations are offered on a regular basis by the employer.
- There is **no** obligation for the employee to take the examination!
- The contact person for this request is your supervisor/direct superior

Occupational safety – conflicts / stress

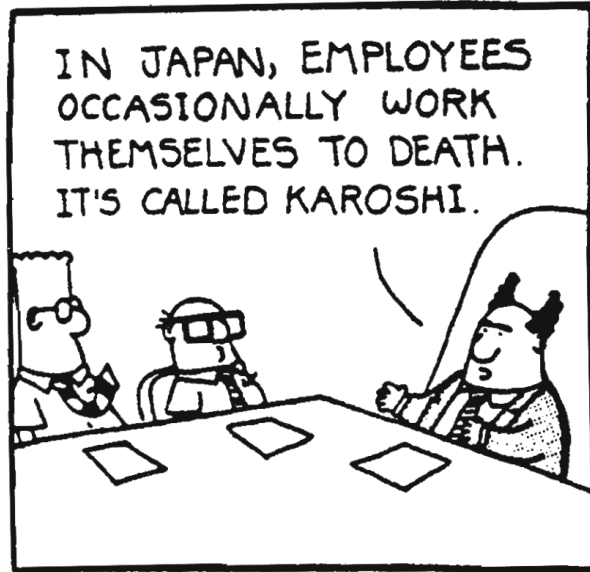
- Conflicts and stress impact on the safety of your working environment!
- Therefore:
 - Respect your colleagues – define and discuss problems
 - Search for solutions together!
 - In case of stress: consult a person of trust (as a rule, your direct supervisor first)



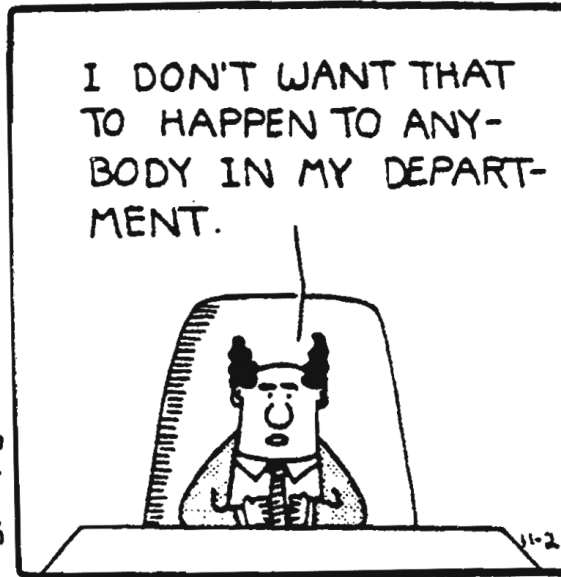
Occupational safety – conflicts / stress

- Contacts:
 - 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!***

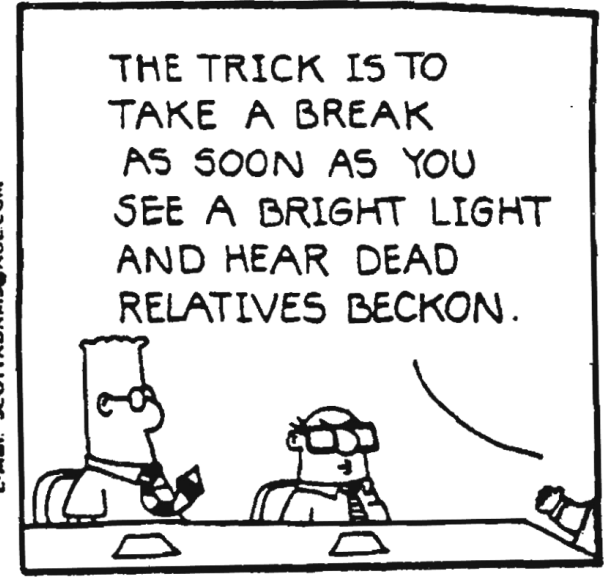
Successful and safe working!



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E-Mail: SCOTTADAMS@AOL.COM



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 → N_2 , Dry Ice, Freezers, Lyophiliser
- Heat → Autoclaves, Heating Cabinets & Stirrers
- Electricity → All electrical appliances

■ Devices

- Centrifuges (power $\geq 500 \text{ W}$ or $E_{\text{kin}} \geq 10,000 \text{ Nm}$)
- 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