

Radiation Safety Manual
PLEASE NOTE THAT ONLY THE GERMAN VERSION IS LEGALLY BINDING
in accordance with § 34 of the Radiation Protection Act

Universität Regensburg
Faculty of Science III
Biology and Pre-Clinical Medicine

The Chair of Biochemistry III - Prof. Dr. H Tschochner

1. Legal Framework

1.1 Radiation Protection Act (StrlSchV) in the applicable version (made available for inspection in room Vkl. 1 0.10 E - Dr. P. Milkereit and in the control area Vkl. 5 1.19)

1.2 Authorization to use radioactive material

Certificate of authorization 4-K3-8816.352-3907 from October 22, 2004
(made available for inspection in room Vkl. 10 10.E - Dr. P. Milkereit and in the control area Vkl. 5 1.19)

2. Responsibilities

2.1 Radiation protection supervisor

Radiation protection supervisor in accordance with § 31-33 StrlSchV:
The Free State of Bavaria, represented by the Bavarian State Ministry of Sciences, Research, and the Arts; the Ministry being represented by Universität Regensburg; the University being represented by the President. The President delegates this task to the relevant professor.

Radiation protection supervisor at the Chair of Biochemistry III: Prof. Dr. Herbert Tschochner

2.2 Radiation protection officers and their internal decision area within the meaning of § 31-33 StrlSchV:

Name: Dr. Philipp Milkereit (Biochemistry III)
Office: Vkl 1 0.10 E, phone 0941-943-2846
Home address: Seifensiedergasse 2, 93059 Regensburg
Telephone (home): 0941-2800916

Deputy:

Name: *Johannes Danner* (Biochemie I)
Office: Vkl 1 1.04, Tel 0941-943-2825
Home address: Gertrud-von-le-Fort-Straße 38, 93051 Regensburg
Telephone (home): 0175 6727115

Name: Dr. Stephan Wenzl (Biochemistry I)
Office: Vkl 1 1.23, phone 0941-943-2829
Home address: Am Grasigen Weg 50, 93128 Regenstauf
Telephone (home): 09402-6225

or the radiation protection officers and their deputies at the Chair of Physiology and the Chair of Cellular and Molecular Anatomy:

Name: Dr. Frank Schweda (Physiology)
Office: Vkl 4 1.07, Tel. 0941-943-2957
Home address: Brunnstr. 42a, 93053 Regensburg
Telephone (home): 0941-299695

Name: Dipl.-Ing. Uwe de Vries (Cellular and Molecular Anatomy)
Office: Vkl 3 1.08, phone 0941-943-2864
Home address: Sophie-Scholl-Str. 96, 93055 Regensburg
Telephone (home): 0941-702284

Name: Prof. Dr. Ralph Witzgall (Cellular and Molecular Anatomy)
Office: Vkl 3 1.03, phone 0941-943-2821
Home address: Herzog-Albrecht-Str. 14, 93059 Regensburg
Telephone (home): 0941-29091039

All individuals from the above listed chairs who handle radioactive substances must follow the orders of the relevant radiation protection officer and his/her deputy.

Any changes regarding the radiation protection officers or their internal decision area must be communicated to the relevant authority (LfU).

3. Handling of Radioactive Substances

3.1 Radioactive substances

- a) The Chair of Biochemistry III is authorized to use the following open radioactive substances in the control area:

Tritium	3.7×10^{10} Bq	(1 Ci)
Carbon 14	1.85×10^9 Bq	(50 mCi)
Phosphorus 32	1.85×10^8 Bq	(5 mCi)
Phosphorus 33	3.7×10^8 Bq	(10 mCi)
Sulphur 35	1.85×10^9 Bq	(50 mCi)
Calcium 45	1.85×10^8 Bq	(5 mCi)
Iodine 125	1.85×10^8 Bq	(5 mCi)

- b) The Chair of Biochemistry III is authorized to use the following open radioactive substances in the supervised area (per room):

Tritium	1×10^9 Bq	(27 mCi)
Carbon 14	1×10^7 Bq	(0.27 mCi)
Phosphorus 32	5×10^6 Bq	(0.135 mCi)
Phosphorus 33	1×10^8 Bq	(2.7mCi)
Sulphur 35	1×10^8 Bq	(2.7 mCi)

The chemical formula must be taken into account.

- c) The Chair of Biochemistry III has installed the following sealed radioactive substances as radioactive sources as external standards in liquid scintillation counters:

Barium 133 with 7.4×10^5 Bq (0.02 mCi)

3.2 Designated areas

Control area:	Radionuclide laboratory (room 5 1.19)
Supervised area :	Rooms 1 0.10A, 1 0.10B, 1 0.10D, 5 0.12A, 5 0.12B, 5 0.13, 5 0.14, 5 0.20 – 5 0.24

3.3 Operating procedures

- a) Only the appointed radiation protection officers and authorized individuals trained in radiation protection and the use of such materials may handle radioactive substances. Individuals under age 18 must not handle any open radioactive substances exceeding the applicable limits (APPENDIX III, table 1, columns 2 and 3 StrSchV). Pregnant and nursing women must not undertake any activity in the control area. Any pregnancy must be declared immediately to the radiation protection officer.
- b) Any experiments involving radioactive substances may only be conducted, if the radiation protection officer or a licensed deputy, who has been designated in writing, is either present or available within no more than 15 minutes of notification by phone.
- c) Any purchase and withdrawal of radioactive substances must be recorded. Therefore, any orders must be signed by the radiation protection officer or his/her deputy and must be entered into the relevant accounting record. The same applies to the withdrawal of radioactive substances.
- d) At the end of each calendar year, the relevant authority will be informed about the purchase, withdrawals and the whereabouts of radioactive substances with half-lives > 100 days.
- e) The proper function of the devices to measure radioactivity is measured and documented on a regular base. The proper function of the measuring devices is to be tested before each usage. This includes the control of the batteries used in the devices and the measuring of the amount of general radiation in the working environment.

3.4 Procedures in the control area

The control area must always be kept locked; the radiation protection officer or his/her deputy will issue the key to authorized individuals. Before leaving or entering the control area, the hand-foot-clothing monitor must be used. When leaving the control area, the absence of contamination must be confirmed by signature in the relevant accounting record (see also 3.6).

- a) Each person authorized to handle radioactive substances is responsible for ensuring that the spread of radioactive substances is kept to the lowest level achievable and that the absorption of radioactive substances into the human body is prevented.
- b) Eating, drinking, and smoking are not allowed.
- c) When working with radioactive substances, lab coats must be worn.
- d) Wounds must be protected by plaster or bandages and by wearing solid gloves so that no activity may enter through the wound.
- e) Open radioactive substances (filling, diluting etc.) should only be handled over troughs lined with sufficient liquid absorbent material.
- f) When performing hazardous work, safety goggles are mandatory. As a rule, gloves must be worn when handling open radioactive substances. Monitors, telephones, doors etc. must not be touched.
- g) Pipetting by mouth is not permitted.
- h) All operations that may involve any potential hazard from inhalation of radioactive substances must be performed in a fume hood.
- i) All containers with radioactive substances or volatile solvents must be kept closed.
- j) Receptacles containing radioactive substances must be labelled with the radiation symbol. Hazard symbols of any kind must not be changed or removed without the author's knowledge.
- k) Radioactive substances must be clearly marked (nuclide, activity, substance, name of person and date)
- l) Used equipment must only be brought into the scullery after all radioactivity has been removed from it.
- m) Radioactive substances that are not being used must be kept in non-flammable and non-melting containers within the control area.
- n) The workplaces must be kept scrupulously clean and must be checked for possible radioactive contamination upon completion of experiments at the end of each working day (monitor, swipe samples) and decontaminated if need be. This must be confirmed by signature, including the isotopes used. Please use the relevant records in the control area and in the supervised areas. Additionally, it must be confirmed that the proper functioning of the radiation gauges has been checked through radioactive source before use.
- o) All radioactive waste must be deposited at the *Zentrale Sammelstelle für radioaktive Abfälle* (Central Collection Point for Radioactive Waste) at Universität Regensburg. Users must make sure that they only bring contaminated material. All substances and objects whose count rate is not higher than background level as measured by the

radiation gauge (Contamat FHT 111M) or, when handling Tritium after having taken swipe samples (counted in a liquid scintillation counter), may be deposited of into the non-radioactive trash.

- p) Both the control area and supervised area may only be cleaned after they have been decontaminated. The control area is cleaned every Friday of a calendar week (respectively on a Thursday, if a Friday falls on a holiday). The cleaning staff will receive proper instruction and information.
- q) Any person noticing any equipment failure as regards radiation protection devices/ control or measuring devices must notify the radiation protection officer or his/her deputy immediately.

3.5 Procedures in the supervised area

When radioactive isotopes are used in the supervised area, make sure to avoid any contamination of the laboratory and all personal contamination. The same code of practice as for the control area applies (see 3.4 a-q) and the proper procedures (3.1, b and c) must be followed.

3.6. Decontamination

The contaminated areas must be marked and confined. Take care to avoid unnecessary spread. If the incident involves personal injury besides contamination, the radiation protection officer must be notified without exception.

As a rule, decontamination must be conducted immediately, wearing gloves and, if need be, overshoes. Drop absorbent paper on liquids. Afterwards, clean thoroughly with water or with the solvent in which the activity has been dissolved.

To decontaminate the hands (skin) wash them with water (and soap if applicable). Contaminated clothing is treated as radioactive waste or is washed within the control area. The rinse water from the decontamination procedures must be treated like radioactively contaminated liquids.

The source of the contaminations must be identified beyond doubt. If need be, other areas must be decontaminated as well.

Do not exceed the following limits (applicable for H-3, C-14, P-32, P-33 and S-35):

Control area:	10 000 Bq/cm ²
Operational supervised area:	1 000 Bq/cm ²
Outside a radiation protection area:	100 Bq/cm ²

In case of doubt, the radiation protection officer or his/her deputy must be informed.

3.7 Guidelines for the disposal of radioactive waste

The Radiation Safety Manual of the *Zentrale Sammelstelle für Radioaktive Abfälle* (=Central Collection Point for Radioactive Waste) at Universität Regensburg applies.

The disposal guidelines have been summarized in a way so that they are generally understandable and have been separated into short-lived and long-lived isotopes. They are

posted in the walls of all laboratories in the operational supervised areas and the control area– see APPENDIX A and B.

Radioactively contaminated liquids may only be disposed of into the sewer system through the use of the sewage containers - see instructions in the control area.

Non-radioactive waste is disposed of into the proper containers that have been labelled accordingly.

3.8 Medical Surveillance

Individuals exposed to radiation at the workplace are subject to a medical examination depending on their level of exposure (§ 60 StrSchV). In accordance with § 54 StrSchV workers are classified into two categories based on the effective dose (partial-body dose: gonads, uterus, red bone marrow):

Category A: ≥ 6 mSv/calendar year

Category B: ≥ 1 mSv/calendar year

All individuals of the A category are subject to a first medical examination and an annual review of health undertaken by the University's Appointed Doctor.

All individuals of the B category are subject to a first medical examination, if they work with open radioactive substances for more than six months. Nature and magnitude of the risk of working with open radioactive substances at the Chair of Biochemistry I make it necessary to group individuals exposed to radiation into category B (maximally). If working with phosphorus 32, iodine 125 and germanium 68. film dosimeters must worn.

When working with Na-22 und Fe-59 the personal dose must be monitored by using direct-reading dosimeters.

If the conditions of exposure regarding the work with radioactive substances change considerably, the radiation protection officer must be notified (this may involve a review of the means of implementation and the requirements of a regular control).

4. Response to abnormal occurrences

4.1 Incidents/Emergencies

When a radioactive incident/accident occurs, the radiation protection officer or his/her deputy must be notified immediately. He or she will provide the necessary instructions which must be strictly adhered to.

4.2 Loss of radioactive materials

Any known or suspected loss of radioactive substances must be reported to the radiation protection officer immediately. It is then his/responsibility to inform the relevant authorities as required.