Guidelines for handling radioactive substances

From the point of view of occupational hygiene radioactive substances are to be regarded as poisons whose incorporation must be avoided. Compared with conventional poisons, the circumstance is that the ionizing radiation emitted by these substances can unfold their harmful effect even without incorporation. Compared to the behavior in chemical laboratories, therefore, further protective measures are required. Basically, work must be done in such a way that any contamination, be it from workplaces, walls, floors, work clothes, tools, etc., remains undone. If contamination nevertheless occurs, it must be reported immediately. The following are some guidelines for the handling of radioactive substances in a nutshell summarized:

1. Each experiment with radioactive substances shall be carried out in such a way that, when using the smallest possible amount, work is carried out within the shortest possible time with the best possible screening.
2. Work with radioactive substances above the exemption limit may only be carried out in protective clothing.
3. Work below and above the exemption limit may only be carried out after prior notification and approval by the radiation protection officer.
4. It must be ensured by all concerned that only the authorized persons are present in the control area of the isotope laboratory and at the special workplaces. Persons under the age of 18 and pregnant women are not authorized.
5. Rooms in which open radioactive substances are to be handled must be marked.
6. When working in the isotope laboratory, wear a lab coat, gloves, goggles and sturdy, closed shoes (not sandals). For handling emitters, eye protection (shielding at least 1 cm Plexiglas disc) should be used. When leaving the isotope laboratory, a possible contamination of the laboratory surfaces, clothing and exposed parts of the body should be monitored by means of a monitor. In the event of personal contamination, the radiation protection officer or a responsible person must be notified immediately. In this case, a contaminated person may not leave the isotope laboratory until the arrival of a radiation protection officer.
7. When handling all radioactive isotopes, personal dosimeters must be worn for individual physical control. These are to be ordered before the planned work by the respective section.
8. Eating, drinking, smoking and the use of cosmetics is prohibited in the Control area of the isotope laboratory and at the special workplaces.
9. All work with radioactive substances should, if possible, be carried out on plastic trays with several layers of absorbent filter paper. After each use, the trays are rinsed with plenty of water, the filter paper is placed in the appropriate waste. Work in which volatile radioactive substances occur must always be carried out in the fume cupboard.
10. Pipetting by mouth and working with injuries in the form of unprotected, open wounds prohibited. Wounds must be protected by plaster or bandage.
11. At the special workplaces the containers and the places containing the radioactive substances are sufficiently marked with adhesive tape ”CAUTION RADIOACTIVITY”
12. During the experiment, at the latest after the end of the experiment, the workplace must be checked for contamination. In addition, a test certificate must be created. The measurement of

contamination also affects all operations below the exemption limit .

13. All work equipment in rooms where open radioactive substances are handled must be regarded as contaminated until proven otherwise.
14. Decontamination is always carried out with gloves and overshoes (plastic bags). Liquids are first absorbed with paper. Then it is cleaned with H_2O or the solvent in which the activity was dissolved. The success of the decontamination should be checked with the help of the monitor and, if necessary, other persons should be consulted with the radiation protection officer. At the end of the work, at the latest at the end of the working day a contamination measurement has to be done.
15. Radioactive waste from special workplaces is disposed of via the isotope laboratory in accordance with the specifications of other persons entrusted with the task of radiation protection. Radioactive waste may only be stored at the special workplace in lockable containers or cabinets.
16. Office supplies of any kind do not belong in a laboratory where open radioactive substances are used.
17. All vessels, especially those with radioactive contents, must always be labeled immediately. The label should contain at least the type of nuclide, the activity and the name of the person responsible as well as being legible. This is especially true to vessels stored in generally accessible refrigerators and freezers.
18. The use of radiation measuring instruments is permitted only after prior, thorough instruction by an experienced employee.
19. Radioactive liquids must not be discharged into the sewage system.
20. After working with open radioactive materials, carry out contamination controls and wash hands thoroughly. In addition, a test certificate must be created. The measurement of contamination also affects all operations below the exemption limit.

In General

- Only those persons who have a valid access permit are authorized to enter radioactive laboratories. This access permission must be granted to those persons who are to carry out activities with open radioactive substances in the said laboratory for an organizational unit as part of their radiation protection authorization. The radiation protection officer and all persons responsible for the laboratory must be given an access permit.
- In case of non-compliance with the relevant regulations on radiation protection, against the work instructions, against the laboratory regulations or instructions of the radiation protection officer, the retention of the access permit must be checked. If, in the opinion of the Radiation Safety Officer, safe work in the laboratory can not be guaranteed beyond doubt by this violation, the authorization of the radiation protection officer must be initiated immediately.
- Persons who need access to the laboratory without having to work with radioactive substances (cleaning staff) will be granted access permission after prior instruction, unless there are any important reasons for this in the view of the radiation protection officer.
- Incidents, radiation accidents and any inspection and service work must be recorded in the laboratory logbook and reported immediately. Inspection and service work may only be carried out after approval by the radiation protection officer.
- The laboratory logbooks must always be accessible to the radiation protection officer, as well as the records of physical and medical controls.
- Radioactive material may only be stored at the workplace for as long as and only in such quantities as is necessary for the operation. The vessels containing the radioactive material must not be left open for more than necessary during the operation, or left outside the radiation shielding protective containers.

- When using the devices, especially the contamination monitors, the utmost care must be taken. Repairs to measuring instruments are by no means to be carried out by the user himself, but he must be informed to the radiation protection officer.

Accountability

The responsibility for all radiation protection concerns is generally with the Medical University. The Medical University as license holder is responsible for the detailed planning and determination of the nature and extent of technical and other radiation protection measures and their monitoring, such as

- Care for facilities, equipment and equipment for radiation protection, including periodic health checks.
- Regular review of the effectiveness of the safety devices and protection
- Creation of work instructions.
- Briefings:

If the license holder does not himself have the necessary training in accordance with §§ 41 to §§ 43, he / she may entrust the radiation protection officer and other persons entrusted with the task of radiation protection with these tasks

- Regulation of in-house powers.

Radiation Protection Officer

ß Duty of attendance according to §15 Radiation Protection Act:

The holder of a license in accordance with §§ 6,7 or 10 of the Radiation Protection Act is obliged to ensure that the necessary number of persons are present during the operation who demonstrably have sufficient knowledge in radiation protection and are entrusted with their perception. For all isotope laboratories and radiation workplaces these are the further persons entrusted with the protection of radiation protection.

- The radiation protection officer and other persons entrusted with the exercise of radiation protection are responsible for the tasks assigned by the license holder.
- The radiation protection officer and the other with the perception of the Radiation protection entrusted persons must be provided the necessary time.
- The radiation protection officer and the other with the perception of the

Persons responsible for radiation protection must be granted access to all necessary information. They are to be consulted by the license holder in all questions of radiation protection.

Training

Further education (§ 41 general radiation protection ordinance):

Radiation protection officers and other persons entrusted with radiation protection must demonstrate successful **participation in further training events at intervals of no more than 5 years.**

Teachings

ß The instruction of persons working in radiation protection areas or other persons who have entered radiation areas on a case-by-case basis

- Before starting the activity
- **At least once a year**
- Records of content and time of instruction are to be kept.

- The pedestal of instructed persons or records must be kept for at least 7 years.
- Essential contents of the instructions:
- General procedures in radiation protection and the precautions to be taken, in particular those related to the given operating, working conditions, taking into account the job,the workplace.
- All essential contents of the license notice (organizational radiation protection measures)
- The health risks associated with the activity
- The importance of technical and organizational regulations
- In case of female workers - early reporting of a pregnancy

Pregnancy limitations

Embryonic tissue is particularly sensitive to ionizing radiation due to its high rate of cell division. Accordingly, the danger in the case of pregnancy is explicitly mentioned here. Therefore, the following rules apply:

- The radiation protection officer must be informed immediately about the presence of a pregnancy.
- Pregnant women are prohibited from entering the control areas in the laboratory.

Instruction – Emergency

When a safety-relevant event occurs, every user is obliged

- Inform the radiation protection officer and / or the person responsible for the equipment immediately.
- In case of uncertainty, the measuring operation must be stopped and the X-ray device must be switched off in a controlled manner in accordance with the operating instructions.
- If a safety-relevant emergency situation occurs, switch off the X-ray device using the emergency button on the device and leave the laboratory.
- Thereafter, each user is obliged to inform the radiation protection officer and / or the person responsible for the equipment immediately.

NOTE:

This instruction serves only to convey general radiation protection regulations. It should be noted that this directive alone does not meet the requirements of the recurrent radiation protection instructions. For this it is additionally necessary

1. The officially approved in individual cases laboratory regulations for the isotope laboratories or radiation systems
2. In addition to providing experimental and workplace-specific safety instructions. In any case, the contents of the instruction must emerge from the proof of instruction.

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