PROCEDURE V.3 AUG. 2020

ANIMAL STUDIES USING IONISING RADIATION

PURPOSE

The purpose of this internal procedure is to establish the conditions regarding the use of X-ray devices and radioactive substances as part of veterinary diagnostics and scientific research in laboratory animals, in accordance with the provisions stated in the *Basic safety standards radiation protection Act* (Dutch: *'Besluit basisveiligheidsnormen stralingsbescherming*' or *Bbs*) and the *Experiments on Animals Act* ('*Wet op de dierproeven*' or *Wod*).

This procedure is intended for radiation protection experts (RPE) and radiation protection officers (RPO; Dutch: 'Toezichthoudend Medewerker Stralingsbescherming' or TMS) with a supervisory role, as well as other persons who in any way can be involved with animal studies, in which sources of ionising radiation are used.

LEGAL FRAMEWORK

For the execution of projects that involve experiments with laboratory animals, the researcher firstly must discuss the project application with the Animal Welfare Body ('Instantie voor Dierenwelzijn' or IvD). Next, a permit is applied for at the Central Authority for Scientific Procedures on Animals ('Centrale Commissie Dierproeven' or CCD). The Animal Experiments Committee ('Dierexperimentencommissie' or DEC) assesses not only ethical aspects, but also scientific relevance, and offers advice to the CCD. The CCD assesses whether the project application meets the provisions stated in the *Wod*, also using the advice of the DEC. The DEC assesses the importance and feasibility of the objective of the project, and weighs these against the expected discomfort for laboratory animals.

APPLICATION APPROVAL WORK PROTOCOL

Whenever the CCD has issued a permit to the licence holder of Maastricht University, the responsible researcher will be notified of this. Subsequently, this researcher submits a work protocol, in which the practices with animals are described in detail. If the use of sources of ionising radiation is requested, an approval, concerning the justification of the use of ionising radiation, of the General Coordinating Expert ('Algemeen Coördinerend Deskundige' or ACD) is required in addition to the permit.

The assessment of the radiation protection aspects of the study occurs according to the format described below, in accordance with the 'Radiation Safety Regulation Randwyck' ('Regeling Stralingshygiëne Randwyck'). The SBE assesses these studies according to the radiation safety recommendations of the International Commission on Radiological Protection (ICRP), taking in account justification, optimisation as well as dose limits. The leading aspect in this is the protection of people against ionizing radiation. If necessary, consultation takes place with the RPE and/or RPO of the department at which the study is performed, and the researcher, to ensure possible additional provisions and/or measures to limit the radiation risk are being taken. The final (radiation safety) approval is granted by the ACD.

RADIATION SAFETY PRINCIPLE OF THE ICRP

Dose control

The choice to use ionizing radiation usually is determined by the higher sensitivity and accuracy compared to techniques, in which no radiation sources are applied. In some cases, however, this implies that the use of radioactive tracers is rather preferred, because this results in a reduction of the number of test animals. Also, the use of X-ray equipment often leads to the benefit that invasive methods can be avoided, and, as a result, the discomfort of the test animals is substantially lowered.

At all times, the intention is to minimize the amount of activity of open radioactive substances, which are administered to test animals, trying to find a balance between the amount of activity and the quality of the resulting image. Similarly, for applications using ionizing radiation emitting equipment, the intention is to use as little radiation as possible.

Justification

If equal or comparable results can be obtained by using alternative methods, the use of ionizing radiation in this application will not be justified. The (biological) harm suffered by both test animals and involved employees by the use of physical or chemical alternatives, will also be taken into account. The expected benefits have to outweigh the disadvantages and/or costs related to the study.

Optimisation

In the context of optimisation, administered doses should be as low as reasonably possible (ALARA). For this, the current state of science, application of state-of-the-art techniques, optimal quality control of equipment, and statistical arguments regarding the number of test animals included in the study.

Assessment

Several types of experiments can be differentiated in animal studies. These can take place under various circumstances and in different rooms and buildings at the Randwyck complex. Application of open radioactive sources in test animals always requires, more than in other in-vitro experiments, extra attention with regard to radiation safety. The possibility of contamination is relatively high.

When designing a study, if deemed necessary, a clinical physicist will be involved, who can provide or check the needed dosimetric data. Radioactive labelled compounds must meet the pharmaceutical quality requirements that apply for radiopharmaceuticals; X-ray equipment must meet the quality control that applies for application in patients. Regarding the preparation of radioactively labelled compounds and the use of X-ray equipment, the quality requirements applying for patient applications are adhered to as much as possible.

Practices with radiation sources as part of biomedical research may only be performed under the regime of a (or several) Written Internal Permission ('Schriftelijk Interne Toestemming' or SIT) for the use of these sources of ionizing radiation at the department concerned, and within the framework of the Complex Licence Randwyck. This SIT is issued based on a risk analysis in which said practices are included.

At all times, the execution of these practices occurs under supervision of the Radiation Protection Officer of the department at which the practices are performed. The researcher has to discuss his study with this TMS beforehand. Furthermore, the fact that various employees are involved in the animal experiments, such as the researcher performing the experiments, support staff, biotechnicians, animal caretakers and the TMS, calls for good consultation beforehand and good mutual communication for the success of the experiments.

The work activities with test animals need to be performed by authorized and competent persons, as stated in the *Wod*, who have sufficient expertise in the field of radiation safety, to be determined by the TMS, but for working with radioactive sources in dispersible form, at least a diploma of the course TMS-VRS D.

These animals have to be housed in rooms that are equipped for this purpose, as well as in suitable cages, which ensure the spreading of radioactive materials as much as possible. Housing of radioactive animals needs to be separate from non-radioactive animals.

Conditions linked to the (internal) transport of large and small test animals, to which radioactive substances have been administered, are described in a separate procedure.

Application (radiation safety) approval

If an approval needs to be acquired from the ACD, the protocol and work protocol have to be sent to straling-crisp@maastrichtuniversity.nl.

The processing time from the moment of acquiring the required documentation is two weeks at most.

LIST OF ABBREVIATIONS

Dutch		English	
ACD	algemeen coördinerend deskundige	-	general coordinating expert
ALARA	as low as reasonably achievable	-	as low as reasonably achievable
Bbs	Besluit basisveiligheidsnormen stralingsbescherming	-	-
CCD	Centrale Commissie Dierproeven	-	Central Authority for Scientific Procedures on Animals
CD	coördinerend deskundige	-	coordinating expert
DEC	Dierexperimentencommissie	-	Animal Experiments Committee
ICRP	International Commission on Radiological Protection	-	International Commission on Radiological Protection
IvD	Instantie voor Dierenwelzijn	-	Animal Welfare Body
SBD	stralingsbeschermingsdeskundige	RPE	radiation protection expert
SBE	stralingsbeschermingseenheid	RPU	radiation protection unit
SIT	schriftelijke interne toestemming	-	written internal permit
TMS	toezichthoudend medewerker stralingsbescherming	RPO	radiation protection officer
TMS-MT	toezichthoudend medewerker stralingsbescherming – medische toepassingen	-	radiation protection officer – medical practices
TMS-VRS D	toezichthoudend medewerker stralingsbescherming – verspreidbare radioactieve stoffen niveau D	-	radiation protection officer – dispersible radioactive materials level D
Wod	Wet op de dierproeven	-	Experiments on Animals Act

REFERENCES

- Besluit basisveiligheidsnormen stralingsbescherming: https://wetten.overheid.nl/BWBR0040179/2018-07-01
- Regeling basisveiligheidsnormen stralingsbescherming: https://wetten.overheid.nl/BWBR0040509/2019-02-15
- ANVS-verordening basisveiligheidsnormen stralingsbescherming: https://wetten.overheid.nl/BWBR0040581/2020-01-01