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## 1 PURPOSE, SCOPE AND RESPONSIBILITIES

This standard operating procedure (SOP) aims to provide guidelines for research-related practices occurring at Oslo Imaging and Therapy Laboratory (OITL) facilities. This includes guidelines for entering and exiting the building, daily inspection standards for animals at the DU-035 facility who have received injections with radioactive isotopes, and general radiation safety practices/responsibilities for OITL researchers and Section for Comparative Medicine (KPM) personnel.

The responsibilities of the Head of OITL, in consultation with KPM, are outlined as follows: updating SOPs and related procedures as appropriate, ensuring that the doors of facilities storing radioactive materials are labeled with a radiation trefoil in accordance with the standards outlined in Appendix 1a: Radiation Signs and Labels, ensuring that the cages of animals treated with radioactive substances are labeled with radioactive substances info, injection date, and dosage in accordance with Appendix 1b.

The Radiation protection officer (RPO) is responsible for ensuring that all radioactive monitoring equipment has undergone calibration, can effectively detect contamination, and is readily available in the lab.

KPM personnel involved in daily inspection of animals will receive mandatory theoretical and practical training prior to the commencement of the work.

Radiation Protection Officer (RPO):

Vegard Torp Lien, PhD

Researcher, NMS

Telephone: 99009244, E-mail: [vegard.torp.lien@syklotronsenteret.no](mailto:vegard.torp.lien@syklotronsenteret.no)

Head of OITL:

Syed Nuruddin, PhD

Senior Researcher, NMS

Telephone: 96724073, E-mail: [syed.nuruddin@syklotronsenteret.no](mailto:syed.nuruddin@syklotronsenteret.no)


## 2 DEFINITIONS

KPM: Section of Comparative Medicine

OITL: Oslo Imaging and Therapy Laboratory

Rotem RAM GENE-1 MARKII: a probe for surveying gamma radiation. Use of with the probe is described in SOP-NMS-IMB-2021-06


RadEye AB100: a probe for surveying alpha and beta radiation. Use of the probe is described in SOP-NMS-IMB-2021-06

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### 3 PROCEDURE

#### Entering the facility

- I. At OITL, indication of an active experiment involving radioactivity will involve two signals: a sign on the entrance of DU-028B and illumination of the lamp by the entrance to DU-028B. An active experiment includes, but is not limited to, injections of isotopes and irradiation. Entering the facility is not permitted for the duration of an active experiment. Under no circumstance should women who are pregnant or may be pregnant; enter an area with ongoing radioactive experiments, contact animals treated with radioisotopes, or enter a facility storing radioactive isotopes.
- II. KPM personnel will inspect animals before 09:15 on weekdays. This time limit is generally not set for the weekend (see exception below).
- III. The general rule is that no experiments will be performed during the weekend. If any experiments must be carried out during the weekend, the operations coordinator and the nominated person performing daily inspections of animals must be notified the Thursday before. The operations coordinator must notify the weekend staff. Weekend inspections must then be carried out before 10:00.
- IV. KPM shall permanently nominate an individual to perform a daily animal inspection. This individual must use a personal dosimeter. OITL staff must use a personal dosimeter. Personal dosimeters should be stored in a labelled bag on the shelf by the logbook "Logbook 132 for R&D/IMB-NMS."
- V. Weekend staff, other KPM personnel, and guests, shall use the DMC 3000 or electronic dosimeter ("guest dosimeter"). For instructions related to the use of a DMC 3000 electronic dosimeter, reference Section 4. In this instance, a personal dosimeter is not required, provided the annual exposure does not exceed 6 mSv.
- VI. Prior to entering DU-028B, consult the logbook (Appendix 2) available outside DU-028B. In the "Safe to Enter" section of the logbook, there are two options: "Yes" and "No." When "Yes" is selected, it is safe to enter OITL. When "No" is selected, individuals are not permitted entry into the laboratory area as a result of unacceptable levels of radioactive contamination. To confirm whether or not access is permitted, contact the Head of OITL or RPO.
- VII. Put a new hairnet, pair of gloves, and surgical mask in a zip lock bag. These materials will be utilized for exiting OITL. Place your phone and access card in a separate zip lock bag. Bring your dosimeter and the guest dosimeter. Put on an extra pair of gloves. Open the door and enter DU-028 to access dressing room and step-over.
- VIII. Place your phone, access card, personal dosimeter and guest dosimeter on the step-over. Put on safety glasses, P3 mask and disposable coat (KPM staff). Dispose of surgical mask. Keep hairnet and gloves.
- IX. Sit down on the step-over and take off your shoes. Turn around and put on new shoes inside the DU-028B. NB! Do not step on the floor with your socks!

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- X. Put on your coat (OITL staff). Place your phone and access card in the pocket of your coat/disposable coat. Turn on the guest dosimeter and place this in the breast pocket of the coat/disposable coat. Put on your personal dosimeter with the nameplate facing away from you.
- XI. Perform personal contamination checks with RadEye AB100. Remember that readings from RadEye AB100 must be stable as a peak reading may just be static electricity. First check your right hand, then your left hand. After confirming that your hands are free of contamination, check your coat, sleeves and front. Then, check the soles of your shoes by lifting one foot at a time. If you have touched the soles of your shoes with the probe, spray some disinfectant on a paper towel and use it to clean the probe. After cleaning the probe, change your gloves. When using RadEye AB100 to measure  $\alpha$ -particles, consider anything above 0.5 cps on the surfaces outside the bench and inside the induction chamber as contaminated. Contact the head of OITL or RPO if you detect contamination. The contamination will be handled according to the protocol described in SOP «NMS-IMB-03 Contamination monitoring and Radioactive decontamination procedure at OITL».
- XII. Turn on the Rotem RAM GENE-1 MARKII dose rate meter, and ensure that the cap is on. The probe will measure the gamma radiation background. When the probe detects gamma radiation, it will beep. The intervals between beeps will decrease as the dose rate increases. The dose rate will be visible on the display.

**Daily inspection of the animals**

- XIII. Animal inspection will occur in DU-035. Animals injected with radionuclides will have their cages labeled in accordance with the standards in Appendix 1B. Labels will indicate the presence of alpha-, beta- or gamma isotopes.
- XIV. When inspecting the animals in DU-035, stay no less than one meter away from the cages and do not touch the outside of the cage. **\*\*Under no circumstances should KPM staff open cages, change water bottles, handle animals or dirty equipment. Notify OITL if any discrepancies are detected.** OITL will change cages, change water bottles, fill food and euthanize sick animals. In the event of an animal emergency (i.e., animal in distress), KPM will contact the OITL. Head of OITL will be available within one hour after receiving call from Animal care staff. The response team consists of three named persons under “The response team” below.
- XV. Record values on the ventilation unit inspection sheet and sign the document after completion of the inspection. Take a picture of the inspection forms and save them under «Arbeidslister MDU og Barrieren → Ferdig utfylt romskjema» upon completion of the form.

**Exiting the facility**

- XVI. Perform a contamination check. Follow the same order as when you entered OITL: Inspect your hands, coat, and then shoes for contamination. Contact the head of OITL or RPO if you detect contamination. Return the RadEye AB100 and Rotem RAM GENE-1 MARKII to its storage location.

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- XVII. Discard your outer gloves in the residual waste container. Remove your phone and access card from the zip lock bag and discard the bag in the residual waste container. Place your phone, access card, guest dosimeter, and personal dosimeter on the step-over. Take off your coat and hang it in the assigned space (OITL staff).
- XVIII. Sit down on the step-over and take off your shoes without stepping on the floor with your socks. Turn around and put on the shoes you came in with.
- XIX. Place a P3 mask in a labeled bag and place this and safety glasses in the allocated space (the mask can be reused for up to eight hours). Dispose of the hairnet as residual waste and place the disposable coat in the allocated space (KPM staff). (The disposable coat can, provided no contamination is detected, be reused for a week.) Dispose of the inner gloves as residual waste. Wash your hands thoroughly! Put on the hair net, mask and gloves that were prepared on the way in. Exit DU-028B.
- XX. Place the personal dosimeter in a marked zip lock bag and place it next to the logbook. Read the values on the guest dosimeter, enter this into the log and place the dosimeter on the shelf.

#### **Recurring Responsibilities**

- XXI. KPM is responsible for replacing inspection sheets in the ventilation unit and performing a daily animal inspection.
- XXII. OITL will, every third week, or when needed, replace the pre-filter in the ventilation unit. KPM must provide training to OITL. Used pre-filters must be handled as hazardous waste according to “SOPNMS-IMB-2020-04.”
- XXIII. OITL will perform health monitoring 4 times a year according to KPM SOP 13-01 (Routine health monitoring of rodents). After thorough contamination control and confirmation of a negative test result for radioactive contamination, the samples will be given to KPM and sent to Idexx with the remaining samples from the section.
- XXIV. OITL will replace used OITL lab coats every Friday (KPM personnel use disposable coats) and will immediately replace coats in the event of contamination.
- XXV. Every Friday OITL will order equipment. This may include, but is not limited to, cages, water bottles, food, paper for animals, and tunnels. To place an order, an email will be sent to “komparativ@basalmed.uio.no.” OITL will purchase their own disposable liners.

#### **The response team**


- Head of OITL: Syed Nuruddin, (Telephone: 96724073)
- Researcher from Bayer: Ana Oteiza (Telephone: 40547105)
- Researcher from Bayer: Gebregziabher Petros (Telephone: 93695991)

#### **Fire emergency**

Alternative 1: Through DU-028B.

Alternative 2: Through the hatch in DU-034 (if escape through DU-028B is not an option)

Alternative 3: Through LU-005 (When the fire alarm is triggered and escape through DU-028B and the hatch in DU-034 is not an option).

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Prior to evacuation, close all cages with animals. If the fire alarm is activated during an experiment involving a surgical procedure, euthanasia must be performed to ensure the welfare of the animal and to prevent the animal from escaping. If possible, bring the RadEye AB100 probe with you. Follow the shortest route to safety. If you do not follow the standard evacuation route, try to remember your path. When you reach safety, perform the exit check using the RadEye AB100 probe. If contamination is detected, stay in place and notify the RPO.

#### 4 USE OF DMC 3000 AND RAD-60 ELECTRONIC PERSONAL DOSIMETER.

##### DMC 3000:


- I. Collect the dosimeter at the entrance to DU028B. Use logbook 135 for R&D/IMB-NMS to register your name, date, time of entrance and the readings from the dosimeter.
- II. To turn on the dosimeter, press the “+” for 3 seconds, until the “ENTER” text appears on the display. Press the “+” button quickly, followed by the “-” button. A sound and light alarm will indicate the dosimeter is on. The reading will show the current accumulated dose in mSv. Write it down in the logbook 135.
- III. Use the “-“ button to switch between the 3 regimes of the dosimeter:
  - a. d:(H10) – total body dose in mSv
  - b. R:(H10) – dose rate in mSv/h
  - c. h: - time since measurements start
- IV. When finished with work at the facility, read the total body dose (d:(H10)). Write down time of exit, and total body dose in the logbook 135. Sign off the measurement.
- V. To turn off the DMC 3000 dosimeter, press the “+” button for 3 seconds until the “EXIT” text appears on the display. Press the “+” button quickly, followed by the “-” button. A sound and light alarm will indicate the dosimeter is off. The display will indicate “PAUSE”.

Figure 1. Display of the DMC 3000 electronic dosimeter during turning on and off.



##### RAD-60 Personal Alarm Dosimeter

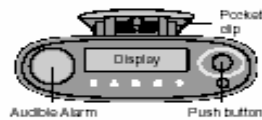
The RAD-60 is a Digital Pocket Alarm Stand Alone Dosimeter designed for use by people who may be exposed to gamma and X-ray radiation during their work. It provides programmable dose rate and dose

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alarms. RAD-60 is microprocessor controlled and is operated using the display and the push button. The push button gives a beep each time it is pressed. To complete an action, release button or press again (bleep) and hold down until a second bleep is heard. The three digit display shows dose, dose rate and various messages. The display and sound signal are used to indicate alarms (dose, dose rate, low battery, defect, dose/dose rate overflow).

- I. Collect the dosimeter at the entrance to DU028B

**RAD-60 Top view**



- II. Use logbook 135 for R&D/IMB-NMS to register your name, date, time of entrance and the readings from the dosimeter.
- III. Switch on, Press push button until all segments are displayed. The dose/dose rate is displayed within 5 seconds.




- IV. Switch off (OFF)-Press push button shortly until the display changes to OFF. Push the button until it beeps. The display goes blank.

## 5 DOCUMENT HISTORY

Version	Description
001	Title: Animal Husbandry practices with Radioactive Animals at microPET lab (DU-034), IMB, UiO
002	Entering, exiting and animal surveillance for Animals treated with radioactive isotopes at Oslo Imaging and Therapy Laboratory at section of comparative medicine (KPM), IMB, UiO
003	RAD-60 dosimeter addition to KPM lab
28.10.2022	Update regarding the use of a personal dosimeter and some general updates regarding entering and exiting OITL (Frøydis Lie Kilmer)

## 6 REFERENCES


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PET trace service manual

Veileder 2: Bruk av åpne radioaktive kilder i laboratorium

Veileder 10: Nukleærmedisin (NRPA)



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## 7 APPENDICES

Appendix	Doc. Id.	Title
1a		Radioactive tri foil
1b		Cage card for animals injected with radioisotopes
2	OITL map	OITL map
3	Contamination record form-01	Contamination monitoring record form for log book 132


### 7.1 Appendix 1a: Labelling of area for work with radioisotopes

#### Radiation area





**Authorized personell only**

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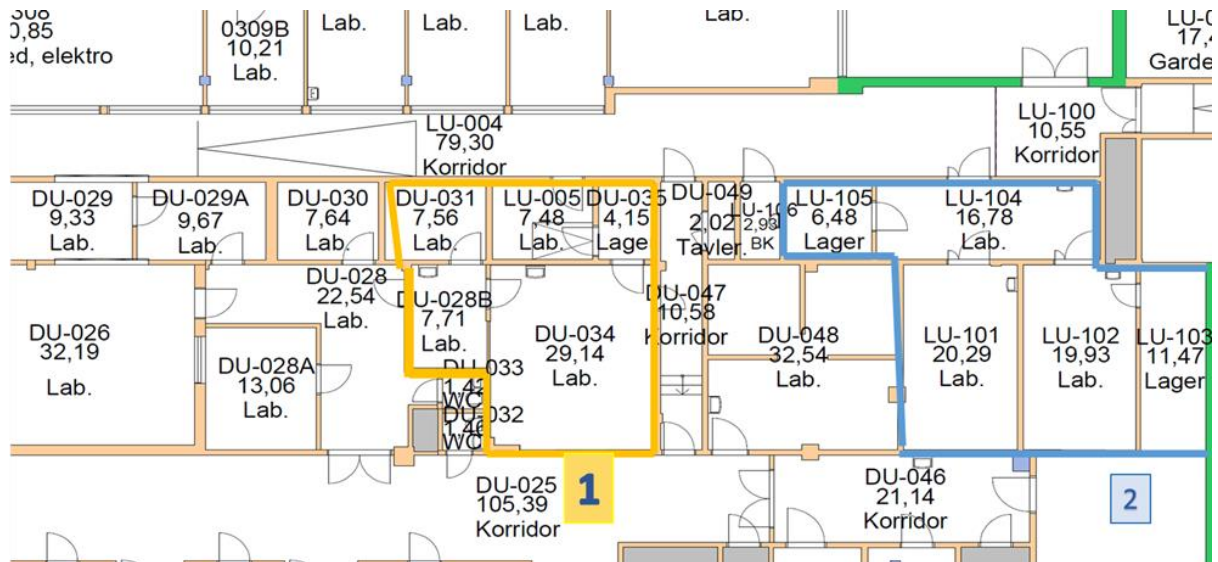
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## 7.2 Appendix 1b: Cage card

Radioactive Study	
Isotope: _____	
Activity per Animal: _____	
Date/Time of Injection: _____	
Date/Time when Animal is no Longer Radioactive: _____	

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### 7.3 Appendix 2: OITL map (active and inactive area)



#### Legend

- 1= Facility for preclinical animal experiments rented by Norsk medisinsk syklotronsenter AS.
- 2= Facility for preclinical Radiochemistry production , quality control and Invitro study lab rented by Norsk medisinsk syklotronsenter AS.

DU-028 B- control room for PET-SPECT-CT scanner and this area is defined as inactive area  
DU-031: is defined as active area where radiochemical dose preparation will be performed and waste bin for long lived and short lived isotopes will be placed.  
DU-034: is defined as active area where animal will be handled for scanning and injection of dose will be performed.  
DU-035: is defined as active area where animals will be kept for longitudinal studies by using long lived isotopes ( AC-225, Th-227, LU-177)



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**7.4 Appendix 3: Contamination Survey Record**

Authorized Researcher's Name:..... Room no: ... Page:.....

All records must be available for inspection and kept for 5 calendar years

**IF CONTAMINATION IS FOUND**

	Date	Instrument ID	Background CPM	location	Results	Monitored by	Cleaned	Labeled	disposed	Safe to enter Yes /No
1							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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**7.5 Appendix 4: Danger sign – experiment ongoing**

