School of Biological Sciences:  
Zoology Building

Ionising Radiation Regulations 1999

LOCAL RULES

These rules apply to the following areas:-  
Zoology rooms 431, 110

Issue date April 2012

Review date April 2014

Note If you are reading this document after the review date please check  
with your RPS that you have the latest version
1. Radiation protection supervisor is: Prof David Hazlerigg

2. Designated areas

<table>
<thead>
<tr>
<th>Controlled radiation areas</th>
<th>Supervised radiation areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>4th floor lab (room 431), 1st floor counting lab (room 110)</td>
</tr>
</tbody>
</table>

3. Unsealed Radionuclides used

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Half Life</th>
<th>Emissions</th>
<th>Contamination monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3H</td>
<td>12 years</td>
<td>Liquid / Solid / Organic</td>
<td>Wipe test and LSC</td>
</tr>
<tr>
<td>14C</td>
<td>5730 years</td>
<td>Liquid / Solid / Organic</td>
<td>G/M E-type model 409</td>
</tr>
<tr>
<td>32P / 33P</td>
<td>14 / 25 days</td>
<td>Liquid / Solid / Organic</td>
<td>G/M E-type model 409</td>
</tr>
<tr>
<td>35S</td>
<td>87 days</td>
<td>Liquid / Solid / Organic</td>
<td>G/M E-type model 409</td>
</tr>
</tbody>
</table>

4. Radiation Equipment used in the area

The following in Room 110: Canberra-Packard Cobra 5010 y-counter, Packard Tri-Card 1600TR LSC, Kontron Betamatic LSC. Hand held G/M type E, C0000409 in room 431

5. General Lab arrangements

These rules must be posted in each laboratory radioactive materials are handled. A prior risk assessment must be carried out before commencing new work activities and recorded using form on the iso-inventory system.

Access to the lab
- Access to radiation areas should be restricted to those who have been trained and are directly involved in the experiment unless they are under the close supervision of the RPS.

General
- Users should be familiar with the University Radiation Safety intranet site (https://www.abdn.ac.uk/safety/resources/radiation/ionising/)
- Experiments should be carefully planned and should only take place if no other equivalent experiment which does not involve radioactive substances exists.
- Consideration should always be given to using the least hazardous radionuclide for example P-33 should be used in preference to P-32.
Experiments involving radioactive materials should only be carried out by suitably trained staff/students. Any new member of staff or student wishing to undertake work with unsealed radioactive substances must first have completed the basic radiation safety course. Additionally the principle investigator/RPS should ensure that all staff or students working on the experiment are proficient in basic laboratory techniques before they start manipulation of radioactive substances unsupervised. It is important that all staff involved in this work are suitably trained in carrying out contamination monitoring.

lab procedures

- Observe all the basic laboratory safety procedures:
  - There must be no eating, drinking or applying cosmetics in the laboratory
  - Never use your mouth to pipette
  - If you see a colleague doing something dangerous, point it out to him/her immediately and if necessary report it to the RPS
  - Work must not be carried out by a person with an undressed cut or abrasion below the wrist

- Lab coats or other suitable protective clothing should be worn at all times when entering a supervised area. Disposable gloves and protective eyeglasses should be worn whenever unsealed sources are being handled or manipulated.

- Work should be carried out over trays wherever possible.

- All apparatus being used with radioactive materials must be labelled using “radioactive” warning tape. The tape must be removed when the apparatus has been washed and found to be clear of contamination.

- Radioactive substances must only be removed from controlled or supervised areas in closed uncontaminated containers.

- Radionuclides emitting penetrating radiations must be adequately shielded. Lead shielding must be used for gamma emitters and perspex shielding for beta emitters.

- Containers for radioactive materials other than Carbon-14 and tritium should not be directly held in the unprotected hand. (Note: the outside of containers of Carbon-14 and H-3 can become contaminated so it is good practice to wear gloves when handling them). Tweezers should be used for handling sealed radioactive sources.

- Contamination must be contained without delay and you must be familiar with the contingency procedures given in section 14

- Keep time spent manipulating radioactive substances to a minimum.

- Place any waste items in the appropriate bin as described in section 13

- Keep all radioactive materials in labelled containers and stored in designated fridge. In general, fridges that are used to store radioactive materials should not be used to store non-radioactive items. If it is necessary to use a fridge for radioactive and non-radioactive items there should be clear demarcation and additional containment for the radioactive items.

- At the end of a work session always tidy up and perform a contamination check of the bench, see section 10. If significant contamination is found then follow the contingency
procedure.

- Always check your gloves, hands and laboratory coat for radioactive contamination before leaving the laboratory, see below.
- Wash your hands using the hand wash sink before leaving the laboratory.
- In case of emergency remain calm and follow the contingency procedures.

6. Local arrangements and procedures

Scintillation counting is not presently possible in the Zoology Building. Arrangements have been made for users who have samples including swabs for contamination checks to count to use the counter based in the Cruickshank Building. Transfer of samples to this counter may be done via the Botanical Garden, in double-sealed containers, labelled clearly with the type and amount of radioactivity being carried. Further advice on this can be sought from the RPS.

7. Pregnant and breast feeding females

Any worker who becomes pregnant should inform the Radiation Protection Supervisor as soon as possible and discuss the situation. It is also the University's policy that anyone who works with any form of ionising radiation and becomes pregnant should be given the option of alternative work. This recommendation would also apply to breast feeding mothers. However if the pregnant or breast feeding female continues working a risk assessment should be carried out to assess the hazard and additional protection measures that may be required. The RPA can advise.

8. Personal Monitoring

Dosimeters are not currently issued to any staff in Zoology. If they become necessary, they will be issued and collected by the RPS.

9. Dose investigation levels

The following dose investigation levels apply.

<table>
<thead>
<tr>
<th>Investigation level (over the wear period of the dosimeter(1))</th>
<th>Effective whole body dose (mSv)</th>
<th>Equivalent dose to the skin (averaged over &lt;100cm²) (mSv)</th>
<th>Equivalent dose to lens of the eye. (mSv)</th>
<th>Equivalent dose Hands, forearms, feet and ankles (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
<td>7.5</td>
<td>2</td>
<td>7.5</td>
</tr>
</tbody>
</table>

\(1\) wear period will either 1 or 2 months as directed by RPA

If one of these levels is exceeded an immediate investigation should take place to establish why the level has been exceeded and any preventative actions that are required.
10. Contamination monitoring

Individuals have responsibility for contamination monitoring. Contamination monitoring should be carried out **before** commencing any work with unsealed radioactive material and **after** completion of the work. In labs where isotopes with half lives greater than 24 hours are used, routine monitoring of the area should also take place. Users should also monitor themselves when work is completed or during work if contamination is suspected. If a significant spill occurs then follow the lab contingency plans given in the local rules. All checks should be recorded on the appropriate contamination monitoring sheet (available at [https://www.abdn.ac.uk/safety/resources/radiation/ionising/](https://www.abdn.ac.uk/safety/resources/radiation/ionising/) Appendix 5).

A plan of the lab is held in the folder of contamination record sheets outside room 431, showing the areas that are to be monitored.

11. Ordering radioactive materials

**Sealed sources must not be ordered**

All ordering of unsealed sources is to be done through the RPS or through Mr Mike Birnie. Sources can **ONLY** be ordered through the Isoinventory system and will be delivered to the Zoology stores, who will notify Mr Mike Birnie & the RPS immediately upon their arrival. They will then be transferred promptly to room 431, and the user / originator of the order notified. All packaging must be monitored for surface contamination during unpacking and transfer of the source, and the RPS informed immediately if leakage during transit is suspected.

12. Storing radioactive materials

Radioactive sources may only be stored in the fridge-freezer in room 431, and must be clearly labelled with date, activity and Isoinventory ID number. Aliquots taken from source stocks and needing to be stored during procedures may be stored in this fridge-freezer **ONLY** if they are clearly labelled stating the stock from which they originate and how much activity they contain.

13. Disposing of radioactive waste

The risk assessment for each procedure must include details of how waste is allocated to liquid, solid or scintillant waste categories. This should take the form of a simple waste calculation based on counted aliquots of different waste fractions during each experiment. The calculation procedure must appear in the Isoinventory risk assessment for each procedure. Where waste is allocated to liquid waste, risk Assessments must also consider the contribution of liquid residues to activities recorded as solid waste. In designing procedures, users are reminded that disposal as aqueous waste, within the designated limits set by SEPA, is the preferred disposal route.

**Aqueous Liquid Waste**

This may be disposed of only via the approved sinks in the radioactive laboratories and with the following precautions:

- The radioactive waste should be poured carefully and directly into the waste outlet.
The total activity of waste discharged per month must not exceed the maximum permitted under the terms of the Authorisation Certificate for the school. Liquid waste disposals should be logged onto the iso-inventory system before disposal is made to ensure limits are not breached.

Solid waste

Solid waste should be disposed of according to the following diagram.

- Solid or Scint waste
- Put waste in numbered waste to appropriate bag in lab
- LLW Solid waste: Includes empty vials, pipette tips, contaminated gloves and other experimental materials
- Seal bag when full
- Attached green label
- Transfer to waste store
- LLW Scint waste: Mainly liquid scintillation vials plus any other items containing contaminated scintillation fluid
- Seal bag when full
- Attach yellow label
- Transfer to waste store
- VLLW: Solid waste below the thresholds given in table 7.1 or that will below the thresholds with in 12 months. Must NOT include sharps bins or any other waste that would not normally be put in normal refuse
- Seal bag when full
- Attach orange label
- Transfer to waste store

At the start of a new series of experiments, Registered workers must consult with the RPS, or Mr Mike Birnie on which bins should be used for different designated types of waste, and to obtain labels. Bag sealing, transfer of bags to the Zoology Radioactive waste store, and then on to University waste store at IMS will be organised by Mr Mike Birnie or by the RPS.
Only the Zoology pool car will be used for transfer of waste bages All bags must be clearly labelled, using the standard color coded labels, indicating bag number, waste type, nuclide and quantity – and all disposals must be properly recorded through the “Aliquot Disposals” menu in Isoinventory.

Never dispose of non-radioactive waste with radioactive waste. If you are unsure check the waste with a suitable contamination monitor. Cans and packaging in which radioactive material has been supplied are not normally contaminated. These should be checked with a suitable monitor and, if no contamination is detected, treated as non-radioactive waste. Be sure to remove references to radioactivity; for example, the outer labels of cans should be removed or obliterated or otherwise defaced.

14. Contingency arrangements

RADIATION SPILLAGE

1. Immediately alert personnel working near the area of the radiation spill and if possible alert RPS. If in doubt contact radiation protection service for help and advice. Any personnel not required to deal with the spillage should remove themselves from the area after checking themselves for contamination.

2. Put on lab coat, over shoes and gloves

3. Do not allow anyone to walk through the spillage and spread the contamination. If possible isolate and cordon off the area.

4. Use a contamination monitor to locate areas of contamination on the work bench, floor and workers.

5. If a worker has become contaminated deal with them first (although it would be prudent to cover the spillage with absorbent material such as paper towels to prevent it from spreading.)
   - If a worker believes they are contaminated they should always attempt to locate the contaminated area and decontaminate just that area. Only if large areas of the body are contaminated should staff resort to a full body shower.
   - Contamination of the skin, hands, arms. If significant contamination is found on the hands staff should remove and discard gloves and re-monitor their bare hands. If still contaminated then the hands should be washed using a suitable detergent and then re-monitored and if necessary a soft brush should be used. Care should be taken not to break the skin. Other areas of exposed skin should be washed in a similar manner and re-monitored. The RPS should make a suitable report of any incident, including an estimation of dose, and submit to the RPA.
   - Contamination in the eyes. If a member of staff suspects that radioactivity has splashed into their eyes, they should use an eye bath. Another member of staff should then take a reading using the contamination monitor. If contamination persists then contact the RPA. The RPS should make an appropriate report of any incident, including an estimation of the dose, and submit it to the RPA.
- **Contamination on clothing.** If contamination is found on a lab coat or other clothing it should be removed, bagged and either disposed of or be allowed to decay.

6. Cover the spillage with absorbent material such as paper towels to prevent it from spreading.

7. Remove as much contamination as possible by absorbing the spill on paper towels. Contaminated towels should be disposed of as radioactive waste.

8. Ensure that any glass that has broken is placed in a sharps bin and label as radioactive.

9. Any residual contamination should be cleaned using a detergent, when mopping up always work form the outside in.

10. Monitor the area to ensure that all the activity has been removed.

11. If the area has been cleared of radioactivity, remove the tapes and signs.

12. Remove apron, shoes, gloves and place in the black plastic bag; monitor and dispose as radioactive waste if necessary

13. Monitor hands, clothes and feet to ensure that they are not contaminated.

14. If clothes or shoes become contaminated, remove them and bag them. If mildly contaminated they should be washed as normal before they are worn again.
## Monthly limits

<table>
<thead>
<tr>
<th></th>
<th>Holding limit (MBq)</th>
<th>Monthly Aqueous disposal limit (MBq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tritium</td>
<td>220</td>
<td>450</td>
</tr>
<tr>
<td>C14</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>P32</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>P33</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>S35</td>
<td>180</td>
<td>90</td>
</tr>
<tr>
<td>Other Beta/Gamma</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>