# University of Aberdeen

## Ionising Radiation Safety Arrangements

### Appendix 5 Contamination monitoring procedures

Version 3

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Authorised by Radiation Hazards Sub Committee

# Contamination Monitoring Record

**A5.0 Introduction**

Contamination monitoring should be carried out **before** commencing any work with unsealed radioactive material and **after** completion of the work (see A5.1). In labs where isotopes with half lives greater than 24 hours are used, a check of the area should be made every 2 weeks (see A5.2). 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.

Contamination monitoring must be recorded in each lab or work area on the *contamination monitoring record* provided at the end of this appendix. In labs where both tritium and other radionuclides are used it may be helpful to use a separate form for tritium. Both daily *before and after work* checks and, *area* checks should be recorded on this sheet. Each column should be dated and records for that day entered in that column. If multiple experiments take place or if contamination is found then more than one column can be used for each day.

For *before and after* work monitoring the the PI/lab supervisor should decide in consultation with the RPS the areas and equipment that should be checked and they should be entered into the first column for the record sheet under *readings before experiment* and *readings after experiment*.

For area checks the PI/lab supervisor should decide in consultation with the RPS which areas should be monitored and a plan should be drawn up on the reverse of the monitoring record sheet indicating the areas to be monitored and allocating them a number. If you require more than 5 areas add them to the first column on the monitoring sheet under weekly check.

## A5.1 Contamination Monitoring Before and After Work with Radionuclides

### A5.1.1 Instructions for monitoring all radionuclides except tritium (H-3)

1. Select an appropriate contamination monitor (see table A5.1) and check the battery status and the last calibration is within 12 months.
2. Note the background radiation level on the monitor away from the work area and enter this number into the *background 1 box* on the monitoring record. Typical background readings are:

   | | |
   |---|---|
   | GM detector e.g. EP15 or type E | < 5 cps |
   | Scintillation detector e.g. 44A | 5 – 15 cps |

3. Before starting work, monitor the work area, floor in front of experiment and any items noted on the monitoring form. Monitoring should be carried out slowly and methodically with the probe held about 1cm from the surface being checked. Enter readings in the each box (no ditto marks!).
4. If the area is contaminated note this on the monitoring record. Wearing gloves, decontaminate any areas where the reading is more than 2 times the background. Wipe the area using a paper towel and 5% decon solution or other suitable cleaning agent. Dispose of the paper as radioactive waste. Monitor the area again and repeat this process until the reading is below the action level and record the result on the record sheet. **If you are unable to decontaminate successfully contact your RPS for advice and ensure no further work is carried out in the area until the issue has been resolved, make a note of this action on the monitoring record.**
5. After completing the work monitor the work surface, floor around work area, the disposal sink and any other areas noted on the monitoring sheet under *readings after experiment*.
6. Decontaminate any areas if necessary as in 4 above.
7. Finally check your gloved hands and lab coat for contamination and any other locations that may have become contaminated. If you find your gloves are contaminated remove them and dispose as radioactive waste and recheck your hands. If your un-gloved hands are

contaminated then wash them without delay using a liquid detergent. Contaminated lab coats or other clothing should be bagged and allowed to decay or disposed of as radioactive waste. **If in doubt ask a colleague to help and follow the contingency plan in the local rules.**

| Radionuclide | Contamination Monitor | Action Level |
|---|---|---|
| Tritium (H-3) | Wipe tests | 2 times the background reading |
| Carbon-14 | GM detector e.g. EP15; **Cap off** | |
| Phosphorus-32 | | |
| Phosphorus-33 | | |
| Sulphur-35 | | |
| Copper-67 | | |
| Iodine-125 | 44A scintillation detector | |
| Iron 59 | GM or Scintillation detector | |
| Carbon-11 | GM detector e.g. EP15; **Cap off** | |
| Nitrogen-13 | | |
| Oxygen-15 | | |
| Fluorine-18 | | |

**Table A5.1** Contamination monitor for common radionuclides
If the radionuclide does not appear on the list then check your risk assessment or contact your RPS.

**A5.1.2 Instructions for monitoring of tritium**

Contamination monitors are not sensitive enough to detect the low energy beta radiation emitted by tritium. Monitoring must therefore be done using wipe tests. It is normally assumed that 10% of any contamination will have been transferred to the wipe. The monitoring procedure is the similar as described in A5.1.1 above with wipe tests substituted for monitoring with a contamination meter.

1. Take 2 steret wipes or swabs and place each straight into a separate scintillation vial with appropriate quantity of liquid scintillant to obtain 2 background readings. The background readings should be entered on the monitoring sheet as background 1 & 2.
2. Before starting work use a steret wipe or swab to wipe an area of about 100 $cm^2$ for small objects or surfaces and 1000 $cm^2$ for larger surfaces such as benches or floors. Use a separate wipe or swab for each item listed on the monitoring sheet
3. Place the wipe in a scintillation vial with appropriate quantity of liquid scintillant.
4. Count the samples in a liquid scintillation counter. The action level is set at 2 times the average background reading.
5. Decontaminate any areas with readings above the action level as described in 5.1.1.
6. Take further wipe tests after completing the work, including the work surface, floor area, disposal sink and any other item noted on the monitoring sheet.
7. Decontaminate if necessary and record actions on monitoring sheet.
8. **If the decontamination was unsuccessful then contact your RPS for advice and ensure no further work is carried out in the area until the issue has been resolved.**

**A5.2 Area checks**

In addition to the monitoring described above, in labs where long lived radioisotopes are used, checks of a larger area should be undertaken every 2 weeks or after every experiment if work is infrequent. This is to ensure that there is no build up of radioactivity over time. Checks should extend into 'clean' areas and include 2 or 3 random areas of the lab to confirm that there is no contamination outside the normal work areas such as door handles, telephones and fridges. Monitoring should be carried out as shown below:

| **Radioisotope** | **Routine monitoring method** |
|---|---|
| Tritium (H-3) | Wipe tests, liquid scintillation counter |
| Carbon-14 | |
| Phosphorus-32 | |
| Phosphorus-33 | |
| Sulphur-35 | |
| Iodine-125 | Wipe tests with gamma counter if available, or scintillation detector |
| Iron-59 | |

A plan of the lab should be drawn on the back of the monitoring record sheet with the areas that are monitored marked on it see A5.0. An entry should be made on the record sheet every time monitoring is carried out, whether contamination is found or not. If a lab is not used for a period of time, there is no need to carry out routine contamination checks, but this should be indicated on the record sheet.

# Contamination Monitoring

| Lab/Lab area | | | | Radionuclides | | | | |
|---|---|---|---|---|---|---|---|---|
| Monitoring method | | | | | | | | |
| Enter counts recorded in each column. Where counts are over 2 times above background average please decontaminate, recount and enter new count in next column. | | | | | | | | |
| Name | | | | | | | | |
| Signature | | | | | | | | |
| Initials | | | | | | | | |
| Date | | | | | | | | |
| **Readings before experiment** | | | | | | | | |
| Background 1 | | | | | | | | |
| Background 2 | | | | | | | | |
| Work area | | | | | | | | |
| pipettes | | | | | | | | |
| container | | | | | | | | |
| Other equip -specify | | | | | | | | |
| Other equip -specify | | | | | | | | |
| Floor in front of exp | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| **Contaminated (Y/N)** | | | | | | | | |
| **Readings after experiment** | | | | | | | | |
| Background 1 | | | | | | | | |
| Background 2 | | | | | | | | |
| Work area | | | | | | | | |
| pipettes | | | | | | | | |
| container | | | | | | | | |
| Other equip -specify | | | | | | | | |
| Other equip -specify | | | | | | | | |
| Floor in front of exp | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| **Contaminated (Y/N)** | | | | | | | | |
| **Twice weekly lab check or with every experiment if experiments are less frequent** | | | | | | | | |
| Background 1 | | | | | | | | |
| Background 2 | | | | | | | | |
| Area 1 on lab plan | | | | | | | | |
| Area 2 on lab plan | | | | | | | | |
| Area 3 on lab plan | | | | | | | | |
| Area 4 on lab plan | | | | | | | | |
| Area 5 on lab plan | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| **Contaminated (Y/N)** | | | | | | | | |

**Radionuclides used:_____ Date:_____**

Plan of lab showing areas to monitored for radiation contamination once every 2 weeks: