UNIVERSITY OF CAMBRIDGE
Department: Veterinary Medicine

Ionising Radiations Regulations 1999, Prior Risk Assessment, and, Environmental Permitting Regulations 2010 (EPR10), 'Best Available Technique' Radioactive Substances – Unsealed Sources

Guidance is available to help you complete this form – please refer to the Safety Office document IR004.

1

Department: Title and assessment reference number	
Name of Assessor/post and status	
Location of work/room number	
Description of the work	

2

Radionuclide and maximum activity used in one procedure	
Time taken for one procedure	
How many procedures carried out in one year?	

3

*This section is to demonstrate that **Best Available Technique (BAT)**, is being observed in order to minimise the disposal of radioactive waste to the environment and to minimise radiation exposures of the public. The process must ensure minimisation of activity in any waste generated **and** minimisation of the volume of any waste transferred to other locations.*

Can you use a non-radioactive method?	
If no, why not?	
Which Radionuclide will you be using?	
Why have you chosen the above Radionuclide?	
Can you use a less dispersible form of the radionuclide, for example, liquid rather than gaseous?	
Will the number of procedures carried out be minimised in order to prevent unnecessary disposals of radioactive waste? - this of course needs to be consistent with good experimental outcomes	

Is this work to be carried out in an existing radioactivity work area? If not, and a new area is being set up, explain why this is necessary.	
How will you minimise any contamination of work surfaces?	
What arrangements are there in place for specifying (fit for purpose), regular monitoring and maintenance of use and disposal facilities e.g. benches, drains, waste stores and fume cupboards	
What have you selected in terms of best practice handling methods which will jointly reduce doses to staff and also minimise the likelihood of accidents, and hence accidental discharges to the environment?	
Has it proved necessary to instigate any compromises in the procedure in order to keep staff doses low (ALARP), but which could also result in higher discharges to the environment? If so, please give details:	
Has the Best Practical Environmental Option (BPEO) been chosen for waste disposal? (consult RPS/Safety Office/RPA for advice)	
Waste route 1 – identify chosen route: Waste per procedure Waste total per month	
Waste route 2 – identify chosen route: Waste per procedure Waste total per month	
Waste route 3 – identify chosen route: Waste per procedure Waste total per month	

How is the proportion of waste going to the above routes calculated or estimated?	
Is there any possibility of unused stocks being returned to the supplier? (or shared with other users?)	
Are radioactive waste disposal procedures documented in your department? (Quote departmental references)	
Do protocols for your work, and local rules require a minimisation approach?	
If not, arrange for these documents to be revised, and confirm action here	
Are accurate records of waste disposal kept in your lab? – review practices if not (set compliance date)	
Will decay storage for this waste be employed within the department (or associated facilities)? If so, where, and for how long and how will the facilities be monitored and maintained?	
Describe the arrangements that exist for radioactive waste storage and disposal (eg SoPs and Local Rules for your Group/Laboratory)	
What departmental training arrangements exist for staff handling radioactive waste?	
Add further information on how you will minimise the environmental and public dose effects that may result from your work	
Have you consulted the Departmental Senior/Lead RPS on this proposal? If not – why not?	

Has the University RPA been consulted on the environmental issues associated with this proposal – if not please explain why this has not occurred – eg if this is a minor change to an existing protocol.	
How will you review the above BAT process for your protocol in order to ensure that best practice continues to be observed by all using the protocol?	

The following sections consider the potential radiation doses to employees and others that may arise from carrying out the work. These sections also enable you to identify the measures that may be needed in order to restrict exposure to ionising radiation. Data for making simple estimates of potential radiation exposure is available on the Safety Office Website (Radiations pages).

4

Who will be involved with this work? **Category of Workers**	**Number of Workers**
Employees	
Other (Specify)	
Female Workers	
Pregnant Workers	

5

Ionising Radiation Hazard Experimental procedure including drain disposals. NO control measures in place	**Details** Supporting data for these estimates can be found on SO's Website (Radiations page) or consult the University RPAs
A. External hand *contact* dose – estimated based on the activity used in *one procedure* enclosed in a plastic syringe	microsieverts *N.B. Hand contact must be avoided!*
B. External radiation dose from activity used in *one procedure*. Estimate as a point source at 30 cms from person	1. Skin dose (for Betas): 2. Deep tissue (penetrating) dose (for Gammas): (in microsieverts)
C. Internal radiation (Ingestion). 10% ingestion from *ONE procedure*	microsievert

D. Internal radiation (Inhalation). Suggest you estimate 10% from *one procedure* – even if not known to normally be volatile	microseivert
E. Estimate of Annual 'whole body' Dose = Value of B2, above multiplied by the number of procedures each year, **plus** C and D values.	microsievert/year
F. Estimate of Annual external skin/extremity dose = B. 1 or the sum of A & B. 1above as applicable (see guidance) multiplied by the number of procedures each year.	microsievert/year
G. Is the substance known to be volatile?	
H. If so – Calculate airborne contamination assuming that 10% of *one procedure* became volatile in your laboratory	Bq/unit volume
I. Absorption through the skin - Likelihood. Y/N and why?	
J. Working surface contamination from total spill of *one procedure*	Bq/unit area
K. Surface dose to the skin, resulting from 10% of activity used in the procedure remaining uniformly on the skin for one hour	microsievert

6	**Ionising Radiation Hazard** **Solid waste disposal operations** **NO control measures in place**	**Details** *Include time spent by 'others' in transferring your waste to the departmental waste store*
	Time handling waste from one procedure	
	A. External radiation dose from activity used in one procedure. Estimate as a point source at 30 cms. Use data from 5.B.1/2,	1. Skin dose (Betas): 2. Deep tissue (penetrating) dose (Gammas):

corrected for (shorter?) time spent handling waste.	(in microsievert)
B. Estimate of annual external skin/extremity dose = 6.A.1. above multiplied by number of procedures each year.	microsievert/year
C. Ingestion/Inhalation exposure for waste transfers. This should not normally be a significant issue if appropriate precautions are taken (see control measures for solid waste, Table 9). However, if relevant (Consult RPA), use time and frequency corrected data from 5.C and D above, as a possible worst case.	Comments: Ingestion : Inhalation: Total microsievert/procedure:
D. Estimate of annual 'whole body' dose = Value of 6.A.2 multiplied by the number of procedures each year, plus the value from 6.C. *(if relevant).*	

7

Possible accident situations	
What are the most likely accident/incident scenarios? Specify likely doses to anyone if these may be greater than those identified above How will the identified accidents be prevented or effects limited?	
What would the effect of failure of engineering controls such as fume cupboards – how would this be dealt with and prevented?	

8

Results of previous monitoring for similar work?	**Comments**
Whole body (for single procedure or annual)	
Extremity (for single procedure or annual)	

9	Control measures for this work, in order to minimise the worst case dose	Comments
	Are adequate Local Rules in place	
	Designation of area proposed for this work: normal, supervised or controlled?	
	Warning Signs	
	Written arrangements (ie System of Work for controlled areas)?	
	Access arrangements for controlled areas	
	Training?	
	Note taken of manufactures and suppliers safety data?	
	Personal Dosimetry?	
	Type of contamination/dose rate monitor to use	
	How will the principles of time and distance be applied to this procedure?	
	Measures to prevent contamination and therefore minimise radiation dose	
	Measures to minimise spread of contamination from the work area	
	Is it likely that contamination could be transferred outside the work area (ie the individual laboratory) that may result in significant radiation exposure? If so how will this contamination be prevented?	
	Provision of radiation shielding	
	Other engineering controls	
	Personal Protective Equipment (PPE) – specify precisely details if needed	
	Additional Precautions for those handling solid waste	
	Has RPS/RPA advice been sought?	
	Other measures	

Estimate the risk to any worker as high, medium or low, as to the likelihood, *when the standard control measures set down in the table above, are employed,* of a worker receiving, in a year, a radiation dose of 6 mSv whole body (sum of external penetrating radiation and internal radiation), and 150 mSv extremity (i.e. skin dose to the hands) – use data from table 5 and 6 above.

6 mSv Whole Body			150 mSv extremities/skin		
High ☐	Medium ☐	Low ☐	High ☐	Medium ☐	Low ☐

10

If the risk has been assessed as LOW, are any potential radiation doses As Low As Reasonably Practicable?	**Additional control measures**
If not ALARP, note additional control measures that must be employed:	

11

High or medium risks	**Additional measures**
In the unlikely event that the above assessment indicates a medium or high risk, ***or*** there is a risk of spread of contamination that could cause significant exposure, you must consult the RPA, and specify additional control measures. For instance:	
Reduce amount of radionuclide used Revise Local Rules and written arrangements Additional training Change designation of work area (consult RPA) Restrict work to controlled area (consult RPA) Personal protective equipment Others	

If it is not possible to further reduce the risk, then further consultation must **take place with the RPA, this will include consideration of classification of workers.**

12	Based on the above assessment, are additional control measures needed for female or pregnant workers? If so, detail the measures. Note that risk assessments should *always* be re-visited in the event of a worker declaring pregnancy	Additional measures:

13	Steps to prevent accidents:	
	Steps to limit consequences of any accident:	

14	Comments from the appointed Radiation Protection Supervisor for the work area in question.	

Research Supervisor (if appropriate): Name: ……..……....

Date: ……..…… Signature: ……

Specify a routine revision date for this assessment: ……..…….

RPS Name: ……..… Date: ……..……

RPS Signature: ……..……..

Ensure that the assessor is aware that <u>re-assessment</u> will always be required for any significant change in this work for instance, changed activity limits or different category of workers including female or pregnant or "new mothers".

15	Additional comments **<u>if</u>** this form is seen by the appointed RADIATION PROTECTION ADVISER	

RPA Name: ……

Signature: ……. (if seen by RPA)