



The Internal Radiation Hazard



Internal Hazard

Internal contamination with unsealed radioisotopes can happen through various routes:

- **Inhalation** - Commonest cause of intake
- **Ingestion** - can occur by transferring a radioisotope from contaminated fingers to mouth
- **Injection** - usually result of careless handling or disposal of hypodermic needles
- **Absorption** - can occur if tritiated water or radioiodine is splashed onto skin.



Avoid internal hazard by using personal protection equipment :

- Lab coat
- Safety glasses/face shield
- Disposable gloves
- Disposable apron
- Appropriate radiation shield
- Personal dosimeter
- Finger Badges
- Eye Badges



Precautions in the Use of Unsealed Radioactive Materials

Setting up the experiment :

- Use the least radiotoxic isotope
- Use the minimum activity required
- Know the physical and chemical properties of the isotope
- Use 'dummy' run experiments without radioisotopes



Working Procedures :

- Lab coats and gloves must be worn at all times and avoid touching areas of uncovered skin with a gloved hand
- Cover work surfaces with disposable absorbent materials, benchkote and use an extra degree of containment, such as a tray
- Use a fume cupboard if there is any risk of releasing gas, dust, aerosols, etc.
- Eating, drinking, smoking or applying cosmetics are prohibited.
- Work must not be carried out by a person with an undressed cut or abrasion below the wrist.
- Monitoring for contamination radiation levels must be carried out routinely.
- Gloves and clothing must be monitored after handling radioactive materials, it is essential if there's a spillage
- Hands must be washed before leaving the laboratory after handling radioactive materials.



Working Procedures Continued :

- Apparatus used for radioactive materials must be labelled with radioactive tape.
- Radioactive waste must be placed in an appropriate container and its activity recorded, along with relevant dates
- Containers for radioactive materials must not be directly held in the hand if this would cause significant doses to fingers.
- Radionuclides emitting penetrating radiations must be adequately shielded.
- Distance yourself from a radioactive source
- Records must be kept of all stocks and radioactive waste
- Contamination must be cleared up without delay.



Radioactive Waste

Three Routes for Disposal :

1. **Liquid waste**, via disposal sink.
2. **Solid waste** to authorised contractor, via RPS.
3. **Gaseous disposal**, via authorised fume cupboard.



Dealing With Radioactive Waste

Radioactive Liquid Waste

- Aqueous waste should be diluted before disposal
- Use only marked disposal sinks
- Run water through sink to disperse waste (avoid splashes)
- Log all activity discharged – very important
- SEPA will ask you to justify your disposal figures
- Do not exceed your monthly disposal limits - expensive!
- No organic solvents



Radioactive Solid Waste :

- Segregate waste into 3H/14C; 32P; others.
- Dispose to marked bins only.
- Do not put non-radioactive waste into these bins.
- Do not put biohazard waste into these bins.
- Do not put radioactive waste into 'normal' waste bins.
- Contents of bins must be labelled.
- Units must be in Bq, kBq, MBq etc – legal requirement.



Radioactive Waste Label

RADIOACTIVE WASTE			
The University, Glasgow	DEPT.:		LAB.:
	ISOTOPE(S)	ESTIMATED ACTIVITY	
		MBq	KBq
LIQUID:	WATER	TOLUENE	OTHER (STATE)
	<input type="text"/>	<input type="text"/>	<input type="text"/>
DATE:	PLEASE SHROUD SHARP POINTS		



Contamination Monitoring

Monitor after use:

- Spill tray
- Work area
- Bench, floor
- Lab Coat
- Gloves
- Shoes



Decontamination Areas

- Decontaminate areas with Decon and work 'out to in'
- 'Safe' level is about 3 Bq/cm²
- 'Fixed' contamination must not exceed 3.5 μSvhr^{-1}

Skin Contamination

- Wash (not scrub) skin with soap and running water
- Do not use Decon on skin
- Do not break the skin
- Report all accidents and spillage's immediately to your local RPS.

If they are not available contact the University Radiation Protection Service (4471/5878) for advice



Radioactive Spillages - S.W.I.M

- **S**top the spillage
- **W**arn other personnel.
- **I**solate the area.
- **M**inimize the exposure to radiation and contamination.



Summary :

The internal hazard is the principal hazard encountered in the use of unsealed radioactive materials.

There is **NO shielding** from an internal intake.

There is **NO distance protection** from an internal intake.

Irradiation occurs **24 hours/day**.

Emissions will be dissipated in the cells of the body.

Certain isotopes will concentrate in particular organs.