Radioactive materials

Substance	Hazard	Comment
Alpha sources (α radiation) Low-activity α sources are used in domestic smoke alarms.	 IONISING RADIATION	Produce heavy ionisation (see *Additional Information*, below) but range is less than 1 mm in living tissue. Little problem if source is kept outside body.
Beta sources (β radiation) All samples of potassium and its compounds (including granite rocks, clays, etc) contain very small amounts of a natural β emitter.	 IONISING RADIATION	Produce medium ionisation (see *Additional Information*, below) but the range is a few centimetres in living tissue. There is little problem if source is kept away from the body.
Gamma sources (γ radiation) Very active γ sources are used in hospitals for killing cancer cells. Domestic smoke alarms emit a little γ radiation.	 IONISING RADIATION	Produce little ionisation (see *Additional Information*, below) but the range is long in living tissue, some passing right through the body. In schools, use a weak source and keep well away from the body.

Additional information:

- When (ionising) radiation is absorbed by living tissue, mostly it results in a few extra hydrogen ions and hydroxide ions in the cytoplasm of cells. These rapidly recombine to form water.
- Some radiation is absorbed by more complex molecules and the ions from these can result in the death of the cell.
- Low levels of ionising radiation have little noticeable effect because biological organisms are continually replacing cells which die for other reasons anyway.
- High doses of radiation can result in skin burns (like sunburn) or radiation sickness (where so many cells have been killed that an organ ceases to function properly).
- Ionising radiation can also affect DNA in cells and change the genetic code. In reproductive organs, this could cause abnormal offspring but has never been confirmed in humans.
- Modified DNA may allow cells to reproduce out of control and form a cancer.

Typical control measures to reduce risk

- Use the lowest-activity source possible (only low-level sources are permitted in schools).
- Keep as far away from the source as possible (For school sources, use a handling tool which keeps the source at least 10 cm from the hand. Observers of demonstrations should generally keep at least 2 m away.).
- Have a clear set of local rules, including “Sources must not be handled by under-16s”.
- When radioactive solids, liquids or gases (open sources) are in use, prevent contamination of people (by use of lab coats and disposable plastic gloves), of benches (by use of trays and sheets of absorbing paper) and apparatus (by handling equipment with disposable tissues).

Assessing the risks

- ***What are the details of the activity to be undertaken? What are the hazards?***
- ***What is the chance of something going wrong?***
  eg, source is dropped, spilt or stolen or somebody moves too close to the source.
- ***How serious would it be if something did go wrong?***
- ***How can the risk(s) be controlled for this activity?***
  eg, can it be done safely? Does the procedure need to be altered?

Emergency action

• **Sealed source dropped**	Do not look directly at source, but use mirror to examine source for damage. Check area for radioactivity where source was dropped.
• **Spilt on the skin or swallowed**	Wash the affected area thoroughly and check for radioactivity. If swallowed, go to a hospital specialising in radiation incidents.
• **Open source spilt on the floor, bench, etc**	Wipe up small amounts with damp tissues. Wipe the area until count rate is less than 50% above background. Place tissues in a plastic bag and dispose of it in solid waste.

