**Marking and labeling**

Source containers should be labelled “Radioactive Material”. The name of the radionuclide, the activity and the treatment warning symbol should also be shown.

**Storage**

When radioactive material is not in use, it must be properly stored. A good storage location will be:
- Only used to store radioactive material.
- Secure.
- Shielded.
- Labelled.

**Transport**

Radioactive material will be transported in a package that complies with national and international regulations. The package will be labelled according to the dose rate.

**Internal exposure**

There may be contamination:
- Where splashes or spills have occurred.
- On the inner surfaces of used vials or other containers.
- On laboratory surfaces.
- On the hands of users.

Where there is radioactive contamination you should:
- Wear plastic gloves.
- Wear protective glasses.
- Cover cuts and wounds.
- Never eat, drink, smoke or apply cosmetics.
- Clean up spills, even minor spills as soon as practicable.
- Not touch things unnecessarily.
- Wash your hands at the end of the period of work.
- Contact the Radiation Protection Officer.

**External exposure**

External exposures to staff can occur:
- When handling primary or stock solutions.
- When handling transport packages.
- When cleaning up radioactive contamination.
- When working near a source storage facility.

External exposures can be controlled by consideration of time, distance and shielding.

Time

<table>
<thead>
<tr>
<th>Distance from Source</th>
<th>Dose Rate (µSv/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>100 µSv/h</td>
</tr>
<tr>
<td>2 m</td>
<td>25 µSv/h</td>
</tr>
<tr>
<td>3 m</td>
<td>10 µSv/h</td>
</tr>
<tr>
<td>4 m</td>
<td>2.5 µSv/h</td>
</tr>
</tbody>
</table>

Distance

If the dose rate at 1 m from a source is 100 µSv/h, the dose rate at 2 m will be 25 µSv/h.

**Survey meters**

Survey meters are very important in helping to keep exposures as low as reasonably achievable (ALARA).

**Radiation monitoring**

It is important to check for contamination in the work area and on the hands of the users at regular intervals while radioactive material is being used. At the end of a period of work, the work space must be thoroughly checked for contamination.

Users should measure the dose rate around storage locations, around primary or stock solutions, or wherever there are large quantities of radioactive material.

**Health effects of radiation exposure**

If radiation doses are very high, the effect on the body will appear relatively soon after the exposure. These acute injuries will occur if the absorbed dose is higher than a threshold value; some sources used as radioactive tracers are capable of delivering such doses. It is therefore essential that procedures for work are followed.

Even if the dose is not high enough to cause serious injury, there is still the possibility of incurring other health effects. These effects, e.g. radiation-induced cancer, are risk based, i.e. the higher the dose received, the greater the chance of developing the effect. To reduce the possibility of developing late effects, radiation doses must be kept.

**Dose and effects**

Units of dose

- The unit of absorbed dose is the gray (Gy).
- The unit used to quantify the dose in radiation protection is sievert (Sv).

- The typical dose from a chest X ray is 20 µSv.

**Dose**

If a person spends two hours in an area where the dose rate is 10 µSv/h, then they will receive a dose of 20 µSv.

**Waste**

Any radioactive waste must be disposed of according to strict procedures that follow regulations and requirements. Records must be kept of all radioactive waste.

**As Low As Reasonably Achievable (ALARA)**

A contaminated person should:
- Stay where he/she is.
- Call for help and alert the Radiation Protection Officer.
- Do not touch anything.
- Do not enter the area unless an injured person needs help.
- Start decontamination procedures only when trained.

**DOSE ASSESSMENT**

Dosimeters

A dosimeter is a means of assessing the dose that the wearer has received. Dosimeters should be worn between the shoulders and the hips and must be returned to the provider regularly so that the dose information can be read. Sometimes, dosimeters are worn on a finger, underneath the gloves, to assess the dose to the hand.

**DOSE EFFECTS**

Health effects of radiation exposure

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**RADIATION PROTECTION OF WORKERS**

Radioactive tracers are substances labelled with a radioactive atom that allow easier detection and measurement. They are used in the oil and gas, chemical, food and tobacco industries as well as in the management of water resources, in scientific research and in medical applications. In use, they can present an external exposure or, if the radioactive material enters the body, an internal exposure.

**EXTERNAL EXPOSURE**

External exposures to staff can occur:
- When handling primary or stock solutions.
- When handling transport packages.
- When cleaning up radioactive contamination.
- When working near a source storage facility.

External exposures can be controlled by consideration of time, distance and shielding.

**IF CONTAMINATION IS PRESENT**

A contaminated person should:
- Stay where he/she is.
- Call for help and alert the Radiation Protection Officer.
- Do not touch anything.
- Do not enter the area unless an injured person needs help.
- Start decontamination procedures only when trained.

**DOSE EFFECTS**

Health effects of radiation exposure

If radiation doses are very high, the effect on the body will appear relatively soon after the exposure. These acute injuries will occur if the absorbed dose is higher than a threshold value; some sources used as radioactive tracers are capable of delivering such doses. It is therefore essential that procedures for work are followed.

Even if the dose is not high enough to cause serious injury, there is still the possibility of incurring other health effects. These effects, e.g. radiation-induced cancer, are risk based, i.e. the higher the dose received, the greater the chance of developing the effect. To reduce the possibility of developing late effects, radiation doses must be kept.

**AS LOW AS REASONABLY ACHIEVABLE (ALARA)**

A contaminated person should:
- Stay where he/she is.
- Call for help and alert the Radiation Protection Officer.
- Do not touch anything.
- Do not enter the area unless an injured person needs help.
- Start decontamination procedures only when trained.