

Information on Damage to a Strontium-90 Applicator

An incident occurred in which the active plate of a strontium-90 applicator became detached from the backing plate and mounting 'boss'. It was initially thought that the strontium-90 from the applicator had been lost. The purpose of this circular is to provide information to users of strontium-90 applicators to reduce the chance of such incidents occurring in future and to ensure that users are aware of the construction of their applicators.

Details of Incident

The incident occurred following an ophthalmic treatment when a radiation therapist was rinsing a strontium-90 applicator over a sink. The active source plate became detached from the backing plate and mounting 'boss'. When this occurred, it was thought that the radioactive strontium-90 had washed down the drain in the sink. The various parts of the applicator in the sink were collected. The s-bend under the sink was removed to try to locate the source, however nothing was found. A plumber was then called to isolate the building from the main sewerage pipes. Again, nothing was found.

At this time, the radiation therapist called the Radiation Safety Program to report the incident and request assistance. The radiation therapist had assumed that the strontium-90 in the applicator was sandwiched between two brass discs and had fallen into the sink. The Radiation Safety Program advised that it was possible that the source plate may, in fact, have been one of the brass discs. An 'autoradiograph' of the parts of the applicator was taken by the radiation therapist. This showed that the source plate was still present. All parts of the applicator were then placed in the storage container for transport to a licensed consultant. He advised that a source plate could become detached due to the adhesive used to attach the source plate to the backing plate degenerating over time. This occurs because of the radiation exposure and the action of the cleaning/sterilising liquids used.

During the time between the apparent loss of the source plate and its correct identification, the radiation therapist had handled the bare source plate (assuming it to be inactive) for between 30 and 90 seconds. The ophthalmologist had also handled the plate for approximately 20 seconds.

The Radiation Safety Program advised the therapist and ophthalmologist to have medical examinations undertaken by a radiation oncologist to check for any radiation damage to their hands. No radiation effects were reported.

The Radiation Safety Program required the damaged applicator to be presented for inspection. The applicator was subsequently repaired and leak tested by a licensed consultant. There was no leakage of strontium-90 from the applicator. All persons involved in the incident were required to submit detailed written reports on the incident. These were presented to the Radiation Advisory Committee. The Committee recommended that all strontium-90 users be advised of the incident and be aware of the construction of their applicators.

Conclusion

An incident of this nature emphasises the need for users of strontium-90 applicators to be able to identify the various parts of their particular applicator, to examine their applicator for potential damage or deterioration and to have calibrations and leak tests undertaken regularly.

Further Information on Strontium-90 Applicators.

Technical Information

The strontium-90 is in an insoluble form and is incorporated in a rolled silver disc which is embedded into a recess in a slightly larger metal disc. The strontium-90 disc is then covered by a thin protective metal foil window. The strontium-90 applicator or plate is thus a disc with an 'active' front face. The window on this face is made as thin as possible to enable as many as possible of the beta particles to be emitted with minimal loss of energy, but thick enough to prevent damage to or loss of the strontium-90. The windows are very delicate and must be treated with great care. There is an inactive border or margin 2-3 millimetres wide surrounding the active area. The 'inactive' back of the plate is thick enough to absorb the beta particles. A 'boss' or lug, to which a handle may be attached, is secured to the back of the plate. Although beta radiation is emitted only from the front face of the plate, X-radiation is produced in all directions by interaction of beta particles with the metal of the device. In addition, beta particles may be scattered from nearby materials.

Strontium-90 applicators are usually made as flat plates but some are fabricated into special shapes (for example, concave) for particular purposes, such as treatment of the eye. Normally, the strontium-90 is uniformly distributed over the surface of the plate, but for some specialised requirements, an asymmetrical distribution is used.

Strontium-90 applicators are very delicate devices and any mishandling, dropping, scratching, corrosion or other damage could cause a dangerous leakage of radioactive material. Strontium applicators should be checked for radioactive leakage at regular intervals not exceeding one year. It is important to note that:

- Although the range of beta particles in tissue is only a few millimetres, the range in air is a few metres.
- The dose-rate is quite high and an applicator may be capable of delivering a therapeutic dose in less than one minute.

A statement of the current surface dose-rate for a particular strontium-90 applicator and a table of times for commonly used doses should always accompany the applicator in its storage box.

Handling and Care of Strontium-90 Applicators or Plates

1. A strontium plate emits very energetic beta particles from the front face of the plate. Personnel handling plates should take care to minimise their exposure to radiation.

2. No significant beta radiation issues from the back of the plate although there is some X-radiation emitted in all directions.
3. The plate shall always be manipulated using the long screw-in handle or long handled forceps applied to the 'boss' or lug on the back of the plate. The plate is a delicate structure so any undue force applied to it may cause the 'boss' or lug to break away from the flat section.
4. The plate should always be held with its active face away from ones person and in such a way that the face is not directed towards anyone else (except in its treatment role).
5. The active face of the plate shall not be viewed directly. If necessary, it may be viewed using a non-metallic mirror.
6. The material of the active face of the plate is very delicate and it should not be scratched or abraded. Forceps, scalpel blade or any other such instrument shall not be used on the face of the plate. If it is necessary to clean the face, it may be rubbed gently on a gauze pad placed on a flat surface and moistened with alcohol. Care should be taken not to expose the fingers to radiation during cleaning.
7. Cold sterilisation only shall be employed. Sterilisation is to be by immersion in a non-corrosive, non-sticky sterilising solution.
8. The plate should be cleaned with alcohol and be completely dry before being replaced in its special container. Saline or sterilising solutions may cause corrosion to the container and damage to the plate.
9. When not in use, and when being transported, the plate shall be kept always in its special container.
10. Strontium plates shall be checked periodically for radioactive leakage.
11. A plate that has been damaged in any way (for example, the 'boss' broken off or the active section bent or scratched) shall be returned immediately to an appropriate body for checking, possible repair and leak testing.

Further Information

Radiation Safety Program
Department of Human Services
17th Floor, 120 Spencer Street
Melbourne Victoria 3000

Phone: (03) 9637 4167
Fax: (03) 9637 4508
email: radiation.safety@dhs.vic.gov.au