Report from a French incident

Hospital incident involving the dispersion of iodine-131 liquid waste from a broken effluent pipe

Description of the incident

In a hospital authorized to undertake therapeutic treatment using I-131, rooms have been specially upgraded on one of the hospital floors. The washrooms in these rooms are equipped with a double evacuation system designed to collect and store I-131 in patients' urine by means of a dedicated collection network. This network includes a PVC pipeline that transfers the effluents from the floor to the building's basement where the storage and decay tanks are located.

The fall of an object inside the pipeline caused a leak in a joint located on the ground floor. This resulted in the release of several litres of contaminated effluents on the ground floor, which then spread to the lower floors.

The leak was detected by department personnel located on the ground-floor. After intervention by the hospital plumber and the person competent in radiation protection, the origin of the effluents was quickly identified, the contamination was revealed and steps to protect hospital personnel and patients were taken. Firemen specialised in radiological interventions collected the contaminated effluents. The decontamination and repair of the premises and of the line were then undertaken.

Radiological Consequences

The radiological consequences were very low. There was no contamination of the wider environment, due to the quantity of effluents dispersed and the sealing of the ground at the lowest level of the building.

The plumber and the radiation protection person remained close to the effluent puddles for a few minutes, the time necessary to characterize their nature. A measurement at 1 metre from the spill on the ground-floor revealed a dose rate of 15 µSv/h.

Tests on these two persons, undertaken one month after the incident, did not reveal any significant internal contamination by I-131.

Lessons to be learned from the incident

The investigation of the causes of the pipeline leak revealed a dislocation of the joint between two floors of the building. This did not, however, result in any leakage of effluents. However, subsequent work was undertaken to reinforce fire protection, which required the creation of concrete slabs between floors. During this work, liquid concrete was able to enter the pipeline – when it solidified, it broke loose and fell off. Given the great height of the pipeline, the concrete lump landed with sufficient force to break the PVC joint on the pipeline. Although this sequence of events is hard to foresee, the following lessons may be learned.

- The design of an effluent collection circuit must take into account the risk of strains on this circuit and define the optimum materials and geometry. In this case, the great vertical height of the conduit and the nature of the pipe material were not favourable elements.
- A preventive maintenance programme for the effluent collection system should also be implemented, in order to prevent its degradation, either by destruction as in this incident, or by the accumulation of deposits (stagnating/dried urine in certain parts of the conduit, presence of paper residues, etc.) that can even obstruct the flow completely. A regular cleaning of the circuit should be performed.
- A regular visual inspection of the whole effluent collection circuit should have revealed the original joint dislocation.
- To the extent possible, liquid retention devices in the case of leaks in the pipes should be provided. In this incident, effectively, there was no means of spill containment under the vertical part of the conduit.
- In terms of the internal exposure risk from short-lived radionuclides, such as Iodine 131, it is important to perform internal dosimetry tests as quickly as possible after the incident, in order to determine the level of exposure with as much precision as possible. In this case, it is clear that the time between the exposure and urine sampling was much too long.

Generally, and specifically in hospitals, it is necessary to be aware of the juxtaposition of different hazards and the various means for reducing risks. In this case, improvements in fire protection were partly responsible for the degradation of protection against radiological risk. The integrated approach to risk management is made even more important where nuclear medicine facilities have to be incorporated into existing facilities, and where the maximum level of radiological protection cannot always be achieved.