

 Report from a French incident

## Internal contamination of nursing staff with iodine-131 due to an epileptic patient

### Description of the incident

A patient with thyroid problems was given iodine-131 metabolic brachytherapy involving the ingestion of 3.7 GBq (100mCi) I-131 in capsule form. The next morning the patient had an epileptic seizure with loss of consciousness; he fell from his bed with urination and vomiting.

The patient was managed by the nursing staff, who immediately returned him to his bed and established a contamination zone on the floor. The nursing staff were very careful not to come into contact with the contaminated biological fluids. Thus, there was no transfer of contamination through contact with the patient's urine or vomit.

The nursing staff remained to take care of the patient for a maximum period of one and a half hours.

### Radiological consequences

Urine tests revealed that four of the nursing staff were internally contaminated - through inhaling the radioactive iodine present in the air during the care of the patient (and perhaps longer, up until the decontamination of the room). There could also have been some external exposure from the I-131 contamination, but this is not thought to have been significant.

The following table gives the estimated doses received by the four exposed persons, based on the activity of I-131 found in the urine:

| Person | Estimated Activity Inhaled at D <sub>0</sub> (Bq) | Activity present In the urine at D+1 (Bq/24 hrs.) | Committed equivalent dose to the thyroid (mSv) | Committed effective dose to the whole body (mSv) |
|--------|---|---|--|--|
| A      | 196   | 55  | 0.03   | 0.001  |
| B      | 536   | 150   | 0.08   | 0.004  |
| C      | 354   | 99  | 0.05   | 0.003  |
| D      | 1643  | 460   | 0.25   | 0.010  |

Coefficient of urinary excretion (D+1): 0.28

Coefficient of whole body dose (Sv/Bq): 7.4E-09

Coefficient of thyroid dose (Sv/Bq): 1.5E-07

(According to ICRP 72 and 78)

## Lessons to be learned from the incident

In the case of a medical emergency, resuscitation takes precedence over any radiological hazards. Therefore, it is worth commending the composure and actions of the nursing staff who reacted well to this situation by avoiding direct contact with the contaminated areas. Although some internal contamination from inhalation did occur, the activity incorporated and the dose received by the staff were low.

The nursing staff should be informed of the various potential exposure pathways from the radionuclides used, and the rules concerning radiation protection after administration of activity.

Iodine-131 is highly volatile and can pass directly from a solid phase to a gaseous phase (sublimation). Therefore, it is necessary to "fix" the contamination very quickly by means of absorbent products (activated carbon). If practicable, ventilate the area to minimise the airborne concentration, and then proceed with surface decontamination. PPE (ie a respirator fitted a special iodine filter) would also provide protection, but it is not normally appropriate to wear this type of equipment near patients (independently of any other consideration).

In addition, in the event of an incident such as this the persons responsible for radiation protection should be immediately notified, and arrangements made for any monitoring such as urine sampling.

The urine of a patient having undergone this type of treatment may contain a non negligible quantity of Iodine 131 and therefore constitute a source of contamination for the staff. It is for this that urinary incontinence is a contraindication for metabolic brachytherapy by Iodine 131 under certain conditions.