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**CODE OF SAFE PRACTICE FOR THE USE OF
IODINE-131 FOR THE TREATMENT OF
THYROID DISORDERS IN CATS**

**National Radiation Laboratory
Ministry of Health
PO Box 25-099
Victoria Street
CHRISTCHURCH**

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1. INTRODUCTION

1.1 The treatment of cats with thyroid disorders using radioactive iodine (I-131) is now accepted as standard practice. This Code of Safe Practice has been produced by the National Radiation Laboratory (NRL) in order to ensure the safe use of I-131 for this purpose.

1.2 Where compliance with this Code is a requirement (Section 2.1), **clauses in the Code using the word “shall” are mandatory.** Other clauses and notes are recommendations and for information.

1.3 As well as compliance with this Code, the user must satisfy the requirements of the radiation protection legislation (Section 2.1).

2. LICENSING

2.1 Legislation

2.1.1 The safe use of radioactive materials is regulated by the Radiation Protection Act 1965 and the Radiation Protection Regulations 1982. No person may use radioactive materials unless he or she has an appropriate licence under the Act, or is acting under the supervision or instructions of such a licensee.

2.1.2 The safety of the use of I-131 for treating cats **shall** be the responsibility of a person who has been granted a licence for the purpose of Veterinary Therapy under the Radiation Protection Act 1965. To be eligible an applicant must:

- (a) be on the New Zealand Veterinary Register, and
- (b) be able to give evidence that he or she has facilities available that comply with this Code of Practice, and
- (c) be able to demonstrate an understanding of the principles of radiation protection that apply to this use.

A condition on the licence will require compliance with this Code of Practice.

In the rest of this Code the term “licence” refers to a licence under the Radiation Protection Act.

2.2 Acting under supervision or instructions

2.2.1 The Radiation Protection Act permits the use of radioactive material by persons suitably trained operating under the supervision or instructions of a licensee. The handling of treated cats may be done by any person who has been sufficiently well trained in safe procedures, under the instructions or supervision of the licensee. However, the ultimate responsibility for safety remains with the licensee.

2.2.2 It is the responsibility of the supervising or instructing licensee to ensure that the requirements of the Act, Regulations, and this Code are satisfied at all times.

2.2.3 Any person handling a cat treated with I-131 before release to the owner **shall** be familiar with the requirements of this Code of Safe Practice.

3. HAZARDS FROM I-131

3.1 Types of radiation emitted

Iodine-131 is a radioactive form of iodine, and it emits two type of radiation:

It emits beta particles that penetrate less than half a millimetre in tissue. When the iodine is taken up in the thyroid gland this radiation is all absorbed within the gland. This is why it is an effective treatment for hyperthyroidism. The beta radiation can only become a hazard if I-131 is ingested or inhaled, or contaminates the skin or eyes.

I-131 also emits penetrating gamma radiation. Ten percent of the radiation will penetrate a 1 cm thickness of lead. The typical activity of I-131 used to

treat a cat is 40 - 80 MBq (megabecquerels). The radiation dose rate at 1 metre from this activity when unshielded is 3 - 5 $\mu\text{Sv/h}$ (microsieverts per hour). (The typical natural background gamma radiation dose rate in New Zealand is 0.03 to 0.06 $\mu\text{Sv/h}$.)

3.2 External radiation risks

The maximum radiation dose in any one year currently allowed in the Radiation Protection Regulations 1982, is 50 mSv (50 000 μSv) for people working with radiation, and 5 mSv (5000 μSv) for members of the public. It is very unlikely that anyone could get anywhere near this dose from the activity of I-131 usually used on cats.

However, it is a fundamental principle of radiation safety that if the risk can be easily reduced then it should be. The easiest way to minimise the risk from external radiation is to maintain as much distance as practical from the source. At 10 cm distance from the neck of a treated cat the dose rate could be as high as 500 $\mu\text{Sv/h}$, but at 2 metres it is just 1 $\mu\text{Sv/h}$.

3.3 Contamination and inhalation risks

The greatest hazard from the use of I-131 is from accidental uptake in the thyroid. This can occur in two ways. Either ingestion by transferring surface contamination from the hands to the mouth, or from inhalation of iodine vapour.

Contaminated urine and faeces readily give off iodine vapour. Therefore it is important that the rooms where treated cats are housed, and where waste is accumulated are well ventilated.

If there is any more than negligible uptake of I-131 in the thyroid it will be easily measured using the radiation survey meter required in 4.2. If any uptake is measured, NRL should be contacted for advice.

4. FACILITIES

4.1 Treatment room

4.1.1 The administration of I-131 to the cat **shall** take place in a well-ventilated room.

4.1.2 A clear flat impermeable bench surface **shall** be available for unpacking and preparing the dose.

4.1.3 A similar (or the same) impermeable bench surface **shall** be available for dosing the cat.

4.1.4 The floor around the bench must also be impermeable.

Note: The possible hazards during this process are spillage due to faulty or damaged packaging, and spillage or dropping of the dose while attempting to administer it to the cat. Any place that the iodine could possibly get onto must be either covered with a disposable impermeable covering, or finished with a surface that is easily washed.

4.2 Radiation survey meter

A radiation survey meter suitable for checking for contamination from spillage or excrement from the cat **shall** be available at all times from the delivery of the dose of I-131 until the facility has been cleaned after release of the cat.

Note: NRL can advise on the choice of a suitable instrument for this.

4.3 Housing for the cat after treatment

4.3.1 The location of the housing for the cat **shall** be at the same premises as the facilities for administering the dose of I-131. The cat **shall not** be transported to another location until it is ready for release to the owner.

4.3.2 The cat **shall** be securely housed in a cage in a well-ventilated room. The room **shall** be equipped with an extraction fan to prevent the build-up of I-131 vapour.

4.3.3 Whenever a treated cat is occupying a cage, there **shall** be a sign on or near the cage with the radioactive trefoil on it and a notice indicating the cat has been treated with radioactive material.

4.3.4 The floor of the room **shall** have an impermeable finish that can be easily decontaminated.

4.3.5 The cage **shall** have a disposable waterproof lining to the base to permit ease of waste disposal.

4.3.6 Any adjacent cages **shall** be empty, or occupied by other treated cats only.

Note: Use of adjacent cages carries the risk of the animals becoming contaminated.

4.3.7 Any cage where a treated cat will be held **shall** be at least 3 metres away from areas of regular occupation (including distance through walls).

4.4 Waste storage area

4.4.1 The waste storage area **shall** be secure, remote, and well ventilated to avoid the build-up of iodine vapour.

4.4.2 The distance between the waste storage area and the nearest regularly occupied location **shall** be at least 3 metres and should be at least 5 metres.

4.4.3 There **shall** be a warning sign, with the radioactive trefoil and the words “Caution Radioactive Material” on it, located so as to indicate clearly the containers of radioactive waste.

Note: Any labelling indicating radioactive material must be removed from bags of waste when they are disposed of.

4.4.4 Acceptable waste storage areas are:

a locked shed with a louvre window;

in rubbish bins with tight lids kept outside in a locked yard;

in a waste storage room in the veterinary clinic at least 3 metres from an occupied area with an extractor fan operating continuously.

5. ADMINISTRATION OF I-131

There are two ways in which the I-131 may be obtained: from a hospital or imported directly.

5.1 I-131 supplied by a hospital

5.1.1 The measured dose **shall** be dispensed into a leak-proof container at a Nuclear Medicine Department or Radiotherapy Department of a hospital, and transported to the premises of the licensed veterinarian for administration.

Notes: If the iodide was originally for oral use, it will need to be filtered before it is suitable for injection.

If the required activity is dispensed directly into a syringe, this will need to be placed in an additional leak-proof container to comply with the transport requirements (Section 6).

If a vial is used with a rubber bung, a volumetric method will be needed to recover the correct activity into a syringe for administration.

5.1.2 The package in which the I-131 is transported and the accompanying documentation **shall** comply with the International Atomic Energy Agency Transport Regulations. See Section 6, below.

5.1.3 The administration of the I-131 to the cat may use one of the following methods:

- Injection into an indwelling cannula;
- Subcutaneous injection;
- Oral administration down the back of the throat using a syringe.

Oral administration **shall** not be used if the cat is suffering from diarrhoea.

5.1.4 The table and surrounds where the cat is injected **shall** be monitored afterwards using a radiation survey meter (Section 4.2).

5.1.5 The syringe, vial, or any other equipment used in the administration procedure that is likely to be contaminated with I-131 **shall** be returned to the hospital for disposal.

5.2 I-131 supplied directly to the veterinary facility

5.2.1 The dose may be purchased directly from a supplier as compressed powder in a capsule containing the required activity for oral administration. Information on suppliers can be obtained from NRL.

Notes: The capsule will generally be delivered with an activity greater than required. It must be kept for the correct length of time until the activity has decayed down to the level required for the dose. The supplier will give details, or NRL can advise.

The capsules are fairly robust and do not break easily. Even if bitten into, the compressed powder (similar to a solid pill) does not readily spill.

5.2.2 Oral administration **shall** not be used on a cat suffering from diarrhoea.

5.2.3 Disposable gloves **shall** be worn when the lead pot containing the capsule is opened, until after the treatment, when the area is verified to be free from contamination using the radiation survey meter.

5.2.4 The capsule **shall** be handled only with tongs or long tweezers (so that the capsule is at least 10 cm from the hand). Administration **shall** be done by taking the capsule from the lead shielded shipping container using the tongs and placing the capsule either directly down the cat's throat, or into a "pet-pillar". This should be done carefully but with due haste, so as to minimise the radiation exposure.

5.2.5 The table and surrounds where the cat is administered **shall** be monitored afterwards using a radiation survey meter.

5.2.6 Any spilt powder **shall** be wiped up using a damp cloth and rubber gloves. This **shall** be continued until no contamination is measurable. The cloth and gloves **shall** be treated as contaminated waste as in Section 6 below.

6. TRANSPORT OF I-131

This Section applies to transport of the dose of I-131 before administration to a cat. After administration with I-131 a cat **shall not** be transported to another premise until ready for release to the owner (Section 9).

6.1 General requirements

Transport of radioactive material within New Zealand is required to comply with the IAEA transport regulations (*Regulations for the safe transport of radioactive materials* / International Atomic Energy Agency). Any shipments directly to the veterinary premises will normally comply with these. However, if material is to be transported from a hospital, the licensee at the hospital supplying the material **shall** ensure that these requirements are satisfied.

The types of package required are:

“Excepted packages” for less than 70 MBq of I-131, or

“Type A packages” for greater than this activity.

6.2 Excepted packages

6.2.1 An Excepted package must be sufficiently robust and secure to withstand reasonable handling, and provide shielding such that the radiation dose rate at any point on the surface is less than 5 μSv per hour.

6.2.2 The package must contain the marking “Radioactive” on an internal surface to warn of the presence of radioactive material on opening the package.

6.2.3 If the material is being sent by commercial freight, then the shipping documents (air waybill or equivalent) must describe the contents as:

“Radioactive Material, Excepted Package, – Limited Quantity of Material, UN 2910”.

6.2.4 The outside of the package **shall** be marked “UN 2910”.

6.3 Type A packages

6.3.1 The requirements for Type A packages are quite detailed and are not covered fully here. However, if the package in which the original shipment of I-131 arrived at the hospital is kept, and has not been damaged or deformed during opening, it will comply. The packaging must be opened and reassembled carefully to maintain the integrity of all its parts. In particular this includes any absorbent material required to satisfy requirements for radioactive liquid. The package will have either had a containment system to prevent leakage, or sufficient absorbent material to absorb twice the volume of the liquid contents.

6.3.2 The smallest overall external dimension of the package must be at least 10 cm. It must be clearly marked with “Type A” and “Radioactive Material, Type A Package, UN 2915”.

6.3.3 Two Category I, II or III labels must be affixed to opposite sides of the package. Which category depends on the radiation dose rate at the surface and at 1 metre from the surface as follows:

Maximum dose rate	At surface	1 m from surface
Category I	5 $\mu\text{Sv/h}$	-
Category II	500 $\mu\text{Sv/h}$	10 $\mu\text{Sv/h}$
Category III	2000 $\mu\text{Sv/h}$	100 $\mu\text{Sv/h}$

Notes: 80 MBq of I-131 gives a radiation dose rate of 5 $\mu\text{Sv/h}$ at 1 metre when unshielded.

11 mm of lead shielding reduces this by a factor of 1/10.

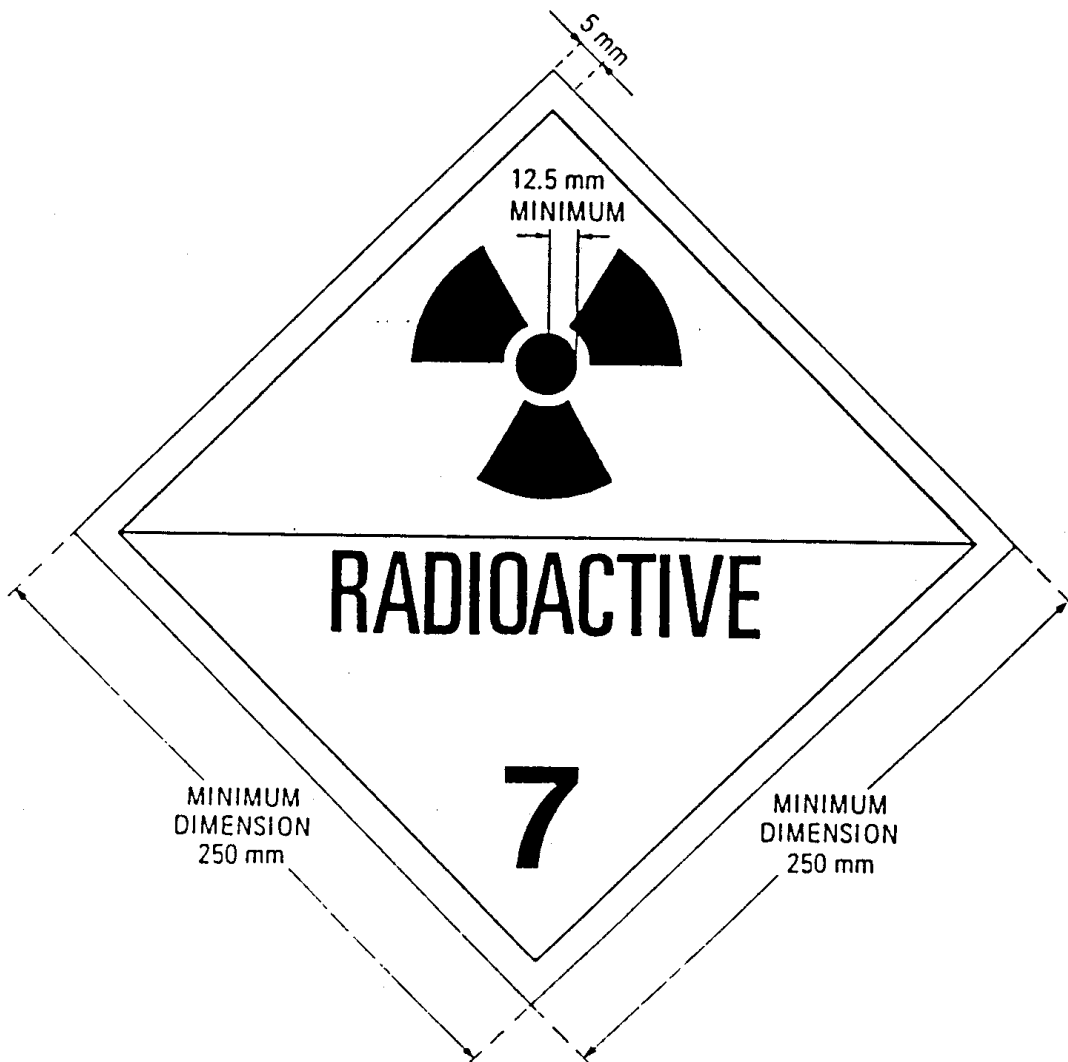
The labels must show the radionuclide, its activity in becquerel units and the Transport Index. The Transport Index is determined by taking the maximum radiation dose rate at any point 1 metre from the surface of the package in $\mu\text{Sv/h}$ and dividing by 10 (ie, the dose rate in mrem/h). Labels are available from NRL.

6.3.4 For road transport, a “Road/Rail/Marine Shipper’s Declaration for Dangerous Goods – Class 7 Radioactive Material” (available from NRL) must be included with the transport documents. For road transport in a private vehicle, this declaration must be carried in the cab of the vehicle.

6.3.5 Vehicle placarding

Any vehicle carrying radioactive materials which require a dangerous goods label (in this case any Type A package, containing more than 70 MBq of I-131) must be placarded. The IAEA Regulations specify that the placards be placed according to international practice, that is, at the rear and both sides of the vehicle. New Zealand law allows an alternative placement in line with standard dangerous goods placarding in New Zealand, that is, at the front and the rear of the vehicle.

The placards **shall** be at least 250 millimetres square, and be of the design reproduced below. The upper half of the diamond shall be yellow, and the lower half white.



7. HANDLING OF CATS AFTER TREATMENT

7.1 Staff should spend as little time as possible within 1 metre of the cage.

7.2 The cat **shall** be handled with disposable gloves and protective gown, and held at arm's length when possible.

7.3 The greatest hazard is from the urine and faeces. This should be collected by gathering it up in a disposable container or the cage lining, and placing it directly into the waste disposal bag. Gloves **shall** be worn whenever waste is handled.

8. DECONTAMINATION PROCEDURES AFTER RELEASE OF CATS

8.1 After a cat has been returned to the owner, the entire cage and surrounding floor **shall** be scrubbed down thoroughly.

8.2 Washing utensils **shall** be rinsed well or discarded with contaminated waste afterwards.

8.3 The area **shall** then be surveyed using a radiation survey meter. Remaining contamination **shall** be cleaned up until unmeasurable, or cannot be removed by further cleaning.

8.4 Gloves **shall** be worn throughout, until the area is verified as free from removable contamination.

9. WASTE DISPOSAL

9.1 All excrement or vomit from a treated cat, or cage-lining material, or cleaning materials, including gloves after use, **shall** be treated as contaminated waste.

9.2 All contaminated waste **shall** be handled with disposable gloves.

Note: The urine will contain up to half of the administered activity of I-131 in the first 3 days.

9.3 Waste **shall** be accumulated in airtight bags well sealed to prevent the release of radioactive iodine vapour. The bags **shall** be clearly marked as containing radioactive waste, and with the date the waste was bagged.

9.4 The waste from the first 3 days **shall** be stored securely in a suitable facility (Section 4.4) for at least 6 weeks before disposal by controlled burial as for biological waste.

9.5 The waste collected after 3 days **shall** be stored and disposed of as in 9.4 but may be disposed of after 3 weeks.

10. RETURN OF CAT TO OWNER

10.1 If, in the judgement of the licensed veterinarian, the owner of a cat is capable of carrying out the instructions given in 10.2, then the cat may be returned to the owner after 5 days if the dose given was 80 MBq or less, or 7 days if the dose was greater. Otherwise the cat **shall** be retained by the veterinarian for at least 2 weeks.

10.2 The veterinarian **shall** provide the owner, at the time of release of the cat, with written instructions for the subsequent handling of the cat. The instructions **shall** include:

For the next 2 weeks after the release of the cat:

- (a) Avoid long periods (more than a few minutes) in close proximity to the cat, particularly during the first week. It is safe to pick it up for short periods but it should not sit on anyone's lap for extended periods or sleep next to them on a bed.**
- (b) Avoid "face-to-face" contact. Don't allow the cat to lick you. If possible wash your hands after handling it, especially before eating.**
- (c) If the cat urinates inside a dwelling, the urine should be cleaned up thoroughly with paper towels which are then placed in a rubbish bag. Use rubber gloves for this, and wash your hands very thoroughly afterwards. If the urine has soaked into garments or carpets they should be washed thoroughly. Garments should be washed separately in a washing machine.**
- (d) If the cat uses a "dirt box", keep this in an unoccupied area. Use a waterproof disposable lining. Wear rubber gloves when cleaning it out.**
- (e) Make sure the cat cannot jump up onto the kitchen bench, or get onto anywhere that food is placed.**

If the above instructions are followed the risk from the radiation will be negligible, and should not be considered a reason for not having a cat treated in this way.