AUSTRALIAN PRODUCT INFORMATION

SODIUM IODIDE [IODINE-131] THERAPY CAPSULE

1 NAME OF THE MEDICINE

Sodium Iodide [^{131}I]

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Description
Sodium Iodide [^{131}I] Therapy Capsules are supplied for oral administration as pale yellow gelatin capsules containing sodium iodide [^{131}I] solution adsorbed on an inert filler (di-sodium hydrogen phosphate). A range of iodine-131 content is available, from 50 MBq to 6000 MBq at the time of calibration at 0900 hrs (Sydney time) each Monday.

Each capsule is contained in a glass serum vial sealed with a rubber stopper and red aluminium seal. The vial is in turn contained in an appropriate lead container. Decapping pliers can be supplied free of charge with the initial order.

For the full list of excipients, see Section 6.1 List of Excipients.

Physical Characteristics for ^{131}I
Iodine-131 with a physical half-life of 8.04 days, decays by beta emission (average energy 182 keV) with associated gamma emission. Stable xenon-131 is formed in 98.9% of decays and radioactive xenon -131m (half-life 11.9 days) in 1.1% of decays. The principal beta emissions and gamma photons are listed in Table 1.

Table 1: Principal Radiation Emission Data.

Principal Radiation	Mean % per Disintegration	Mean Energy (KeV)
Beta - 1	2.1	69.4 (Avg.)
Beta - 3	7.3	96.6 (Avg.)
Beta - 4	89.4	191.5 (Avg.)
Gamma - 7	6.1	284.3
Gamma - 14	81.2	364.5
Gamma - 17	7.3	637.0
Gamma - 19	1.8	722.9

Reference: Weber D A, Eckerman K F, Dillman L T and Ryman J C, MIRD: Radionuclide Data and Decay Schemes, The Society of Nuclear Medicine, 1989.

Table 2: Physical Decay Profile for ^{131}I.

Days	Fraction Remaining	Days	Fraction Remaining
0	1.000	15	0.274
1	0.917	16	0.252
2	0.842	17	0.231
3	0.772	18	0.212
4	0.708	19	0.194
5	0.650	20	0.178
6	0.596	21	0.164
7	0.547	22	0.150
8	0.502	23	0.138
9	0.460	24	0.126
10	0.422	25	0.116
11	0.387	26	0.106
12	0.355	27	0.098
13	0.326	28	0.089
14	0. 299		

External Radiation
The specific gamma ray constant for iodine-131 is 0.61 mGy per MBq^{-h} at 1 cm. The first half-value thickness of lead for iodine-131 is 0.26 cm and a lead thickness of 2.6cm will produce an attenuation factor of about 10^{-2}. Attenuation by lead is given in Table 3.

Table 3: Coefficient of attenuation of ^{131}I gamma rays with various thickness of lead shield.

Shield Thickness of Lead (Pb) (cm)	Coefficient of Attenuation
0.26 0.95 2.6 4.6 6.5	0.5 10^{-1} 10^{-2} 10^{-3} 10^{-4}

3 PHARMACEUTICAL FORM

Yellow coloured gelatin capsule printed with an "ANSTO" logo and an "Ionising radiation trefoil symbol.

4 CLINICAL PARTICULARS

4.1 THERAPEUTIC INDICATIONS

Sodium Iodide (^{131}I) Therapy Capsule is indicated in the treatment of hyperthyroidism, and the detection and ablation of residual functioning thyroid tissue in differentiated thyroid carcinoma.

4.2 DOSE AND METHOD OF ADMINISTRATION

The capsules are for oral administration and the dose ranges usually employed are as follows:

Thyrotoxicosis	150-600 MBq
Thyroid ablation	800-2000 MBq
Thyroid carcinoma	2000-6000 MBq

Instructions for Use:

(i) Prepare disposable gloves for staff and patient, absorbent paper tissues, empty disposable paper cup and a drink of water in a disposable paper cup.

(ii) Check expiry date of capsule, remove lid of lead container.

(iii) Measure the activity of the capsule while still in the sealed glass vial.

(iv) In a suitably ventilated enclosure remove the cap and closure from the glass vial, while still in the lead shipping container, using a decapping apparatus.

(v) With forceps or pliers, pick up the glass vial and tip the capsule into an empty disposable paper cup. Place the empty vial, and the closure in the lead container, and close the lead pot with the lid.

Note: The empty vial and closure should be remeasured to confirm that no significant loss of activity has occurred from the capsule during transport and storage.

(vi) Present both disposable paper cups to the patient who should then swallow the capsule and take a drink of water if necessary. The patient should be advised not to bite the capsule.

(vii) Treat gloves, cups and the empty vial, stopper and cap as radioactive waste.

Radiation Dosimetry:
The estimated absorbed radiation doses to euthyroid patients from an oral dose of iodine-131 is presented in table 4 - 7 below. This data has been taken from ICRP publication 128, Radiation Dose to Patients from Radiopharmaceuticals: a Compendium of Current Information Related to Frequently Used Substances; p.277-280.

The biokinetic model is described as a compartment model including inorganic iodide as well as organically bound iodine released to the body tissues following discharge from the thyroid. The ICRP model refers to oral administration. As part of the risk-benefit assessment it is advised that the effective dose and likely radiation doses to individual target organ(s) are calculated prior to administration. The activity might then be adjusted according to thyroid volume, biological half-life and the "re-cycling" factor which takes into account the physiological status of the patient (including iodine depletion) and the underlying pathology.

The radiation exposure mainly affects the thyroid. The radiation exposure of the other organs is in the range of thousandths lower than that of the thyroid. It depends on the dietary intake of iodine (the uptake of radioiodine is increased up to 90% in iodine deficient areas and it is decreased to 5% in iodine rich areas). It further depends on the thyroid function (eu-, hyper-, or hypothyroidism) and on the presence of iodine accumulating tissues in the body (e.g. the situation after excision of the thyroid, the presence of iodine accumulating metastases and on thyroid blockade) The radiation exposure of all other organs is correspondingly higher or lower, depending on the degree of accumulation in the thyroid.

In thyroid blocked patients, estimated radiation absorbed dose to various body organs per unit of ^{131}I activity administered (mGy MBq^{-1}) is presented in Table 4.

In Tables 5, 6 and 7, estimated radiation absorbed dose to various body organs per unit of ^{131}I activity administered (mGy MBq^{-1}) is given for low, medium, and high thyroid uptake scenarios respectively.

Dose calculations have been performed for standard (70 kg) adults, and for 15-, 10-, 5-, and 1-year-old children.

Table 4: Absorbed dose for ^{131}I-iodide: thyroid blocked, oral administration.

Organ	Absorbed dose per unit activity administered (mGy MBq^{-1})				
	Adult	15 years	10 years	5 years	1 year
Adrenals	4.4E-02	5.4E-02	8.6E-02	1.4E-01	2.5E-01
Bone surfaces	3.0E-02	3.7E-02	5.9E-02	9.2E-02	1.8E-01
Brain	2.1E-02	2.6E-02	4.3E-02	7.1E-02	1.4E-01
Breast	2.0E-02	2.5E-02	4.2E-02	6.9E-02	1.3E-01
Gallbladder wall	3.7E-02	4.8E-02	8.5E-02	1.3E-01	2.1E-01
Gastrointestinal tract -					
Stomach wall	8.7E-01	1.1E+00	1.6E+00	2.8E+00	5.9E+00
Small intestine wall	3.5E-02	4.4E-02	7.0E-02	1.1E-01	1.9E-01
Colon wall	1.4E-01	1.8E-01	3.0E-01	5.0E-01	9.2E-01
(Upper large intestine wall	1.2E-01	1.5E-01	2.5E-01	4.2E-01	7.5E-01)
(Lower large intestine wall	1.7E-01	2.2E-01	3.7E-01	6.1E-01	1.2E+00)
Heart wall	6.2E-02	8.0E-02	1.3E-01	2.0E-01	3.7E-01
Kidneys	2.7E-01	3.2E-01	4.6E-01	6.9E-01	1.2E+00
Liver	5.0E-02	6.5E-02	1.0E-01	1.6E-01	3.0E-01
Lungs	5.3E-02	6.8E-02	1.1E-01	1.8E-01	3.6E-01
Muscles	2.6E-02	3.2E-02	5.1E-02	8.0E-02	1.5E-01
Oesophagus	2.4E-02	3.0E-02	4.9E-02	7.9E-02	1.5E-01
Ovaries	3.8E-02	4.9E-02	7.6E-02	1.1E-01	2.0E-01
Pancreas	6.0E-02	7.3E-02	1.1E-01	1.6E-01	2.8E-01
Red marrow	3.1E-02	3.8E-02	6.1E-02	9.5E-02	1.8E-01
Salivary glands	2.7E-01	3.3E-01	4.4E-01	5.9E-01	8.6E-01
Skin	1.9E-02	2.3E-02	3.8E-02	6.2E-02	1.2E-01
Spleen	6.4E-02	7.7E-02	1.2E-01	1.9E-01	3.4E-01
Testes	2.5E-02	3.3E-02	5.5E-02	8.4E-02	1.5E-01
Thymus	2.4E-02	3.0E-02	4.9E-02	7.9E-02	1.5E-01
Thyroid	2.2E+00	3.6E+00	5.6E+00	1.3E+01	2.5E+01
Urinary bladder wall	5.4E-01	7.0E-01	1.1E+00	1.4E+00	1.8E+00
Uterus	4.5E-02	5.6E-02	9.0E-02	1.3E-01	2.1E-01
Remaining organs	2.9E-02	3.7E-02	6.0E-02	1.0E-01	1.8E-01
Effective dose (mSv MBq^{-1})	2.8E-01	4.0E-01	6.1E-01	1.2E+00	2.3E+00

ICRP publication 128, Radiation Dose to Patients from Radiopharmaceuticals: a Compendium of Current Information Related to Frequently Used Substances.

Table 5: Absorbed dose ^{131}I-iodide: thyroid - low uptake, oral administration.

Organ	Absorbed dose per unit activity administered (mGy MBq^{-1})				
	Adult	15 years	10 years	5 years	1 year
Adrenals	5.1E-02	6.7E-02	1.2E-01	2.0E-01	4.4E-01
Bone surfaces	8.9E-02	1.0E-01	1.4E-01	2.2E-01	4.0E-01
Brain	9.3E-02	1.0E-01	1.3E-01	1.8E-01	3.0E-01
Breast	3.8E-02	5.0E-02	1.0E-01	1.7E-01	3.2E-01
Gallbladder wall	4.3E-02	5.7E-02	1.0E-01	1.8E-01	3.6E-01
Gastrointestinal tract -					
Stomach wall	7.7E-01	1.0E+00	1.5E+00	2.5E+00	5.3E+00
Small intestine wall	3.3E-02	4.3E-02	7.3E-02	1.1E-01	2.2E01
Colon wall	1.4E-01	1.8E-01	3.2E-01	5.8E-01	1.3E+00
(Upper large intestine wall	1.2E-01	1.5E-01	2.7E-01	4.9E-01	1.0E+00)
(Lower large intestine wall	1.7E-01	2.2E-01	3.9E-01	7.1E-01	1.6E+00)
Heart wall	8.9E-02	1.2E-01	2.1E-01	3.6E-01	7.7E-01
Kidneys	2.7E-01	3.4E-01	5.0E-01	8.4E-01	1.8E+00
Liver	9.3E-02	1.4E-01	2.4E-01	4.6E-01	1.2E+00
Lungs	1.0E-01	1.3E-01	2.2E-01	3.8E-01	7.9E-01
Muscles	8.4E-02	1.1E-01	1.7E-01	2.7E-01	4.8E-01
Oesophagus	1.0E-01	1.5E-01	3.0E-01	5.8E-01	1.1E+00
Ovaries	3.7E-02	4.9E-02	8.0E-02	1.3E-01	2.8E-01
Pancreas	6.4E-02	8.0E-02	1.3E-01	2.1E-01	4.1E-01
Red marrow	7.2E-02	8.6E-02	1.2E-01	1.9E-01	3.7E-01
Salivary glands	2.2E-01	2.7E-01	3.6E-01	4.9E-01	7.2E-01
Skin	4.3E-02	5.3E-02	8.0E-02	1.2E-01	2.5E-01
Spleen	6.9E-02	8.9E-02	1.5E-01	2.6E-01	5.5E-01
Testes	2.4E-02	3.2E-02	5.6E-02	9.5E-02	2.0E-01
Thymus	1.0E-01	1.5E-01	3.0E-01	5.9E-01	1.1E+00
Thyroid	2.8E+02	4.5E+02	6.7E+02	1.4E+03	2.3E+03
Urinary bladder wall	4.5E-01	5.8E-01	8.9E-01	1.2E+00	1.6E+00
Uterus	4.2E-02	5.4E-02	9.0E-02	1.5E-01	2.8E-01
Remaining organs	8.4E-02	1.1E-01	1.7E-01	2.5E-01	4.4E-01
Effective dose (mSv MBq^{-1})	1.4E+01	2.3E+01	3.4E+01	7.1E+01	1.1E+02

ICRP publication 128, Radiation Dose to Patients from Radiopharmaceuticals: a Compendium of Current Information Related to Frequently Used Substances.

Table 6: Absorbed dose ^{131}I-iodide: thyroid - medium uptake, oral administration.

Organ	Absorbed dose per unit activity administered (mGy MBq^{-1})				
	Adult	15 years	10 years	5 years	1 year
Adrenals	5.5E-02	7.4E-02	1.3E-01	2.4E-01	5.5E-01
Bone surfaces	1.2E-01	1.4E-01	1.9E-01	3.0E-01	5.2E-01
Brain	1.3E-01	1.4E-01	1.8E-01	2.4E-01	3.9E-01
Breast	4.8E-02	6.3E-02	1.3E-01	2.3E-01	4.3E-01
Gallbladder wall	4.6E-02	6.3E-02	1.2E-01	2.1E-01	4.5E-01
Gastrointestinal tract -					
Stomach wall	7.1E-01	9.5E-01	1.4E+00	2.4E+00	5.0E+00
Small intestine wall	3.2E-02	4.3E-02	7.5E-02	1.1E-01	2.4E-01
Colon wall	1.4E-01	1.8E-01	3.4E-01	6.3E-01	1.4E+00
(Upper large intestine wall	1.2E-01	1.5E-01	2.8E-01	5.3E-01	1.2E+00)
(Lower large intestine wall	1.7E-01	2.2E-01	4.0E-01	7.6E-01	1.8E+00)
Heart wall	1.0E-01	1.4E-01	2.5E-01	4.5E-01	1.0E+00
Kidneys	2.7E-01	3.4E-01	5.3E-01	9.3E-01	2.1E+00
Liver	1.2E-01	1.8E-01	3.1E-01	6.2E-01	1.7E+00
Lungs	1.3E-01	1.6E-01	2.8E-01	5.0E-01	1.0E+00
Muscles	1.2E-01	1.5E-01	2.4E-01	3.8E-01	6.6E-01
Oesophagus	1.4E-01	2.2E-01	4.5E-01	8.7E-01	1.7E+00
Ovaries	3.6E-02	4.9E-02	8.2E-02	1.5E-01	3.3E-01
Pancreas	6.6E-02	8.4E-02	1.4E-01	2.4E-01	4.9E-01
Red marrow	9.5E-02	1.1E-01	1.5E-01	2.4E-01	4.8E-01
Salivary glands	1.9E-01	2.4E-01	3.2E-01	4.3E-01	6.4E-01
Skin	5.7E-02	7.0E-02	1.0E-01	1.6E-01	3.3E-01
Spleen	7.2E-02	9.6E-02	1.6E-01	2.9E-01	6.8E-01
Testes	2.3E-02	3.2E-02	5.6E-02	1.0E-01	2.3E-01
Thymus	1.4E-01	2.2E-01	4.5E-01	8.7E-01	1.7E+00
Thyroid	4.3E+02	6.9E+02	1.0E+03	2.2E+03	3.6E+03
Urinary bladder wall	3.9E-01	5.1E-01	7.9E-01	1.1E+00	1.5E+00
Uterus	4.0E-02	5.3E-02	8.9E-02	1.5E-01	3.2E-01
Remaining organs	1.1E-01	1.5E-01	2.3E-01	3.3E-01	5.8E-01
Effective dose (mSv MBq^{-1})	2.2E+01	3.5E+01	5.3E+01	1.1E+02	1.8E+02

ICRP publication 128, Radiation Dose to Patients from Radiopharmaceuticals: a Compendium of Current Information Related to Frequently Used Substances.

Table 7: Absorbed dose ^{131}I-iodide: thyroid - high uptake, oral administration.

Organ	Absorbed dose per unit activity administered (mGy MBq^{-1})				
	Adult	15 years	10 years	5 years	1 year
Adrenals	5.9E-02	8.2E-02	1.5E-01	2.8E-01	6.6E-01
Bone surfaces	1.6E-01	1.8E-01	2.4E-01	3.7E-01	6.5E-01
Brain	1.7E-01	1.8E-01	2.3E-01	3.0E-01	4.9E-01
Breast	5.8E-02	7.7E-02	1.7E-01	2.8E-01	5.4E-01
Gallbladder wall	4.9E-02	6.8E-02	1.3E-01	2.4E-01	5.4E-01
Gastrointestinal tract -					
Stomach wall	6.6E-01	8.8E-01	1.3E+00	2.2E+00	4.7E+00
Small intestine wall	3.2E-02	4.3E-02	7.7E-02	1.2E-01	2.6E-01
Colon wall	1.4E-01	1.9E-01	3.5E-01	6.8E-01	1.6E+00
(Upper large intestine wall	1.2E-01	1.6E-01	3.0E-01	5.8E-01	1.4E+00)
(Lower large intestine wall	1.6E-01	2.2E-01	4.2E-01	8.1E-01	2.0E+00)
Heart wall	1.2E-01	1.6E-01	3.0E-01	5.5E-01	1.2E+00
Kidneys	2.7E-01	3.5E-01	5.5E-01	1.0E+00	2.4E+00
Liver	1.4E-01	2.2E-01	3.9E-01	7.9E-01	2.2E+00
Lungs	1.5E-01	2.0E-01	3.5E-01	6.1E-01	1.3E+00
Muscles	1.5E-01	1.9E-01	3.1E-01	4.9E-01	1.5E-01
Oesophagus	1.9E-01	2.8E-01	5.9E-01	1.2E+00	2.3E+00
Ovaries	3.5E-02	4.9E-02	8.4E-02	1.6E-01	3.7E-01
Pancreas	6.8E-02	8.8E-02	1.5E-01	2.7E-01	5.7E-01
Red marrow	1.2E-01	1.4E-01	1.9E-01	2.9E-01	5.9E-01
Salivary glands	1.6E-01	2.0E-01	2.7E-01	3.7E-01	5.5E-01
Skin	7.1E-02	8.7E-02	1.3E-01	1.9E-01	4.1E-01
Spleen	7.5E-02	1.0E-01	1.8E-01	3.3E-01	8.0E-01
Testes	2.2E-01	3.1E-02	5.7E-02	1.1E-01	2.7E-01
Thymus	1.9E-01	2.8E-01	5.9E-01	1.2E+00	2.3E+00
Thyroid	5.8E+02	9.4E+02	1.4E+03	3.0E+03	4.9E+03
Urinary bladder wall	3.4E-01	4.4E-01	6.8E-01	9.5E-01	1.3E-01
Uterus	3.8E-02	5.1E-02	8.9E-02	1.6E-01	3.6E-01
Remaining organs	1.5E-01	1.9E-01	2.9E-01	4.2E-01	7.4E-01
Effective dose (mSv MBq^{-1})	2.9E+01	4.7E+01	7.1E+01	1.5E+02	2.5E+02

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4.3 CONTRAINDICATIONS

The use of this therapeutic radiopharmaceutical is absolutely contraindicated in women who are pregnant. Women of reproductive age should have a negative pregnancy test at the time of radionuclide therapy, and should take appropriate contraceptive measures.

The use of therapeutic iodine-131 is not recommended in persons with renal insufficiency, as delayed excretion will result in increased whole body radiation.

This therapy is contraindicated in-patients who are being treated concurrently with thyroid hormone or antithyroid drugs, are vomiting or have diarrhoea.

Note: "Iodine allergy" is not a contraindication for use, because of the very small chemical amounts of iodine in therapeutic capsules (e.g. approx. 3 microgram in a 500 MBq capsule).

4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE

Warning
Iodine -131 should not be administered to individuals below the age of 18 years unless such use is essential in the judgement of the clinician and the benefits outweigh any potential risks.

Precautions - General
Radiopharmaceuticals should be used only by physicians who are qualified and licensed to handle radioisotopes.

Identified precautions - Hyponatraemia
Serious manifestations of hyponatraemia have been reported after sodium iodide [^{131}I] therapy in elderly patients who have undergone total thyroidectomy. Risk factors include older age, female sex, use of thiazide diuretics and hyponatraemia at the start of sodium iodide [^{131}I] therapy. Regular serum electrolyte measurements and monitoring should be considered for these patients.

Dose handling
Radiation exposure to staff must be minimised. In particular, the capsules should NOT be handled directly. The glass vial containing the capsule may be contaminated externally with iodine-131 and appropriate handling precautions should be used.

As iodine-131 is volatile and the daughter radionuclide xenon-131m is gaseous, the vial containing the capsule should be uncapped in a ventilated enclosure. (Tests have failed to detect any diffusion of radioactivity from the sealed glass vial between manufacture and use).The activity of the capsule should be checked with a suitable instrument immediately prior to administration.

Patient care
Care should be taken to minimise unwanted radiation exposure to patients, consistent with proper patient management, and to minimise radiation exposure to clinical personnel.

Patients should be encouraged to drink copious fluids before and after capsule administration and to void as often as possible after administration in order to reduce the radiation dose to the kidneys, stomach and bladder. A high standard of patient hygiene is desirable.

Discharge of patients after I-131 procedure
Discharge of Patients Undergoing Treatment with Radioactive Substances should be in accordance with Radiation Protection Series Publication No. 4, published by Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).
https://www.arpansa.gov.au/sites/default/files/legacy/pubs/rps/rps4.pdf

It is recommended that the ambient dose equivalent rate at a distance of 1 metre from a patient who is undergoing treatment with a radioactive substance should not exceed 25 μSv/hour at the time of the patient's discharge from the hospital.

Individualised instructions relevant to the patient's medical and social circumstances should be provided to each patient by the licensed medical specialist responsible for the treatment. The instructions should include, where appropriate, the need to restrict close proximity to other members of the household, especially children, young persons and pregnant women, the importance of good personal hygiene in order to prevent the spread of contamination, and the date when normal activities may be resumed.

Use in renal impairment
The use of therapeutic iodine-131 is not recommended in persons with renal insufficiency, as delayed excretion will result in increased whole body radiation (See section 4.3 Contraindications).

Use in the elderly
No data available.

Paediatric use
Safety and efficacy in children have not been established.

Effects on laboratory tests
No data available.

4.5 INTERACTIONS WITH OTHER MEDICINES AND OTHER FORMS OF INTERACTIONS

The uptake of iodine-131 will be affected by recent intake of stable iodine in any form, e.g. seafood, radiographic contrast media, and by antithyroid drugs and thyroxine. The patient's history should be fully investigated in this regard.

Antithyroid drugs should be withheld for at least 3 days prior to iodine-131 therapy, and thyroxine should be withdrawn for at least 4 weeks prior to therapy. Adequate trapping of iodide by thyroid tissue or thyroid cancer metastases should be demonstrated before the administration of a therapeutic dose of iodine-131.

Long-term Effects
Therapy using iodine-131 can induce hypothyroidism. To some extent, this effect is dose dependent, but life-long follow-up of patients treated with iodine-131 is advised.

4.6 FERTILITY, PREGNANCY AND LACTATION

Effects on fertility
Adequate long-term studies have not been performed in animals to determine whether this drug affects fertility. After radioiodine therapy of thyroid carcinoma, a dose dependent impairment of fertility may occur in men and women. Depending on the activity dose, a reversible impairment of the spermatogenesis could occur in doses above 1,850 MBq. Clinical relevant effects including oligospermia and azoospermia and elevated serum FSH serum levels have been described after administration greater than 3,700 MBq.

Contraception in males and females:
Contraception for 6 months (for patients with benign thyroid conditions) or 12 months (for patients with thyroid cancer) is recommended for both sexes after therapeutic administration of sodium iodide (^{131}I).

Men should not father a child for a time period of 6 months after radioiodine treatment to allow the replacement of irradiated by non-irradiated spermatozoa. Sperm banking should be

considered for men who have extensive disease and therefore may need high sodium iodide (^{131}I) therapeutic doses".

Women of childbearing potential:
When an administration of radiopharmaceuticals to a woman of childbearing potential is intended, it is important to determine whether or not she is pregnant. Any woman who has missed a period should be assumed to be pregnant until proven otherwise. If in doubt about her potential pregnancy (if the woman has missed a period, if the period is very irregular, etc.), alternative techniques not using ionising radiation (if there are any) should be offered to the patient. Women receiving sodium iodide (^{131I}) should be advised not to become pregnant within 6-12 months after administration.

Use in pregnancy
Pregnancy Category X

See section 4.3 Contraindications.
There are no animal study data on the effects of sodium iodide [^{131}I] on embryofetal development. The use of sodium iodide (^{131}I) is contraindicated during established or suspected pregnancy or when pregnancy has not been excluded because transplacental passage of sodium iodide (^{131}I) can cause severe and possibly irreversible hypothyroidism in neonates (the absorbed dose to the uterus for this medicinal product is likely to be in the range 20-270 mGy for therapeutic indications and 0.2 mGy for diagnostic indications, and the fetal thyroid gland avidly concentrates iodine during the second and third trimesters).

If a differentiated thyroid carcinoma is diagnosed during pregnancy, sodium iodide (^{131}I) treatment should be postponed until after the childbirth.

As sodium iodide (^{131}I) readily crosses the placenta, adverse effects are expected when used during pregnancy due to fetal thyroid accumulation of ^{131}I that leads to neonatal hypothyroidism. Females and males of reproductive potential should use effective contraception during treatment and for at least 6 months after the last dose.

Use in lactation
Iodine-131 is excreted in human milk. Before administering radiopharmaceuticals to a mother who is breast-feeding, consideration should be given to the possibility of delaying the administration of radionuclide until the mother has ceased breast-feeding, and what is the most appropriate choice of radiopharmaceuticals, bearing in mind the secretion of activity in breast milk. If the administration is considered necessary, breast-feeding must be discontinued at least 8 weeks before sodium iodide (^{131}I) administration to allow sufficient time for involution to occur and to avoid excess concentration of sodium iodide [^{131}I] in breast tissue and should not be resumed.

For radioprotection reasons following therapeutic doses, it is recommended to avoid close contact between mother and infants for 6 h.

4.7 EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

The effects of this medicine on a person's ability to drive and use machines were not assessed as part of its registration.

4.8 ADVERSE EFFECTS (UNDESIRABLE EFFECTS)

Rare adverse reactions have been reported following the administration of iodine-131. Their relationship to the very small chemical amounts of iodine administered is not clear. These reactions have included vomiting, nausea, tachycardia, pruritus and rash. Other reported side effects include radiation-induced thyroiditis and sialitis, and transient worsening of hypothyroidism.

Potential effects of a high dose of iodine-131 include radiation sickness, pulmonary fibrosis, bone marrow depression, acute leukemia, anaemia, acute thyroid crisis and death.

Reporting suspected adverse effects
Reporting suspected adverse reactions after registration of the medicinal product is important. It allows continued monitoring of the benefit-risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions at - *www.tga.gov.au/reporting-problems.*

4.9 OVERDOSE

See section 4.8, Adverse Effects (undesirable effects).

For information on the management of overdose, contact the Poisons Information Centre on 13 11 26 (Australia).

5 PHARMACOLOGICAL PROPERTIES

5.1 PHARMACODYNAMIC PROPERTIES

Mechanism of action
The pharmacological active substance is sodium iodide (^{131}I) in the form of sodium iodide that is taken up by the thyroid. The physical decay takes place essentially in the thyroid gland, where sodium iodide (^{131}I) has a long residence time, delivering a selective irradiation to this organ.
In the amount used for therapeutic indications, no pharmacodynamic effects of sodium iodide (^{131}I) are to be expected.

More than 90% of the radiation effects result from emitted β radiation which has a mean range of 0.5 mm. The β irradiation will dose dependently decrease cell function and cell division leading to cell destruction. The short range and almost absence of uptake of sodium iodide (^{131}I) outside the thyroid lead to a negligible amount of irradiation exposure outside the thyroid gland.

Clinical trials
No data available.

5.2 PHARMACOKINETIC PROPERTIES

Absorption
After oral administration, sodium iodide (^{131}I) is absorbed rapidly from the upper gastrointestinal tract (90% in 60 minutes). The absorption is influenced by gastric emptying. It is increased by hyperthyroidism and decreased by hypothyroidism.
Studies on the serum activities levels showed that after a fast increase, over 10 to 20 minutes, an equilibrium is reached after about 40 minutes. After oral administration of sodium iodide (^{131}I) solution an equilibrium is reached at the same time.

Distribution and organ uptake
The pharmacokinetics follows that of unlabelled iodide. After entering the blood stream it is distributed in the extra thyroidal compartment. From here it is predominantly taken up by the thyroid that extracts approximately 20% of the iodide in one pass or excreted renally. The iodide uptake in the thyroid reaches a maximum after 24-48 hours, 50% of the maximum peak is reached after 5 hours. The uptake is influenced by several factors: patient age, thyroid gland volume, renal clearance, plasmatic concentration of iodide and other drugs (see section 4.5). The iodide clearance by the thyroid gland is usually 5-50 mL/min. In case of iodine deficiency the clearance is increased to 100 mL/min and in case of hyperthyroidism can be up to 1,000 mL/min. In case of iodide overload the clearance can decrease to 2-5 ml/min. Iodide also accumulates in the kidneys.
Small amounts of sodium iodide (^{131}I) are taken up by salivary glands, gastric mucosa and they would also be localised in breast milk, the placenta and choroid plexus.
The iodide fixed by the thyroid enters the known metabolic path of thyroid hormones and is incorporated in the organic substances entering in the synthesis of thyroid hormones.

Biotransformation
The iodide that has been taken up by the thyroid follows the known metabolism of the thyroid hormones and is incorporated in the organic compounds from which the thyroid hormones are synthesised.

Elimination
Urinary excretion is 37-75%, faecal excretion is about 10%, with almost negligible excretion in sweat. Urinary excretion is characterised by the renal clearance, which constitutes about 3% of the renal flow and is relatively constant from one person to another. The clearance is lower in hypothyroidism and in impaired renal function and higher in hyperthyroidism. In euthyroidic patients with normal renal function 50-75% of the administered activity is excreted in urine within 48 hours.

Half-life
The effective half-life of radioiodine in plasma is about 12 hours in blood plasma and about 6 days in the thyroid gland. Thus after administration of sodium iodide (^{131}I) about 40% of the activity has an effective half-life of 6 hours and the remaining 60% of 8 days.

Renal impairment
Patients with renal impairment may have a decrease in the radioiodine clearance, resulting in increased radiation exposure of sodium iodide (^{131}I) administered. One study showed, for example, that patients with impaired renal function undergoing continuous ambulatory peritoneal dialysis (CAPD) have a clearance of radioiodine 5 times lower than patients with normal kidney function.

Note: As with other iodine-131 gelatin capsules, some iodine-131 is lost due to binding of iodine-131 to the capsule material. This iodine-131 does not appear to be available for uptake by the thyroid.

5.3 PRECLINICAL SAFETY DATA

Genotoxicity
The genotoxic potential of sodium iodine [^{131}I] has not been evaluated under in vitro or in vivo conditions.

Carcinogenicity
The carcinogenic potential of sodium iodide [^{131}I] has not been evaluated in any animal studies.

6 PHARMACEUTICAL PARTICULARS

6.1 LIST OF EXCIPIENTS

Sodium Phosphate Dibasic Anhydrous
Sodium Bicarbonate
Sodium thiosulfate pentahydrate
Water for injections
Gelatin capsule hard:
- Iron oxide yellow
- Titanium dioxide
- Gelatin
- Tek Print SW-9008 Black Ink

6.2 INCOMPATIBILITIES

This medicinal product must not be mixed with other medicinal products except with those as required to achieve therapeutic indications given in Section 4 of this Product Information document.

Interaction of this medicine with others is also given in Section 4.5 of this Product Information document.

6.3 SHELF LIFE

In Australia, information on the shelf life can be found on the public summary of the ARTG. The expiry date can be found on the 'packaging' under this heading.

Note: This product has an expiration period of 14 days from the date of calibration (shown on the product vial label).

6.4 SPECIAL PRECAUTIONS FOR STORAGE

Store below 25 degrees Celsius.

6.5 NATURE AND CONTENTS OF CONTAINER

Primary:
The primary container is a labelled 10 mL serum vial of USP Type 1 (neutral) glass or equivalent with a 20 mm outer diameter neck. The closure is a 20 mm halo-butyl rubber stopper (or equivalent). The metal caps are plain 20 mm aluminium seals and are red in colour.

Secondary:
The outer container is a labelled lead pot of suitable thickness.

Tertiary:
For transport, the lead pot is packed in an approved Type A package.

6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

Disposal of all radioactive wastes should be carried out in accordance with the *"Code for the Disposal of Radioactive Waste by the User - Radiation Protection Series, C-6, September 2018", published by Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).*

Refer to Section 4.4 - Special warnings and precautions for use.

In Australia, any unused medicine or waste material should be disposed of in accordance with local requirements.

6.7 PHYSICOCHEMICAL PROPERTIES

Chemical structure

Molecular Formula: $Na^{131}I$

Chemical structure: **Na^{+}.....$^{-}I[^{131}]$**

CAS number

7790-26-3

7 MEDICINE SCHEDULE (POISONS STANDARD)

Unscheduled.

8 SPONSOR

ANSTO
New Illawarra Rd,
Lucas Heights
NSW 2234, Australia

Mailing address:
Health, Locked Bag 2001, Kirrawee DC
NSW 2232, Australia

Telephone: 1800 251 572
Facsimile: 02 9543 6511
E-mail: health@ansto.gov.au
Website: www.ansto.gov.au

Product Code:
10020: 50MBq – 600MBq
10233: 700MBq – 6,000MBq

Australian Registration Number:
AUST R: 22808

9 DATE OF FIRST APPROVAL

15/10/1991

10 DATE OF REVISION

01/03/2024

SUMMARY TABLE OF CHANGES

Section Changed	Summary of new information
N/A	-