

DRAXIMAGE®

SODIUM IODIDE I 131 SOLUTION, USP

THERAPEUTIC

For Intravenous Use

DESCRIPTION

Sodium Iodide I 131 Solution, USP for therapeutic use by intravenous administration is a sterile, aqueous solution of sodium iodide I 131 containing the desired quantity of I 131 calibrated for the required date. The specific activity of the I 131 is designated as no-carrier-added. Each mL of aqueous solution also contains <0.15 mg of Disodium Edetate Dihydrate, <0.33 mg of Sodium Thiosulfate Pentahydrate, <3.0 mg of Disodium Phosphate Anhydrous, 0.9% (v/v) benzyl alcohol (as preservative), and 9 mg Sodium Chloride. The pH of the solution is between 7.5 and 8.5.

ACTION

Following intravenous administration, about 10 to 25% of the administered dose is selectively concentrated from the blood by the normal thyroid gland and about 60% by the hyperthyroid gland. The thyroid uses iodine to form thyroid hormones (thyroxine [T4], triiodothyronine [T3]) by iodination of tyrosine residues in thyroglobulin. Iodine is also accumulated but not organified by the stomach mucosa, choroid plexus, lactating breast and salivary glands; the remainder is distributed within the extracellular fluid. In euthyroid patients, approximately 60 to 90% of the administered dose is excreted in the urine within 24 hours.

INDICATIONS AND USAGE

Sodium Iodide I 131 Solution, USP is indicated for the treatment of hyperthyroidism (diffuse toxic goiter and single or multiple toxic nodular goiter). It may also be used for the treatment of recurrent hyperthyroidism after surgery.

Sodium Iodide I 131 Solution, USP may also be used for therapy of some thyroid carcinomas such as functioning metastatic papillary or follicular carcinoma of the thyroid.

CONTRAINDICATIONS

Because Sodium Iodide I 131 Solution, USP may cause fetal harm, it is contraindicated in women who are or may become pregnant. Therefore, this radiopharmaceutical should only be administered to a woman of childbearing capability if pregnancy (β -HCG) tests are negative.

Sodium Iodide I 131 Solution, USP is contraindicated in patients who are vomiting or have diarrhea, in the patients with moderate or severe renal dysfunction, and in those with thyrotoxic cardiac disease, particularly the elderly.

WARNINGS

Because of the increased absorbed radiation dose from I 131 in pediatric patients, the risks and benefits from therapy with Sodium Iodide I 131 Solution, USP must be assessed before consideration is given to the use of this radiopharmaceutical in pediatric patients.

PRECAUTIONS

General

Goitrogenic foods, many drugs (antitussives, expectorants, glucocorticoids, monovalent anions, sodium nitroprusside, synthetic and natural thyroid preparations, anti-thyroid medications, iodinated radiographic media, phenylbutazone, salicylates, vitamins, etc.) and certain diseases (nephrosis, impaired renal function, etc.) interfere with the accumulation of radioiodide by the thyroid. Therefore, a careful review of the patient's history, current medication and recent diagnostic tests is required prior to the administration of Sodium Iodide I 131 Solution, USP.

Concomitant use of bone marrow depressants may enhance the depression of the hematopoietic system caused by the use of large doses of Sodium Iodide I 131 Solution, USP.

Sodium Iodide I 131 Solution, USP, like other radioactive drugs, must be handled with care. Precautions should be taken to ensure minimum radiation exposure to the patient consistent with proper patient management, and to ensure minimum radiation exposure to occupational workers.

Sodium Iodide I 131 Solution, USP is radioactive and therefore adequate shielding of the radiopharmaceutical must be maintained.

The expiry time is 30 days after calibration date that is indicated on the tag accompanying the product vial.

Radiopharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radionuclides and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

Carcinogenesis, Mutagenesis, Impairment of Fertility

No long term animal studies have been performed to evaluate the carcinogenic or mutagenic potential of Sodium Iodide I 131 Solution, USP or whether this drug affects fertility in males or females.

Pregnancy

Animal reproduction and teratogenicity studies have not been conducted with Sodium Iodide I 131 Solution, USP. It is also not known whether Sodium Iodide I 131 Solution, USP can cause fetal harm when administered to a pregnant woman or can affect reproductive capacity. There have been no studies in pregnant women.

Sodium Iodide I 131 Solution, USP should only be administered to a woman of childbearing capability when appropriate contraceptive measures have been taken or when pregnancy tests are negative. See "CONTRAINDICATIONS".

Ideally, examinations using radiopharmaceuticals, especially those elective in nature, in women of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

Nursing Mothers

Iodine I 131 is excreted in human milk during lactation. Therefore, formula feedings must be substituted for breast feedings.

Pediatric Use

The risk to benefit ratio should be assessed before consideration is given to the use of this product in this age group. See "WARNINGS".

ADVERSE REACTIONS

With the use of large doses of Sodium Iodide I 131 Solution, USP, potential side effects include acute radiation sickness, sialoadenitis, pain, hemorrhage and swelling in tumors, hyperthyroidism, bone marrow suppression (leukopenia, thrombocytopenia, anemia), and radiation thyroiditis.

About 25% of patients become hypothyroid during the first year post-therapy, while remainder become hypothyroid at a rate of 2% - 3% per year.

PHYSICAL CHARACTERISTICS

Iodine 131 decays by beta emission and associated gamma emission with a physical half-life of 8.04 days¹. The principal beta emissions and gamma photons are listed in Table 1.

Table I
Principal Radiation Emission Data

Radiation	Mean %/ Disintegration	Mean Energy (keV)
Beta-1	2.12	69.4
Beta-3	7.36	96.6
Beta-4	89.30	191.4
Gamma-7	6.05	284.3
Gamma-14	81.20	364.5
Gamma-17	7.26	637.0

External Radiation

The specific gamma ray constant for I 131 is $15.8 \mu\text{Ci} \cdot \text{kg}^{-1} \cdot \text{MBq}^{-1} \cdot \text{h}^{-1}$ (2.27 R/mCi-hr) at 1 cm. The first half value layer is 0.26 cm of lead. A range of values for the relative attenuation of the radiation resulting from the interposition of various thicknesses of lead is shown in Table 2. For example, the use of 4.6 cm of lead will attenuate the radiation emitted by a factor of about 1000.

Table 2
Radiation Attenuation by Lead Shielding

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

To correct for physical decay of this radionuclide, the fractions that remain at selected intervals after calibration are shown in Table 3.

Table 3
Physical Decay Chart
Iodine 131: Half-life 8.04 days

Days	Fraction Remaining	Days	Fraction Remaining	Days	Fraction Remaining
0*	1.00	8	0.50	15	0.274
1	0.917	9	0.460	16	0.252
2	0.842	10	0.422	17	0.231
3	0.772	11	0.387	18	0.212
4	0.708	12	0.355	19	0.194
5	0.650	13	0.326	20	0.178
6	0.596	14	0.299	21	0.164
7	0.547				

*Calibration Time

RADIATION DOSIMETRY

The estimated absorbed radiation doses² to a euthyroid adult patient (70 kg) with different levels of thyroid uptake delivered by the intravenous administration of Sodium Iodide I 131 Solution, USP are shown in Table 4.

Table 4
Absorbed Radiation Doses

Organ	Maximum Thyroid Uptake					
	5%		15%		25%	
	mGy/MBq	rads/mCi	mGy/MBq	rads/mCi	mGy/MBq	rads/mCi
Thyroid	70	260	220	800	350	1300
Stomach Wall	0.46	1.7	0.43	1.6	0.38	1.4
Red Marrow	0.038	0.14	0.054	0.20	0.07	0.26
Liver	0.054	0.2	0.095	0.35	0.13	0.48
Testes	0.023	0.08	0.023	0.09	0.024	0.09
Ovaries	0.038	0.14	0.038	0.14	0.038	0.14
Total Body	0.065	0.24	0.13	0.47	0.19	0.71

DOSAGE AND ADMINISTRATION

The recommended dosage ranges of Sodium Iodide I 131 Solution, USP for therapy of the average (70 kg) adult patient are:

Hyperthyroidism: 148 - 370 megabecquerels (4 - 10 millicuries). Certain disorders such as toxic nodular goiter may require larger doses. Anti-thyroid drugs should be discontinued for 3 - 4 days prior to the administration of the dose and withheld for 7 - 14 days afterwards.

Thyroid Carcinoma: 3.7 - 5.55 gigabecquerels (100 - 150 millicuries) for ablation of normal thyroid tissue.
3.7 - 7.4 gigabecquerels (100 - 200 millicuries) for subsequent treatments.

The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration.

DIRECTIONS FOR USE

Sodium Iodide I 131 Solution, USP is ready for intravenous administration. Take precautions to minimize radiation exposure by the use of suitable shielding. Waterproof gloves should be worn while handling the radiopharmaceutical.

HOW SUPPLIED

DRAXIMAGE[®] Sodium Iodide I 131 Solution, USP

Therapeutic

Product No. 0350-073

Sodium Iodide I 131 Solution, USP for therapeutic use by intravenous administration is a sterile, aqueous solution of sodium iodide I 131 containing the desired quantity of I 131 calibrated for the required date. The volume and specific concentration of the solution are indicated on the tag accompanying the vial. The specific activity of the I 131 is designated as no-carrier-added. Each mL of aqueous solution also contains <0.15 mg of Disodium Edetate Dihydrate, <0.33 mg of Sodium Thiosulfate Pentahydrate, <3.0 mg of Disodium Phosphate Anhydrous, 0.9% (v/v) benzyl alcohol (as preservative), and 9 mg Sodium Chloride. The pH of the solution is between 7.5 and 8.5.

Sodium Iodide I 131 Solution, USP is supplied in a unit dose vial.

STORAGE

Sodium Iodide I 131 Solution, USP may be stored at or below room temperature (2°C - 30°C).

EXPIRY

Expiry is 30 days from the calibration date that is stated on the radioassay information tag accompanying the product vial.

REFERENCES

1. Kocher, David C., "Radioactive Decay Data Tables", DOE/TIC 11026, page 133 (1981).
2. Berman M, Braverman LE, Burke J, De Groot L, McCormack KR, Oddie TH, Rohrer RH, Wellman HN, Smith EM. MIRD Dose Estimate Report No. 5. Summary of Current Radiation Dose Estimates to Humans from ^{123}I , ^{124}I , ^{125}I , ^{126}I , ^{130}I , ^{131}I , and ^{132}I Sodium Iodide. J Nucl Med 1975;16:857-60

Revised August 15, 2001