

AUSTRALIAN PRODUCT INFORMATION ULTRAGAT™ RBC (STANNOUS CHLORIDE DIHYDRATE) POWDER FOR INJECTION

1 NAME OF THE MEDICINE

Stannous chloride dihydrate.

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Ultragat™ RBC Kit for the Preparation of Technetium Tc 99m-Labelled Red Blood Cells, a diagnostic radiopharmaceutical agent.

Ultragat RBC is a sterile, non-pyrogenic, diagnostic kit for the *in vitro* preparation of Technetium Tc 99m-Labelled Red Blood Cells.

Each kit consists of three separate non-radioactive components. A reaction vial containing the active ingredient stannous chloride dihydrate, the contents of the vial are lyophilised and stored under argon. There are two syringes containing diluent solutions for reconstitution.

For the full list of excipients, see section 6.1 LIST OF EXCIPIENTS.

Physical Characteristics

Technetium Tc 99m decays by isomeric transition with a physical half-life of 6.02 hours.¹ The principal photon that is useful for detection and imaging is listed in **Table 1**.

Table 1. Principal Radiation Emission Data¹

Radiation M	Mean Percent/Disintegration	Energy (keV)
Gamma-2	89.07	140.5

The specific gamma ray constant for Technetium Tc 99m is 0.78 R/mCi-hr at 1 cm. The first half-value thickness of lead (Pb) for Technetium Tc 99m is 0.017 cm. A range of values for the relative attenuation of the radiation emitted by this radionuclide resulting from the interposition of various thicknesses of lead (Pb) is presented in **Table 2**. For example, the use of 0.25 cm of lead will decrease the external radiation exposure by a factor of about 1000.

Table 2. Radiation Attenuation by Lead Shielding

Shield Thickness (Pb) cm	Coefficient of Attenuation
0.017	0.5
0.08	10 ⁻¹
0.16	10 ⁻²
0.25	10 ⁻³
0.33	10 ⁻⁴

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

Table 3. Physical Decay Chart: Technetium Tc 99m, Half-life 6.02 Hours

Hours	Fraction Remaining	Hours	Fraction Remaining
0*	1.000	7	0.447
1	0.891	8	0.398
2	0.794	9	0.355
3	0.708	10	0.316
4	0.631	11	0.282
5	0.562	12	0.251
6	0.501		

*Calibration Time

3 PHARMACEUTICAL FORM

Reaction vial: Powder for injection.
White lyophilised powder.
Syringe I: Diluent, Clear colourless liquid.
Syringe II: Diluent, Clear colourless liquid.

4 CLINICAL PARTICULARS

4.1 THERAPEUTIC INDICATIONS

Technetium Tc 99m-Labelled Red Blood Cells are used for blood pool imaging, including cardiac first pass and gated equilibrium imaging and for detection of sites of gastrointestinal bleeding.

4.2 DOSE AND METHOD OF ADMINISTRATION

Dosage

The suggested dose range of Technetium Tc 99m-Labelled Red Blood Cells in the average patient (70 kg) is 370 MBq (10 mCi) to 740 MBq (20 mCi).

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

Radiation Dosimetry

The estimated radiation doses to an average adult (70 kg) from an intravenous injection of a maximum dose of 740 megabecquerel (MBq) (20 millicurie [mCi]) of Technetium Tc 99m-Labelled Red Blood Cells are shown in **Table 4**.

These radiation absorbed dose values were calculated using the Medical Internal Radiation Dose (MIRD) Committee Schema.

Method of Administration

The Instructions for Preparation must be carefully followed for preparing Technetium Tc 99m-Labelled Red Blood Cells using Ultragat RBC.

Parenteral products should be inspected visually for particulate matter and discoloration prior to administration, whenever solution and container permit. Aseptic procedures and a shielded syringe should be employed in preparing and withdrawing doses for administration to

Table 4. Absorbed Radiation Dose Estimates² for Ultragat RBC Technetium Tc 99m-Labelled Red Blood Cells*

Organ	mGy/740 MBq	Rads/20 mCi
Total Body	3.0	0.30
Spleen	22	2.2
Bladder Wall	4.8	0.48
Testes	2.2	0.22
Ovaries	3.2	0.32
Blood	8.0	0.80
Red Marrow	3.0	0.30
Heart Wall	20	2.0
Liver	5.8	0.58
Bone Surfaces	4.8	0.48

* Assumes non-resting state and biological half-life for all organs and whole body of 63.7 hours. The peak percent dose for heart chambers is 15.5%, for liver is 5.57%, spleen is 4.07% and for remainder of body is 74.8%. Assumes patient voids at 2.0 hour intervals.

patients. The user should wear waterproof gloves during the administration procedure.

It is recommended that the labelled red blood cells be administered within 30 minutes of preparation or as soon as possible thereafter.

Procedure for the Preparation of Technetium Tc 99m-Labelled Red Blood Cells

- Collect patient's blood sample (1.0 to 3.0 mL) using heparin or Anticoagulant Citrate Dextrose Solution (ACD) as an anticoagulant. The amount of ACD should not exceed 0.15 mL of ACD per mL of blood. The recommended amount of heparin is 10 to 15 units per mL of blood. DO NOT USE EDTA OR OXALATE AS AN ANTICOAGULANT.
- Using a large-bore (19 to 21 gauge) needle, transfer 1.0 to 3.0 mL of anticoagulated whole blood to the Reaction Vial and gently mix to dissolve the lyophilised material. Allow to react for five minutes.
- Add contents of Syringe I, mix by gently inverting four to five times.
- Add the contents of Syringe II to the Reaction Vial. Mix by gently inverting four to five times.
- Place the vial in a lead shield fitted with a lead cap and having a minimum wall thickness of 3mm. Add 370 to 3700 MBq (10 to 100 mCi) Sodium Pertechnetate Tc 99m (in a volume of up to 3 mL) to the Reaction Vial. The avoidance of long Technetium Tc 99m in-growth times and the use of fresh Sodium Pertechnetate Tc 99m generator eluate is recommended.
- Mix by gently inverting Reaction Vial four to five times. Allow to react for 20 minutes with occasional mixing.
- Technetium Tc 99m-Labelled Red Blood Cells should be injected within 30 minutes of preparation or as soon as possible thereafter.
- If desired, assay labelling efficiency immediately prior to injection. Typical labelling efficiency is greater than 95%.
- Mix gently prior to withdrawal of patient dose. Aseptically transfer the Technetium Tc 99m- Labelled Red Blood Cells to a syringe for administration to the patient. Use largest bore needle compatible with patient administration to prevent hemolysis.
- Assay the Technetium Tc 99m-Labelled Red Blood Cell patient dose in a suitable calibrator and complete the radioassay information label. Affix the radio assay information label to the shield.

Note 1: The kit does not contain an anticoagulant. Therefore, a syringe treated with ACD or heparin must be used for drawing the patient's blood. The amount of ACD should not exceed 0.15 mL of ACD per mL of blood. The recommended amount of heparin is 10 to 15 units per mL of blood. Improperly anticoagulated blood will be unsuitable for reinjection.

Note 2: If desired, the labelling yield determination can be carried out as follows: Transfer 0.2 mL of the Technetium Tc 99m-Labelled Red Blood Cells to a centrifuge tube containing 2 mL of 0.9% NaCl. Centrifuge for five minutes and carefully pipet off the diluted plasma. Measure the radioactivity in the plasma and red blood cells separately in a suitable counter.

Calculate labelling efficiency as follows:
% RBC Labelling = $\frac{\text{Activity RBC} \times 100}{\text{Activity RBC} + \text{Activity Plasma}}$

4.3 CONTRAINDICATIONS

None known.

4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE

The components of the kit are sterile and non-pyrogenic. It is essential that the user follow the directions carefully and adhere to strict aseptic procedures during preparation.

The contents of the kit are intended only for use in the preparation of Technetium Tc 99m-Labelled Red Blood Cells and are NOT to be administered directly to the patient.

The contents of this kit are not radioactive. After Sodium Pertechnetate Tc 99m is added, however, adequate shielding of the final preparation must be maintained.

Technetium Tc 99m-Labelled Red Blood Cells must be handled with care to ensure minimum radiation exposure to the patient, consistent with proper patient management, and to ensure minimum radiation exposure to occupational workers.

The labelled red blood cells must be reinjected only into the patient from whom the blood was drawn.

Nuclear medicine procedures involving withdrawal and reinjection of blood have the potential for transmission of blood borne pathogens. Procedures should be implemented to avoid administration errors and viral contamination of personnel during blood product labelling. A system of checks similar to the ones used for administering blood transfusions should be routine.

It is recommended that the labelled red blood cells be administered within 30 minutes of preparation or as soon as possible thereafter. A small study showed that Technetium Tc 99m-Labelled Red Blood Cells prepared with Ultragat RBC have equivalent *in vivo* labelling efficiency when administered both immediately after preparation (5 patients studied) and at 6 hours after preparation (6 patients studied) with a 24-hour labelling efficiency averaging 97% for both groups.

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

Use in the elderly

There is no special safety or dosage information available for use in the elderly.

Paediatric use

Safety and efficacy in paediatric patients have not been established.

5.3 PRECLINICAL SAFETY DATA

Genotoxicity

No data available.

Carcinogenicity

No long term animal studies have been performed to evaluate carcinogenic or mutagenic potential or to determine the effects on male or female fertility.

6 PHARMACEUTICAL PARTICULARS

6.1 LIST OF EXCIPIENTS

Reaction Vial:
– glucose
– sodium citrate dihydrate

Syringe I:

– sodium hypochlorite
– water for injections

Syringe II:

– citric acid monohydrate
– glucose
– sodium citrate dihydrate
– water for injections

6.2 INCOMPATIBILITIES

Incompatibilities were either not assessed or not identified as part of the registration of this medicine.

6.3 SHELF LIFE

Before reconstitution: 15 months from date of manufacture.
After reconstitution: Inject within 30 minutes of preparation where possible. Use within 6 hours of preparation.

6.4 SPECIAL PRECAUTIONS FOR STORAGE

Before reconstitution:
Kit:
Stored below 25°C. Protect from light. Do not freeze.
Reaction Vial:
Stored below 25°C. Do not freeze
Syringe I:
Stored below 25°C. Protect from light. Do not freeze.
Syringe II:
Stored below 25°C. Do not freeze.

After reconstitution:
Stored below 25°C. Do not freeze.

6.5 NATURE AND CONTENTS OF CONTAINER

Each pack contains 5 kits.

Each kit contains:

- 1x reaction glass vial;
- 1x glass syringe I;
- 1x glass syringe II.

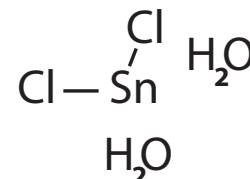
6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

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

6.7 PHYSICO-CHEMICAL PROPERTIES

Chemical structure

Stannous chloride dihydrate has the following structural formula:



CAS number

CAS number for stannous chloride dihydrate: 10025-69-1.

7 MEDICINE SCHEDULE (POISONS STANDARD)

Not scheduled. Not considered by committee.

8 SPONSOR

Landauer Radiopharmaceuticals Pty Ltd
Level 3/69 Phillip Street
Parramatta NSW 2150
Australia
Contact number: (02) 8651 4000

9 DATE OF FIRST APPROVAL

2 February 1994

10 DATE OF REVISION

20 January 2023

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Summary Table of Changes

Section changed	Summary of new information
4.2	Safety Related Change to Note 1
4.2, 4.8 and 10	Minor Editorial Changes

² Dose estimates based on Phase I human biodistribution data generated at Brookhaven National Laboratories. Dose estimates were calculated at Oak Ridge Associated Universities, Oak Ridge, Tennessee.

¹ Koehler, David C., "Radioactive Decay Data Tables," DOE/TIC-11026, 108 (1981).