Theragenics

TheraSeed®
Pd-103 Device

Instructions for Use

EC REP

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1 INTRODUCTION

This document contains instructions for use of Theragenics® TheraSeed® Palladium-103 (Pd-103) devices.

The product labels for all TheraSeed® configurations use symbols to convey essential product information. Each symbol is defined in Table 1.

Table 1: Definition Of Symbols

SYMBOL	MEANING
	Caution, consult accompanying documents
	Do not reuse
	Use by
	Batch code / Production identifier
	Catalog number
	Serial Number
	Sterilized using irradiation
	Sterilized using ethylene oxide
	Sterilized using steam
	Do not resterilize
	Do not use if package damaged
	Device Manufacturer
	Authorized Representative in the European Community
	CE Mark of the Notified Body, authorized since February 2019
R_xOnly	Caution: Federal (USA) law restricts this device to sale by or on the order of a physician.
	Caution: Radioactive material
	MR Conditional
	Single sterile barrier system with protective packaging inside
MD	Medical device
	Consult instruction for use or consult electronic instruction for use

2 WARNINGS AND PRECAUTIONS

A WARNING indicates the potential for death, serious injury, or other serious adverse events due to use or misuse of the device.

TheraSeed® Seed Products

- TheraSeed® seeds contain radioactive material.
- DO NOT reuse – Single use only.
- DO NOT re-sterilize.
- DO NOT use if sterile package is damaged.
- DO NOT use a damaged source. If a seed is damaged or broken contact your Radiation Safety Office and initiate containment and decontamination in accordance with your facility's radiation safety procedures.
- DO NOT expose implanted sources to therapeutic levels of ultrasound energy as the device may inadvertently concentrate the ultrasound field and cause harm.
- Pd103 seeds should never be handled roughly or forced into any implant accessory e.g. cartridge or needle. Such force may damage the wall of the brachytherapy source, potentially causing release of palladium into the environment or tissues surrounding an implanted brachytherapy source.

C20®, VSM and Mick® Cartridges

- DO NOT handle cartridges by the spring loaded plunger.
- DO NOT overtighten the cartridge shield cover.
- DO NOT use force on seeds or cartridges.
- DO NOT force cartridges into applicator.
- DO NOT forcibly remove cartridges from applicator.

Customised preloaded needle kits

A customised preloaded needle kit is a prescription device and must not be used or substituted for use by anyone other than the patient for whom it has been prescribed.

3 RESTRICTIONS ON USE / CAUTIONS

Pd103 seeds and accessories should be used by physicians who are qualified by training and experience in the safe use and handling of radionuclide brachytherapy sources and whose experience and training has been approved by the appropriate government authorities authorized to license the use of radioactive materials.

Pd103 seeds and accessories should be used in those facilities that have been approved by the appropriate government authorities authorized to license the use of radioactive materials.

CAUTION: Only individuals trained by an authorized user at the licensed facility should handle the sources. Direct contact with the TheraSeed® device should be avoided; the use of forceps or tweezers is recommended.

DO NOT re-sterilize or reprocess the TheraSeed® device.

CAUTION: Implant Needles - Using the stylet with excessive force to manipulate a lodged seed may damage the seed. Needles are not intended to penetrate bone. If resistance is encountered, verify needle position. Do not push into bone as this may cause the needle to bend or break. Replace needle if cannula or tip is damaged.

4 RADIATION

The half-value layer (HVL) of lead for Pd-103 is .008 mm. Exposure can be reduced by 97% or more with a thin sheet of lead (0.06 mm). The shielding of Pd-103 results in a reduction of exposure to attending medical personnel and visitors.

TheraSeed® should be handled only by those individuals trained by an authorized user at the licensed facility. Proper precautions should be taken when handling the sources. Direct contact with the TheraSeed® device should be avoided; the use of forceps or tweezers is recommended.

Personnel monitoring is required. Dosimetry monitors, such as TLD devices, should be used to monitor hand and whole body exposure. During preparation and source device implantation procedures, all practical steps should be taken to keep exposure as low as reasonably achievable. Limiting exposure time, increasing distance, careful planning of the administration procedure, and use of shielded barriers should be considered in meeting this goal. The Site Radiation Safety Officer should be consulted regarding specific local requirements.

5 In-VITRO CHARACTERISTICS

The use of titanium for the tube and end cups assures good tissue compatibility. The dose distribution surrounding each individual seed is moderately anisotropic. Dose distribution calculations may need to account for this degree of anisotropy. Total attenuation resulting from titanium encapsulation, x-ray marker, and self-absorption from the Pd-103 pellet is approximately 58%, on average.

6 MRI Safety Information

MR Conditional

Non-clinical testing demonstrated that the TheraSeed Palladium-103 Device is MR Conditional. A patient with this device can be scanned safely in an MR system under the following conditions:

- Static magnetic field of 1.5-Tesla or 3-Tesla, only
- Maximum spatial gradient magnetic field of 4,000-Gauss/cm (40-T/m)
- Maximum MR system reported, whole body averaged specific absorption rate (SAR) of 2-W/kg for 15 minutes of scanning (i.e., per pulse sequence) in the Normal Operating Mode

Under the scan conditions defined, the TheraSeed Palladium-103 Device is expected to produce a maximum temperature rise of 1.6˚C after 15-minutes of continuous scanning (i.e., per pulse sequence).

In non-clinical testing, the image artifact caused by the TheraSeed Palladium-103 Device extends approximately 5-mm from this implant when imaged using a gradient echo pulse sequence and a 3-Tesla MR system.

NOTE: MR Testing did not address mitigation risks associated with MRI scans when seeds are within, adjacent to, or in close proximity with any other implanted devices.

7 SOURCE RECEIPT AND STORAGE

Records of receipt, storage, and disposal of TheraSeed® Pd-103 devices should be maintained in accordance with government regulatory policies. Products should be strictly controlled and stored in a secured area. Any discrepancies in seed count must be reported immediately to Theragenics® Customer Service. See Section 15 for contact information.

- TheraSeed® products should remain in the sterile package until ready to use.
- TheraStrand® and TheraSleeve® devices should not be exposed to high humidity (above 50%) for significant duration. Sterile needles should remain sealed in the sterile package until ready to use.
- The shelf-life of TheraSeed®, independent of product configuration, is determined by the decay rate. Refer to the product label for expiration date.

8 DISPOSAL

8.1 Seeds

When disposal is indicated, TheraSeed® sources should be transferred to an authorized radioactive waste disposal agency. TheraSeed® should be disposed of in accordance with applicable laws and regulations.

8.2 Packaging

CAUTION: Handle and dispose of radioactive material, needles, accessories, shielding and packaging, in accordance with applicable laws and regulations.

9 PRODUCT DESCRIPTIONS

9.1 TheraSeed®

The TheraSeed® Pd-103 device consists of a laser welded titanium tube containing two Pd-103 plated graphite pellets and a lead x-ray marker. (Figure 1.)

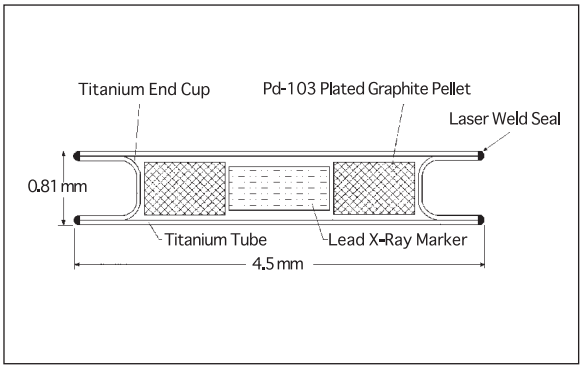

Figure 1: TheraSeed®

9.2 Seeds in Magazines

Theragenics® offers three seed magazines for TheraSeed®.

9.2.1 The Vertical Seed Magazine and C20 magazine have a 20-seed capacity with integrated and count indicator.

9.2.2 The Mick® Magazine has a 15-seed capacity.

9.3 Stranded and Custom Loaded Products

9.3.1 TheraLoad® consists of a variable number of seeds and spacers custom loaded into 18-gauge brachytherapy needles. The maximum length of configured components may not exceed 7.0 cm.

9.3.2 TheraSleeve® consists of a variable number of seeds and spacers contained in a bioabsorbable sleeve and custom loaded into 18-gauge brachytherapy needles. The maximum length of configured components may not exceed 7.0 cm.

9.3.3 TheraStrand® consists of a variable number of seeds and spacers contained in bioabsorbable suture and custom loaded into 18-gauge brachytherapy needles. All TheraStrand® configurations begin and end with a 2.75 mm spacer (Figure 2). The maximum length of configured components is 6.5 cm.

9.3.4 TheraStrand® RT - Loose TheraStrand® may also be provided in a 20-strand shielded container / sterile cup or in a 4-strand sterile container to facilitate sterile strand assay.

The stiffened suture material used for TheraStrand® and the bioabsorbable sleeve used for TheraSleeve® stabilize the seeds in the treated tissue to provide desired dosimetry and minimize seed movement during delivery/insertion, and help to prevent seed migration.[1,2] Both materials are biocompatible and are commonly used in medical devices. The spacers used in custom loaded product configurations are made from the same material as the suture.

9.4 Needle/Strand Specifications

- The components are supplied in standard 18-gauge needles.
- The needles contain a bone wax plug that is approximately 5 mm long.
- The bioabsorbable suture and spacers are made of 90/10 (glycolide/L-lactide), for which absorption occurs in 56-70 days.
- The bioabsorbable sleeve is made of 20/80 (glycolide/L-lactide), for which absorption occurs in 140-180 days.

TheraSeed®, TheraLoad®, TheraSleeve®, and TheraStrand® are single use devices. The devices should not be resterilized or reused.

10 INDICATIONS FOR USE AND CONTRAINDICATIONS

Palladium-103 seeds with an activity range of 0.8 U to 4.0 U are indicated for permanent interstitial treatment of localized prostate cancer. The seeds may be used as primary treatment as monotherapy or combined with other modalities such as external beam radiation therapy and/or androgen deprivation therapy.

Contraindications for transperineal permanent prostate brachytherapy stipulated by the American College of Radiology and the American Brachytherapy Society[3] are:

- Life expectancy of less than 10 years in the setting of low-risk prostate cancer.
- Unacceptable operative risk
- Poor anatomy which, in the opinion of the radiation oncologist, could lead to a suboptimal implant (e.g., large or poorly healed transurethral resection of the prostate (TURP) defect, large median lobe, large gland size).
- Pathologically positive lymph nodes
- Significant obstructive uropathy
- Distant metastases

11 PRODUCT SPECIFICATIONS

11.1 Source Limitations

It is possible through rough handling (abrasion, incision, etc.), high temperatures, or crushing that a TheraSeed® device could rupture and leak. If this happens, contact your facility Radiation Safety Officer.

11.2 Source Characteristics / Dosimetry

Pd-103 has a half-life of 16.991 days and decays by electron capture with the emission of characteristic x-rays of 20-23 keV and Auger electrons. To correct for physical decay of the Pd-103, decay factors at selected days after the reference date are shown in Table 2. The sources remain therapeutic through about 5 half-lives, or about 90 days for Pd-103.

Refer to the AAPM Task Group No. 43 (TG43) update for a dosimetric characterization of TheraSeed®.[4]

Table 2: Decay of Palladium-103

Day	Decay Factor	Day	Decay Factor	Day	Decay Factor	Day	Decay Factor	Day	Decay Factor
1	0.9600	8	0.7215	15	0.5423	22	0.4076	29	0.3063
2	0.9216	9	0.6927	16	0.5206	23	0.3913	30	0.2941
3	0.8848	10	0.6650	17	0.4998	24	0.3757	31	0.2823
4	0.8494	11	0.6384	18	0.4798	25	0.3606	32	0.2711
5	0.8155	12	0.6129	19	0.4607	26	0.3462	33	0.2602
6	0.7829	13	0.5884	20	0.4422	27	0.3324	34	0.2498

11.3 Calibration

The TheraSeed® Pd-103 device is calibrated by direct comparison against a standard source of the same model that has been calibrated by the National Institute of Standards and Technology (NIST) or ADCL for air kerma strength. The resulting calibration is reported in air kerma strength (μGy m^2 h^{-1}, also defined as U) as well as Apparent Activity (mCi).

The air kerma strength and total apparent activity values contained on the product label are calculated to 12:00 noon ET (Eastern Time) on the given reference date.

11.4 Source Output Verification

A Sealed Source Calibration Certificate is provided with every order. The seeds are 100% assayed and assigned to inventory ranges. The Sealed Source Calibration Certificate identifies the calibration information for each order based on the original assay/inventory range. If you request either 10% or 100% independent assay, an additional Sealed Source Calibration Certificate, including assay results, is provided. For further verification, a radiograph is provided for stranded orders. A digital image is also provided for custom loaded needle orders. Extra loose seeds or calibrated seeds can be provided for independent measurement.

12 AVAILABLE SOURCE STRENGTH RANGE

Available ranges are 0.8 U to 4.0 U based on the corrected NIST 1999 WAFAC standard, implemented March 5, 2001. The uncertainty of the Air Kerma Strength for the TheraSeed® Pd-103 device is approximately ± 7%. Other seed strengths may be available upon request. Please check with your Theragenics® Customer Service Representative regarding special order availability.

Typically, for a monotherapy dose of 125 Gy in prostate treatment, seed strengths of 2.0-3.0 U are ordered. For a boost dose of 100 Gy in prostate treatment, seed strengths of 1.5-2.0 U are ordered.[5]

13 DIRECTIONS FOR USE

Package Integrity

1. Visually inspect the product packaging prior to aseptic presentation to ensure integrity of the sterile barrier system and verify product is within the expiration date.
2. **DO NOT** use if package is damaged or expired.

13.1 TheraStrand® Real Time (RT)

13.1.1 Open the shipping container and review documentation to verify order contents.

13.1.2 Remove the sterile container from the lead pig.

13.1.3 Carefully inspect the sterile container – Do not use if container or Tyvek lid are damaged.

13.1.3.1 If using the RT individual container, perform assay per your established protocol.

13.1.3.2 Contact Theragenics® Radiation Physics department if assistance is needed with the assay protocol.

13.1.4 Peel back the lid and remove the shielded insert to the sterile field, utilizing ALARA practices.

13.1.5 Use sterile tweezers to grasp the protruding end of a strand.

13.1.6 Remove the strand and transfer directly to a sterile brachytherapy needle or to a sterile cutting surface for further processing.

13.1.7 Repeat steps 13.1.5 – 13.1.6 until all strands have been removed from the shielded insert.

Note: In accordance with ALARA principles, it is recommended that strands remain in the shielded insert until ready to process.

13.2 Custom Loaded Needles

13.2.1 Open the shipping container and review documentation to verify order contents.

13.2.2 Ensure that the Needle Configuration Plan (Form F1007) provided is consistent with the treatment plan. Contact Customer Service if there are discrepancies.

13.2.3 Open the inner shipper and remove the sterile package(s).

13.2.4 Carefully inspect the sterile packages – Do not use if package or Tyvek lid are damaged.

13.2.5 Peel to open the sterile package. Remove the foam liner and remove the inner tray to the sterile field.

NOTE: If you need to radiograph your order, remove the bottom cover by separating the snap locks and replace upon completion.

13.2.6 Take care to avoid contamination when opening the sterile package. TheraLoad®, TheraSleeve®, and TheraStrand® devices may not be resterilized.

13.2.7 The needle tray is shielded and can be used in either a horizontal or vertical position.

NOTE: Refer also to the Tray Set-Up Guide for visual set up instructions.

13.2.8 To use horizontally:

- Remove the top cover (unshielded portion, covering the needle stylets) by separating the snap locks.
- Fold the upper half of the tray underneath the needles and lay flat on the sterile work surface to dispense.

13.2.9 To use vertically, the top cover is used as a tray base:

- Repeat the steps above, and place the folded needle tray into the tray base. The tray base should be oriented with the three circular stops forward, and the two triangular stops to the rear.
- Using your thumb and forefinger, engage the butterfly clips on both sides.
- Note – Use of the butterfly clips provides extra stability to the upright needles, but is not required.

13.2.10 Upon removing needles for use, ensure the stylet lock is secure and carry needles in a horizontal or "tip upwards" position to avoid loss of seeds in the event that the needle plug has become displaced during shipment.

13.2.11 Remove stylet lock from needle hub and begin seed placement.

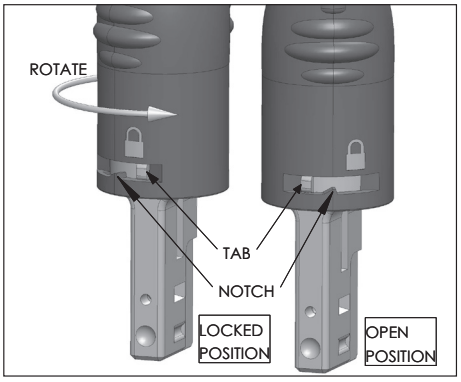

Figure 2: Removing the Magazine Cover

13.3 Loose Seeds and Seeds in Magazines

13.3.1 For seeds in magazines, always remove the magazine cover gently to prevent the shifting of seeds. Hold the magazine upright when opening/removing the cover so that seeds do not fall out.

13.3.2 If you have purchased sterile TheraSeed® in vials or magazines, strict aseptic practices should be followed when loading the seeds into standard 18-gauge prostate needles. Take care not to damage seeds during loading.

13.3.3 Insert a sterile magazine into your Mick® applicator and proceed with the implant procedure.

13.3.4 To open either magazine, grasp the magazine body and hold in an upright position.

13.3.4.1 To open a C20 or Mick® magazine, unscrew the magazine cover and lift off.

13.3.4.2 To open the vertical seed magazine (VSM), rotate the cover counterclockwise past the notch until the tab is in the open position (Refer to Figure 2). Remove the cover using gentle upward pressure.

13.3.5 Remove seeds with fine point tweezers using ALARA practices.

13.3.6 To replace the VSM cover: position the plunger paddle into the magazine body. Align the open position of the magazine cover with the tab on the magazine body and press the cover into place. Rotate the cover clockwise past the notch until it locks.

14 ADVERSE EFFECTS

WARNING: A correlation between fistula formation and rectal anterior wall biopsy has been reported and is therefore a relative contraindication.[12,13]

Adverse effects associated with LDR prostate brachytherapy implants have been reported and include:

Urinary toxicity: haematuria, perineal bruising and pain, lower urinary tract symptoms (LUTS – such as dysuria, urinary urgency, frequency and nocturia), cystitis, urethritis, superficial urethral necrosis, urinary retention, urinary stricture, bladder neck contracture, urinary incontinence.[6-9]

Rectal toxicity: Diarrhoea, constipation, anal incontinence/urgency, proctitis, rectal bleeding, rectal stricture, rectal ulcer/rectal fistula.[10,12,13]

Erectile and sexual function toxicity: Haematospermia, a decline in erectile function is common after brachytherapy with recovery to baseline function returning from 3 months to 5 years after therapy.[9] There are sporadic reports in the literature of paternity after brachytherapy with no evidence of birth anomalies; however, usual practice is to recommend sperm banking prior to the procedure if subsequent fertility is a concern.[14]

15 CUSTOMER SERVICE

To place an order, obtain return authorization, or obtain product information, please contact Theragenics® Customer Service or your distributor.

16 REPORTING REQUIREMENTS

All serious incidents are required to be reported as soon as possible to Theragenics Corporation® or the distributor. Email: customerservice@theragenics.com or US phone number 1-770-831-5225.

17 REFERENCES

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