Theragenics

TheraSeed® Model 200
Pd-103 Device

Instructions for Use


Do not reuse


Caution


Do not use if package damaged

Do not resterilize

Caution, Federal (USA) law restricts this device to sale by or on the order of a licensed physician

Non-sterile

Sterilized using irradiation

Sterilized using ethylene oxide

Sterilized using steam


Device Manufacturer


Caution: Radioactive material

Catalog number

Serial Number

Batch code / Production identifier

MR conditional


Use by


Single sterile barrier system with protective packaging inside

Medical device


Consult instruction for use or consult electronic instruction for use


Manufacturer:
Theragenics Corporation®
5203 Bristol Industrial Way
Buford, GA 30518 USA
www.theragenics.com
1-770-271-0233

10-11-005/0322

RESTRICTIONS ON USE / CAUTIONS

General

TheraSeed® source 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.

TheraSeed® source 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: Caution should be used when handling the sources. Direct contact with the TheraSeed® source should be avoided; the use of forceps or tweezers is recommended.

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

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.

RADIATION

The half-value layer (HVL) of lead for TheraSeed® is .008 mm. Exposure can be reduced by 97% or more with a thin sheet of lead (.06 mm). The shielding of Pd-103 results in a reduction of exposure to attending medical personnel and visitors.

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 (ALARA). 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.

In-VIVO 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.

MRI Safety Information

MR

Non-clinical testing has demonstrated that TheraSeed® Palladium-103 device is MR-Conditional.

A patient with this device can be scanned safely immediately in an MR System under the following conditions:

- Static magnetic field: 1.5-Tesla and 3.0-Tesla, only
- Maximum spatial gradient magnetic field of 4000-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 (ie per pulse sequence) in a normal operating mode

Under the scan conditions defined above, the TheraSeed® Palladium-103 device is expected to produce a maximum temperature rise of 1.6°C after 15 minutes of continuous scanning (ie per pulse sequence).

In non-clinical testing, the image artifact caused by TheraSeed® Palladium-103 device extends approximately 5-mm from the 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.

SOURCE RECEIPT AND STORAGE

Records of receipt, storage, and disposal of TheraSeed source 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. For contact information US phone number 1-770-831-5225 or email: customerservice@theragenics.com.

- The shelf-life of TheraSeed® source, independent of product configuration, is determined by the decay rate. Refer to product label for expiration date.

DISPOSAL

Sources

When disposal is indicated, TheraSeed® sources should be transferred to an authorized radioactive waste disposal agency. TheraSeed® sources should not be disposed of in normal waste.

Packaging

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

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

- 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.
- TheraSeed® 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 Pd-103 into the environment or tissues surrounding an implanted brachytherapy source

C20™ 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.

Customized preloaded needle kits

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

CAUTIONS

A CAUTION indicates the potential to damage the device as a result of use or misuse of the device.

INDICATIONS USE/CONTRAINDICATIONS

The TheraSeed® Pd-103 device is indicated for tumors with any of the following characteristics:

- Localized
- Unresectable
- Low to Moderate Radiosensitivity

The tumors may be of the following type:

- Superficial
- Intrathoracic
- Intra-abdominal
- Lung, Pancreas, Prostate, Head and Neck
- Residual Following External Beam Radiation or Excision of Primary Tumor
- Recurrent

AVAILABLE SOURCE STRENGTH RANGE

Available source strengths 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 1.5-1.8 U are ordered[1].

PRODUCT DESCRIPTIONS

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.)

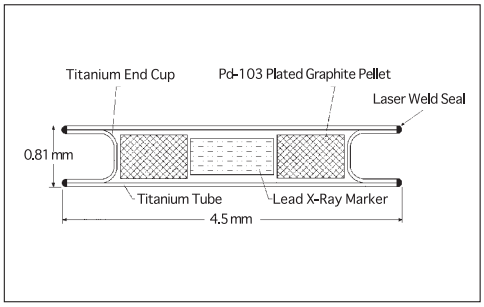

Figure 1: TheraSeed® Model 200

Seed in Magazines -
Theragenics® offers three seed magazines compatible with the Mick® applicator as listed below.

1. Theragenics® Vertical Seed Magazine and C20 magazine has a 20-seed capacity with integrated radiation shielding and seed counter.
2. Mick™ Shielded Magazine has a 15-seed capacity.
3. AnchorSeed® is a polymer coated seed also offered in a 15-seed magazine.

Stranded and Custom Loaded Products

1. TheraLoad® consists of a variable number of seeds and spacers custom loaded into an 18- gauge brachytherapy needle. The maximum length of configured components may not exceed 7.0 cm.
2. TheraSleeve® consists of a variable number of seeds and spacers contained in a bioabsorbable sleeve and custom loaded into an 18-gauge brachytherapy needle. The maximum length of configured components may not exceed 7.0 cm.
3. AnchorLoad® contains loose AnchorSeed® and spacers, max length 7.0 cm.
4. TheraStrand® consists of a variable number of seeds and spacers contained in bioabsorbable suture and custom loaded into an 18-gauge brachytherapy needle. All TheraStrand® configurations begin and end with a 2.75 mm spacer. The maximum length of configured components is 6.5 cm.
5. TheraStrand® RT - Loose TheraStrand- may be packaged as a 20 -strand capacity shielded container or a 4- strand capacity shielded container suitable for sterile strand well-chamber 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.[2-3] 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.

Needles/ Strand Specifications

1. The components are supplied in standard18-gauge brachytherapy needle.
2. The needles contain a bone wax plug that is approximately 5 mm long.
3. The bioabsorbable suture and spacers are made of 90/10 (glycolide/L-lactide), for which absorption occurs in 56-70 days.
4. The bioabsorbable sleeve is made of 20/80 (glycolide/L-lactide), for which absorption occurs in 140-180 days.
5. The bioabsorbable strand polymer is made of polydioxanone, for which absorption occurs in 182-238 days.

PRODUCT SPECIFICATIONS

Source Limitations
It is possible through rough handling (abrasion, incision, etc.), high temperatures, or crushing that an TheraSeed® device could rupture and leak. If this happens, contact your facility Radiation Safety Officer. The area should be closed off immediately and personnel limited to avoid radioactive contamination. The damaged device should be placed in a sealed container and the area should be decontaminated.

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 1.

Refer to the AAPM Task Group No. 43 (TG43) update for a dosimetric characterization of TheraSeed® (Model 200).[4]

Table 1: 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

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 ADCLfor air kerma strength. The resulting calibration is reported in air kerma strength ($\mu Gy\ m^2\ h^{-1}$, 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.

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 with every order. A digital image is also provided for custom loaded needle orders. Extra loose seeds or calibrated seeds can be provided for independent measurement.

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.

TheraStrand Real Time RT

1. Open the shipping container and review documentation to verify order contents.
2. Remove the sterile container from the lead pig.
3. Carefully inspect the sterile container – Do not use if container or Tyvek lid are damaged.
4. Peel back the lid and remove the shielded insert to the sterile field, utilizing ALARA practices.
5. Using strict aseptic practices, use sterile tweezers to grasp the protruding end of a strand.
6. Remove the strand and transfer directly to a sterile brachytherapy needle or to a sterile cutting surface for further processing.
7. Repeat steps 1-5 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.

Custom Loaded Needles

1. Open the shipping container and review documentation to verify order contents.
2. Ensure that the Needle Configuration Plan (Form F1007) provided is consistent with the treatment plan. Contact Customer Service if there are discrepancies.
3. Open the inner shipper and remove the sterile package(s).
4. Carefully inspect the sterile package(s) – Do not use if package or Tyvek lid are damaged.
5. Peel to open the sterile package. Remove the foam liner and remove the inner tray to the sterile field.
6. During placement of a pre-loaded needle product, ensure the needle hub is pulled fully against the stylet prior to removal from the gland. Pre-loaded products should remain in the sterile container until ready for use.

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

7. Take care to avoid contamination when opening the sterile package, TheraLoad®, TheraSleeve®, and TheraStrand® devices may not be reserialized.
8. 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.

9. 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.
10. 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.

11. Upon removing needles for use, ensure the stylet lock is secure and carry needles in a horizontal or “tip up” position to avoid loss of seeds in the event that the needle plug has become displaced during shipment.
12. Remove stylet lock from needle hub and begin seed placement.

Loose Seeds and Seeds in Magazines

1. If you have purchased sterile TheraSeed® in vials or magazines, aseptic practices should be followed when loading the seeds into a standard 18-gauge brachytherapy needle. Take care not to damage seeds during loading.
2. Insert a sterile magazine into your Mick® Applicator and proceed with the implant procedure.
3. To open C20™ or Mick® magazine - grasp the magazine body and hold in an upright position.
   - Unscrew the magazine cover and lift off.
   - Remove seeds with fine point tweezers using ALARA practices
4. To open the vertical seed magazine (VSM), rotate the cover counterclockwise past the notch until the tab is in the open position. Remove the cover using gentle upward pressure
   - Remove seeds with fine point tweezers using ALARA practices.
   - 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.

STERILIZATION

If you have purchased non-sterile products, sterilize as directed below.

CAUTION: DO NOT use sterilization methods or parameters other than those listed below.

1. Before using an autoclave ensure there are drain screens, traps or some other means to prevent loss of seeds through the drain.
2. For cylindrical pigs (vial and MICK® magazines): Remove the lid from the lead pig. Loosen the cap of the glass vial for sterilizing loose seeds.
3. For rectangular pigs (20 Seed Magazines): Open the lead pig and remove the Tyvek lid from the cup. Replace the pig lid, being sure not to obstruct the vent holes. Wrap the pig.

Validated Parameters for User Sterilization

Table 2: Steam Sterilization

Product Configuration	Cycle	Temperature	Minimum Exposure Time	Drying / Cooling Time
Seeds in vial	Gravity displacement	132° C (270°F)	15 minutes	Drying Time: 0 minutes Cooling Time: 0 minutes
	Prevacuum (flash)	132° C (270°F)	3 minutes (3 preconditioning pulses)	Drying Time: 0 minutes Cooling Time: 0 minutes
Seed Magazine in plastic cup	Prevacuum (flash)	132° C (270°F)	5 minutes (3 preconditioning pulses)	Drying Time: 0 minutes Cooling Time: 0 minutes
Seeds in MICK® Magazines in plastic cup	Gravity displacement	132° C (270°F)	30 minutes	Drying Time: 0 minutes Cooling Time: 0 minutes
	Prevacuum (flash)	132° C (270°F)	5 minutes (3 preconditioning pulses)	Drying Time: 0 minutes Cooling Time: 0 minutes
Seeds in C20 Flatpack	Gravity displacement	121° C (250°F)	24 minutes at 15 psig	Drying Time: 0 minutes Cooling Time: 0 minutes
	Prevacuum (flash)	132° C (270°F)	4 minutes at 27 psig	Drying Time: 0 minutes Cooling Time: 0 minutes

Table 3: Ethylene Oxide Sterilization

Product Configuration	Temperature	Humidity	EtO Concentration	Minimum Exposure Time	Heated Aeration
Seeds in vial	55 ± 2° C	70 ± 5 %RH	725 ± 25 mg/L	2 hours	12 hours at 55 ± 2° C
Seeds in MICK® Magazines	55 ± 2° C	70 ± 5 %RH	725 ± 25 mg/L	2 hours	12 hours at 55 ± 2° C

ADVERSE EFFECTS

WARNING: A correlation between fistula formation and rectal anterior wall biopsy has been reported and is therefore a relative contraindication in these patients.

Adverse effects: Associated with low dose rate prostate brachytherapy implants are: -

- 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.[5-8]
- Rectal toxicity: Diarrhea, constipation, anal incontinence/urgency, proctitis, rectal bleeding, rectal stricture, rectal ulcer/rectal fistula.[8] Fistula formation has been described following anterior wall biopsy of the rectum in patients who have been treated with low dose rate brachytherapy.[9-11] Therefore anterior wall biopsy of the rectum should be avoided in these patients. 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.[12] 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.[13]

Adverse effects: Associated with temporary ocular plaque brachytherapy reported by the American Brachytherapy Society task force[14] are:

- Decrease in visual acuity
- Radiation cataract
- Intraocular radiation vasculopathy that may involve retina, optic disc and/or iris
- Brachytherapy may affect the eyelids, eye-lashes, conjunctiva, tear production, corneal surface integrity, sclera, and ocular muscles.
- Within the eye, radiation can cause iritis, uveitis, synechiae, neo- vascular glaucoma, cataract, posterior neovascularization, haemorrhage, retinal detachment, retinopathy, and optic neuropathy.
- The most common late sight-limiting posterior segment complication is radiation maculopathy.
- Unusual complications include persistent strabismus and scleral thinning:

CUSTOMER SERVICE

Orders and Information

For product information or to place an order, contact Theragenics® Customer Service at (877) 444-7333, or email: customerservice@theragenics.com, Monday through Friday, 8:00 AM to 6:00 PM ET. Orders may also be submitted via facsimile at (800) 458-4303.

Returns

Defective, damaged or out of specification product may be returned for credit with prior return authorization. Please do not return product without first obtaining a return authorization.

1. Seeds
   Guidelines for returning TheraSeed® devices to Theragenics® are provided in the "Returned TheraSeed Packing List" received with your order. Appropriate labeling and shipping containers will be provided if necessary. Please indicate your request when calling for return authorization.
2. Packaging
   If you desire to return lead packaging materials, please do the following:
   - Contact Customer Service for return authorization.
   - To ensure personnel safety, please remove all radioactive sources from the lead packaging.
   - Place packaging materials in a shipping container and return to Theragenics®.

REPORTING REQUIREMENTS

All serious incidents are required to be reported as soon as possible to Theragenics Corporation® or the distributor. US phone number 1-877-444-7333 or email: customerservice@theragenics.com

REFERENCES

1. Beyer, et al., "American Brachytherapy Society (ABS) Recommendations for clinical implementation of NIST-1999 standards for Pd-103 brachytherapy", Int. J. Radiat. Oncol. Biol. Phys. 47, 273-275 (2000)
2. Tapen EM, Blasko JC, Grimm PD, et al. Reduction of radioactive seed embolization to the lung following prostate brachytherapy. Int J Radiat Oncol Biol Phys 1998; 42: 1063-1067.
3. Al-Qaisieh B, Carey B, Ash D, Bottomley D. The use of linked seeds eliminates lung embolization following permanent seed implantation for prostate cancer. Int J Radiat Oncol Biol Phys 2004; 59: 397- 399.
4. Rivard, et al., "Update of AAPM Task Group No. 43 Report: A revised AAPM protocol for brachytherapy dose calculations", Med Phys. 31, 663-674, (2004)
5. Langley SEM, Soares R, Uribe J, et al. Long-term oncological outcomes and toxicity in 597 men aged </=60 years at time of low-dose-rate brachytherapy for localised prostate cancer. BJU Int 2018; 121: 38- 45.
6. Keyes M, Miller S, Pickles T, et al. Late urinary side effects 10 years after low-dose-rate prostate brachytherapy: population-based results from a multiphysician practice treating with a standardized protocol and uniform dosimetric goals. Int J Radiat Oncol Biol Phys 2014; 90: 570-578.
7. Rodda S, Tyldesley S, Morris WJ, et al. ASCENDE-RT: An Analysis of Treatment-Related Morbidity for a Randomized Trial Comparing a Low-Dose-Rate Brachytherapy Boost with a Dose-Escalated External Beam Boost for High- and Intermediate-Risk Prostate Cancer. Int J Radiat Oncol Biol Phys 2017; 98: 286-295.
8. Keyes M, Spadinger I, Liu M, et al. Rectal toxicity and rectal dosimetry in low-dose-rate (125) I permanent prostate implants: a long-term study in 1006 patients. Brachytherapy 2012; 11: 199-208.
9. Theodorescu D, Gillenwater JY, Koutrouvelis PG. Prostatourethral-rectal fistula after prostate brachytherapy. Cancer 2000; 89: 2085-2091.
10. Shakespeare D, Mitchell DM, Carey BM, et al. Recto-urethral fistula following brachytherapy for localized prostate cancer. Colorectal Dis 2007; 9: 328-331.
11. Leong N, Pai HH, Morris WJ, et al. Rectal Ulcers and Rectoprostatic Fistulas after (125) I Low Dose Rate Prostate Brachytherapy. J Urol 2016; 195: 1811-1816.
12. Keyes M, Pickles T, Crook J, et al. Effect of aging and long-term erectile function after iodine-125 prostate brachytherapy. Brachytherapy 2015; 14: 334-341.
13. Mydlo JH, Lebed B. Does brachytherapy of the prostate affect sperm quality and/or fertility in younger men? Scand J Urol Nephrol 2004; 38: 221-224.
14. American Brachytherapy Society - Ophthalmic Oncology Task Force. Electronic address pec, Committee AO. The American Brachytherapy Society consensus guidelines for plaque brachytherapy of uveal melanoma and retinoblastoma. Brachytherapy 2014; 13: 1-14.