



**YOUR GUIDE TO LUTATHERA® TREATMENT**  
Answering your questions about PRRT

The background of the slide is a photograph of two people's feet stepping into shallow water. The water is splashing, and the scene is lit with warm, golden light, suggesting a sunset or sunrise. The water ripples and reflects the light, creating a shimmering effect. The feet are positioned on the left side of the frame, with the water splashing around them.





## YOUR HEALTH CARE PROVIDER GAVE YOU THIS BOOKLET SO YOU CAN LEARN ABOUT LUTATHERA® (lutetium Lu 177 dotatate)

This booklet may help answer some of the questions you have about LUTATHERA®. This booklet is not intended to replace the advice given to you by your health care provider (HCP). You should always speak with your HCP about any questions you may have.

### IMPORTANT SAFETY INFORMATION<sup>1</sup>

#### APPROVED USE:

LUTATHERA® (lutetium Lu 177 dotatate) is a prescription medicine used to treat adults with a type of cancer known as gastroenteropancreatic neuroendocrine tumors (GEP-NETs) that are positive for the hormone receptor somatostatin, including GEP-NETs in the foregut, midgut, and hindgut.



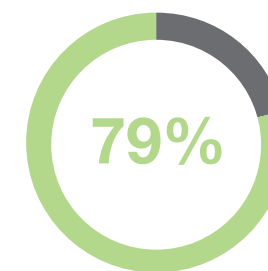
## WHAT IS LUTATHERA®?

**LUTATHERA® is the first approved medicine from a class of drugs called Peptide Receptor Radionuclide Therapy (PRRT).** It is a treatment for a type of tumor known as gastroenteropancreatic neuroendocrine tumors (GEP-NETs). GEP-NETs are tumors of the neuroendocrine cells from the stomach, gut, or pancreas that make hormones, which may cause symptoms such as flushing and diarrhea.

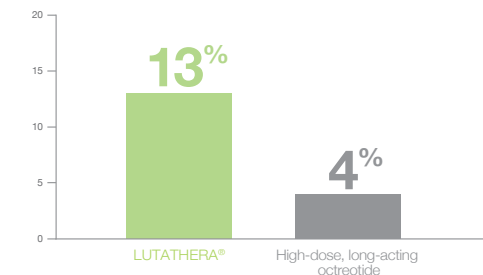
LUTATHERA® is a medicine that uses radiation to kill cancer cells, which means it works differently than most other cancer medicines. It is given as an infusion in a hospital setting and is made up of 2 parts:

1. A tumor-targeting part that helps find cancer cells with somatostatin receptors
2. A radioactive part that helps kill the cells

In a clinical trial that compared patients with midgut neuroendocrine tumors who received LUTATHERA® in combination with long-acting octreotide to those who received a larger than normal dose of long-acting octreotide:



LUTATHERA® reduced the risk of cancer spreading, growing, or getting worse by 79% compared to a larger than normal dose of long-acting octreotide<sup>1</sup>



More patients treated with LUTATHERA® had their tumors shrink compared to patients treated with a larger than normal dose of long-acting octreotide<sup>1</sup>

The most common and most serious side effects of LUTATHERA® include: vomiting, nausea, decreased blood cell counts, increased liver enzymes, decreased blood potassium levels, and increased glucose in the bloodstream.

**Please see additional Important Safety Information on pages 8-9 and accompanying full Prescribing Information.**

## HOW IS LUTATHERA<sup>®</sup> (lutetium Lu 177 dotatate) GIVEN?

### Once you agree to receive LUTATHERA<sup>®</sup>

It's important to tell your health care provider everything about your disease and health status. This should include:

- ✓ Symptoms you may have
- ✓ Any changes in your daily habits
- ✓ If you are pregnant or breastfeeding
- ✓ If you have trouble controlling when you urinate or have a bowel movement
- ✓ All the medicines you are taking

It is especially important to tell your health care provider if you are taking a type of medicine called a somatostatin analog. If you are taking one, you might have to stop or change your treatment for a short time before and while taking LUTATHERA<sup>®</sup>.



### Before your first infusion

A few weeks before your first LUTATHERA<sup>®</sup> infusion, your health care provider may conduct a few tests to make sure you are ready for treatment. They will check your liver, kidneys, and blood. Depending on the results, they may hold off on administering LUTATHERA<sup>®</sup> until you are ready.



### The day of therapy

You will go to your health care provider's hospital to have LUTATHERA<sup>®</sup> administered. This is usually done in the Nuclear Medicine department. The doctors and nurses in this department are specially trained to use medicines like LUTATHERA<sup>®</sup>.



### After the infusion

Because LUTATHERA<sup>®</sup> treatment uses radiation, you will have to wait a short while before you can leave the hospital. The more you urinate, the faster the radiation will leave your body. A health care provider will let you know when it's safe for you to leave the hospital. Within a day of receiving LUTATHERA<sup>®</sup>, you will be given an injection of long-acting octreotide 30 mg. You will receive an injection of long-acting octreotide 30 mg after each LUTATHERA<sup>®</sup> infusion.



### After your last dose

Your health care provider may check your liver, kidneys, and blood on a routine basis after your last LUTATHERA<sup>®</sup> dose. You will continue receiving long-acting octreotide 30 mg until your cancer spreads, grows, or gets worse for up to 18 months since you started LUTATHERA<sup>®</sup> treatment.



**The infusion**  
The infusion process lasts about 5 hours.  
**Approximately 1 hour before you are given LUTATHERA<sup>®</sup>:**  
You will be given a medicine that will help with any vomiting or an upset stomach that you may experience because of the treatment.  
**30 minutes before you are given LUTATHERA<sup>®</sup>:**  
You will be given an amino acids infusion through an IV. This will help protect your kidneys.  
This infusion will take at least 4 hours. It will continue during and after you receive LUTATHERA<sup>®</sup>.  
**The LUTATHERA<sup>®</sup> infusion:**  
Will take 30 to 40 minutes and is given through IV.

**Your next infusion**  
You may receive LUTATHERA<sup>®</sup> up to 3 more times after your first infusion. These doses will be between 8 and 16 weeks apart.  
You and your health care provider will decide how many doses and how long between each dose is right for you.  
Between each dose, your health care provider may check your liver, kidneys, and blood again.

### IMPORTANT SAFETY INFORMATION<sup>1</sup>

**Radiation exposure:** Treatment with LUTATHERA<sup>®</sup> will expose you to radiation which can contribute to your long-term radiation exposure. Overall radiation exposure is associated with an increased risk for cancer. The radiation in LUTATHERA<sup>®</sup> will be detectable in your urine for up to 30 days. You should stay well hydrated before, during, and after your treatment and urinate frequently.

Please see additional Important Safety Information on pages 8-9 and accompanying full Prescribing Information.



## AFTER RECEIVING LUTATHERA<sup>®</sup> (lutetium Lu 177 dotatate)

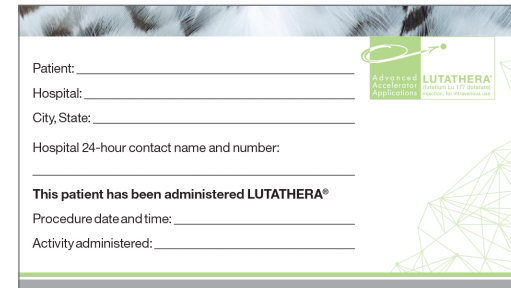
Since LUTATHERA<sup>®</sup> is a nuclear medicine therapy, there are some things you should do to keep everyone safe and minimize exposure to family members and the general public.

### At the hospital:

- While you are taking LUTATHERA<sup>®</sup>, you will be kept away from other patients in the hospital to limit their exposure. Your family members and caregivers may be with you during your treatment but they may be asked to leave for the 30 to 40 minutes that LUTATHERA<sup>®</sup> is being given

### After leaving the hospital:

- You should limit close contact with children and elderly for the first week or two after you are given LUTATHERA<sup>®</sup>. Your health care provider may provide further instructions to help minimize radiation exposure to others. You should always follow your health care providers instructions



Patient: \_\_\_\_\_

Hospital: \_\_\_\_\_

City, State: \_\_\_\_\_

Hospital 24-hour contact name and number: \_\_\_\_\_

**This patient has been administered LUTATHERA<sup>®</sup>**

Procedure date and time: \_\_\_\_\_

Activity administered: \_\_\_\_\_

### LUTATHERA<sup>®</sup> Release Card:

Your health care provider may fill out a LUTATHERA<sup>®</sup> release card and hand it to you after treatment. This card will list your name, the amount of medicine that you received, and a contact name and phone number. You should keep this card with you on-hand for a few days after your treatment, especially if you are traveling through an airport.

## IMPORTANT SAFETY INFORMATION<sup>1</sup>

**Kidney problems:** Treatment with LUTATHERA<sup>®</sup> will expose your kidneys to radiation and may impair their ability to work as normal. You may be at an increased risk for kidney problems after LUTATHERA<sup>®</sup> treatment if you already have kidney impairment before treatment. In some cases, patients have experienced kidney failure after treatment with LUTATHERA<sup>®</sup>. Your health care provider will monitor changes and provide you with a medication to help protect your kidneys.

## HELPFUL HINTS AND INFORMATION

### Care providers:

- If a care provider helps you in the bathroom, they should wear disposable gloves for the first few days after you are given LUTATHERA<sup>®</sup>

### Showering:

- Daily showering is recommended for at least the first few days after receiving LUTATHERA<sup>®</sup>

### Breastfeeding:

- You should not breastfeed during LUTATHERA<sup>®</sup> treatment and for 2.5 months after your final LUTATHERA<sup>®</sup> infusion

### Using the toilet:

- You should drink plenty of fluids on the days you receive LUTATHERA<sup>®</sup> and after. The more you urinate, the faster you will get rid of the radiation from your body
- For a few days after you receive LUTATHERA<sup>®</sup>, use the toilet in a seated position, even for men, and use toilet paper each time
- For a few days after you receive LUTATHERA<sup>®</sup>, flush toilet paper and/or wipes down the toilet and flush twice
- Wash your hands every time you use the toilet

### Contraception:

- You should use effective contraception (for example, the pill or a condom) during LUTATHERA<sup>®</sup> treatment and for 7 months after your final dose if you are a woman or 4 months if you are a man

### Side Effects:

- Treatment with LUTATHERA<sup>®</sup> may cause side effects. If you think you are having a side effect, you should tell your health care provider right away
- Depending on your experience with LUTATHERA<sup>®</sup>, your health care provider may decide to change, pause, or stop your treatment

Please see additional Important Safety Information on pages 8-9 and accompanying full Prescribing Information.

## IMPORTANT SAFETY INFORMATION<sup>1</sup>

LUTATHERA® can cause serious side effects. If you experience these side effects, your health care provider may need to adjust or stop your treatment. You should always follow your health care provider's instructions. Serious side effects may include:

**Radiation exposure:** Treatment with LUTATHERA® will expose you to radiation which can contribute to your long-term radiation exposure. Overall radiation exposure is associated with an increased risk for cancer. The radiation in LUTATHERA® will be detectable in your urine for up to 30 days. You should stay well hydrated before, during, and after your treatment and urinate frequently.

**Bone marrow problems:** Treatment with LUTATHERA® may cause a drop in the number of your blood cells. You may experience blood-related side effects such as low red blood cells (anemia), low numbers of cells that are responsible for blood clotting (thrombocytopenia), and low numbers of a type of white blood cells (neutropenia). People with low blood counts can develop serious infections. Other conditions that you may develop as a direct result of treatment with LUTATHERA® is a bone marrow disorder called myelosuppression, as well as blood and bone marrow cancers known as secondary myelodysplastic syndrome and leukemia. Your health care provider will routinely check your blood counts and tell you if they are too low. Speak with your health care provider if

you experience any signs or symptoms of myelosuppression or infection, such as fever, chills, dizziness, shortness of breath or increased bleeding or bruising. Your health care provider may need to adjust or stop your treatment accordingly.

**Kidney problems:** Treatment with LUTATHERA® will expose your kidneys to radiation and may impair their ability to work as normal. You may be at an increased risk for kidney problems after LUTATHERA® treatment if you already have kidney impairment before treatment. In some cases, patients have experienced kidney failure after treatment with LUTATHERA®. Your health care provider will monitor changes and provide you with a medication to help protect your kidneys.

**Liver problems:** In the clinical studies of LUTATHERA®, less than 1% of patients were reported to have tumor bleeding (hemorrhage), swelling (edema) or tissue injury (necrosis) to the liver. If you have tumors in your liver, you may be more likely to experience these side-effects. Signs that you may be experiencing liver damage include increases in blood markers called ALT, AST and GGT. Your health care provider will monitor your liver using blood tests and may need to adjust or stop your LUTATHERA® treatment accordingly.

**Hormonal gland problems (carcinoid crisis):** During your treatment you may experience certain symptoms that are related to hormones released from your cancer. These symptoms may include flushing, diarrhea, difficulty breathing (bronchospasm), and low blood pressure (hypotension), and may occur 24 hours after your first LUTATHERA® treatment. Your health care provider will monitor you closely. Speak with your health care provider if you experience any of these signs or symptoms.

**Pregnancy warning:** Tell your health care provider if you are pregnant or you or your partner plan to become pregnant. LUTATHERA® can harm your unborn baby. Use an effective method of birth control during treatment and for 7 months (for females) and 4 months (for males) after the final treatment with LUTATHERA®. You should not breastfeed during treatment with LUTATHERA® and for 2.5 months after your final LUTATHERA® infusion.

**Fertility problems:** Treatment with LUTATHERA® may cause infertility. This is because radiation absorbed by your testis and ovaries over the treatment period falls in the range of exposure where temporary or permanent infertility may be expected.

Tell your health care provider if you are taking any other medications, including somatostatin analogs. Somatostatin analogs may affect how your LUTATHERA® treatment

works. Your health care provider may ask you to stop taking your long-acting somatostatin analogs 4 weeks before LUTATHERA® treatment. You may continue taking short-acting somatostatin analogs up to 24 hours before your LUTATHERA® treatment.

The most common and most serious side effects of LUTATHERA® include: vomiting, nausea, decreased blood cell counts, increased liver enzymes, decreased blood potassium levels, and increased glucose in the bloodstream.

The risk information provided here is not comprehensive. To learn more, talk about LUTATHERA® with your health care provider. The FDA-approved product labeling can be found at [www.lutathera.com](http://www.lutathera.com).

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit [www.fda.gov/medwatch](http://www.fda.gov/medwatch) or call 1-800-FDA-1088.

### Please see full Prescribing Information for LUTATHERA®

Distributed by: Advanced Accelerator Applications USA, Inc., NY 07041

**Reference: 1.** LUTATHERA® [prescribing information]. Millburn, NJ: Advanced Accelerator Applications USA, Inc.; January 2018.

## PATIENT ASSISTANCE THROUGH AAA PatientCONNECT™

AAA PatientCONNECT™ is committed to helping patients afford their LUTATHERA® (lutetium Lu 177 dotatate) treatment.\*

Through AAA PatientCONNECT™, you may be eligible for financial assistance including:

- Co-pay assistance if you have commercial insurance
- LUTATHERA® available at no cost if you are uninsured

## ENROLLING IN AAA PatientCONNECT™



To enroll in AAA PatientCONNECT™, your health care provider **must** submit an Enrollment Form on your behalf. Your health care provider may access this enrollment form by visiting [www.aapatientconnect.com](http://www.aapatientconnect.com) or calling 1-844-638-7222.



Both you and your health care provider **must** sign this form prior to submitting it to AAA PatientCONNECT™.

\*Some restrictions apply. For full terms and conditions, please call AAA PatientCONNECT™ at 844-NETS-AAA. Patients who are enrolled in any type of government insurance or reimbursement programs are not eligible. As a condition precedent of the co-payment support provided under this program, e.g., copay refunds, participating patients and pharmacies are obligated to inform insurance companies and third-party payers of any benefits they receive and the value of this program, as required by contract or otherwise. Void where prohibited by law or restricted. Patients enrolled in the AAA PatientCONNECT™ Patient Assistance Program are not eligible for Copay Assistance.

## FIND A SUPPORT ORGANIZATION



A support network of family, friends, and caregivers may help you through your treatment journey. In addition, support communities can provide you with information you may find helpful. Below is a list of support organizations that you and your caregivers may find helpful.

### Carcinoid Cancer Foundation (CCF)

1-888-722-3132

Email: [info@carcinoid.org](mailto:info@carcinoid.org)

[www.carcinoid.org](http://www.carcinoid.org)

### Los Angeles Carcinoid Neuroendocrine Tumor Society (LACNETS)

Email: [info@lacnets.org](mailto:info@lacnets.org)

[www.lacnets.org](http://www.lacnets.org)

### Northern California CarciNET Community (NorCal CarciNET)

[www.norcalcarcinet.org](http://www.norcalcarcinet.org)

### The Neuroendocrine Cancer Awareness Network (NCAN)

Phone: 516 -781-7814 / 1-866-850-9555

Email: [info@netcancerawareness.org](mailto:info@netcancerawareness.org)

[www.carcinoidawareness.org](http://www.carcinoidawareness.org)

### The Healing NET Foundation

Phone: 615-369-6463

Email: [info@thehealingnet.org](mailto:info@thehealingnet.org)

[www.thehealingnet.org](http://www.thehealingnet.org)

Please see additional Important Safety Information on pages 8-9 and accompanying full Prescribing Information.





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AAA-Lu177-US-0018 | 01/18

**Please see accompanying full Prescribing Information.**



## HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use LUTATHERA safely and effectively. See full prescribing information for LUTATHERA.

**LUTATHERA® (lutetium Lu 177 dotatate) injection, for intravenous use**  
**Initial U.S. Approval: 2018**

### INDICATIONS AND USAGE

LUTATHERA is a radiolabeled somatostatin analog indicated for the treatment of somatostatin receptor-positive gastroenteropancreatic neuroendocrine tumors (GEP-NETs), including foregut, midgut, and hindgut neuroendocrine tumors in adults. (1)

### DOSAGE AND ADMINISTRATION

- Verify pregnancy status in females of reproductive potential prior to initiating LUTATHERA. (2.1)
- Administer 7.4 GBq (200 mCi) every 8 weeks for a total of 4 doses. (2.2)
- Administer long-acting octreotide 30 mg intramuscularly 4 to 24 hours after each LUTATHERA dose and short-acting octreotide for symptomatic management. (2.3)
- Continue long-acting octreotide 30 mg intramuscularly every 4 weeks after completing LUTATHERA until disease progression or for up to 18 months following treatment initiation. (2.3)
- Premedicate with antiemetics 30 minutes before recommended amino acid solution. (2.3)
- Initiate recommended intravenous amino acid solution 30 minutes before LUTATHERA infusion; continue during and for 3 hours after LUTATHERA infusion. Do not reduce dose of amino acid solution if LUTATHERA dose is reduced. (2.3)
- Modify LUTATHERA dose based on adverse reactions. (2.4)
- Prepare and administer as recommended. (2.5)

### DOSAGE FORMS AND STRENGTHS

Injection: 370 MBq/mL (10 mCi/mL) in single-dose vial. (3)

### CONTRAINDICATIONS

None.

### WARNINGS AND PRECAUTIONS

- Risk from Radiation Exposure: Minimize radiation exposure during and after treatment with LUTATHERA consistent with institutional good radiation safety practices and patient management procedures (2.1, 5.1)

- Myelosuppression: Monitor blood cell counts. Withhold, reduce dose, or permanently discontinue based on severity. (2.4, 5.2)
- Secondary Myelodysplastic Syndrome (MDS) and Leukemia: Median time to development: MDS is 28 months; acute leukemia is 55 months. (5.3)
- Renal Toxicity: Advise patients to urinate frequently during and after administration of LUTATHERA. Monitor serum creatinine and calculated creatinine clearance. Withhold, reduce dose, or permanently discontinue based on severity. (2.3, 2.4, 5.4)
- Hepatotoxicity: Monitor transaminases, bilirubin and albumin. Withhold, reduce dose, or permanently discontinue based on severity. (2.4, 5.5)
- Neuroendocrine Hormonal Crisis: Monitor for flushing, diarrhea, hypotension, bronchoconstriction or other signs and symptoms. (5.6)
- Embryo-Fetal Toxicity: LUTATHERA can cause fetal harm. Advise females and males of reproductive potential of the potential risk to a fetus and to use effective contraception (5.7, 8.1, 8.3)
- Risk of Infertility: LUTATHERA may cause infertility. (8.3)

### ADVERSE REACTIONS

Most common Grade 3-4 adverse reactions ( $\geq 4\%$  with a higher incidence in LUTATHERA arm) are lymphopenia, increased GGT, vomiting, nausea, increased AST, increased ALT, hyperglycemia and hypokalemia. (6.1)

**To report SUSPECTED ADVERSE REACTIONS, contact Advanced Accelerator Applications USA, Inc. at 1-844-863-1930 or us-pharmacovigilance@adacap.com, or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.**

### DRUG INTERACTIONS

Somatostatin Analogs: Discontinue long-acting analogs for at least 4 weeks and short-acting octreotide at least 24 hours prior to each LUTATHERA dose. (2.3, 7.1)

### USE IN SPECIFIC POPULATIONS

Lactation: Advise not to breastfeed. (8.2)

**See 17 for PATIENT COUNSELING INFORMATION**

**Revised: 01/2018**

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## FULL PRESCRIBING INFORMATION

### 1 INDICATIONS AND USAGE

LUTATHERA is indicated for the treatment of somatostatin receptor-positive gastroenteropancreatic neuroendocrine tumors (GEP-NETs), including foregut, midgut, and hindgut neuroendocrine tumors in adults.

### 2 DOSAGE AND ADMINISTRATION

#### 2.1 Important Safety Instructions

LUTATHERA is a radiopharmaceutical; handle with appropriate safety measures to minimize radiation exposure [see *Warnings and Precautions* (5.1)]. Use waterproof gloves and effective radiation shielding when handling LUTATHERA. Radiopharmaceuticals, including LUTATHERA, should be used by or under the control of physicians who are qualified by specific training and experience in the safe use and handling of radiopharmaceuticals, and whose experience and training have been approved by the appropriate governmental agency authorized to license the use of radiopharmaceuticals.

Verify pregnancy status of females of reproductive potential prior to initiating LUTATHERA [see *Use in Specific Populations* (8.1, 8.3)].

#### 2.2 Recommended Dosage

The recommended LUTATHERA dose is 7.4 GBq (200 mCi) every 8 weeks for a total of 4 doses. Administer pre- and concomitant medications and administer LUTATHERA as recommended [see *Dosage and Administration* (2.3, 2.5)].

#### 2.3 Premedication and Concomitant Medications

##### Somatostatin Analogs

- Before initiating LUTATHERA: Discontinue long-acting somatostatin analogs (e.g., long-acting octreotide) for at least 4 weeks prior to initiating LUTATHERA. Administer short-acting octreotide as needed; discontinue at least 24 hours prior to initiating LUTATHERA [see *Drug Interactions* (7.1)].
- During LUTATHERA treatment: Administer long-acting octreotide 30 mg intramuscularly between 4 to 24 hours after each LUTATHERA dose. Do not administer long-acting octreotide within 4 weeks of each subsequent LUTATHERA dose. Short-acting octreotide may be given for symptomatic management during LUTATHERA treatment, but must be withheld for at least 24 hours before each LUTATHERA dose.
- Following LUTATHERA treatment: Continue long-acting octreotide 30 mg intramuscularly every 4 weeks after completing LUTATHERA until disease progression or for up to 18 months following treatment initiation.

##### Antiemetic

Administer antiemetics 30 minutes before the recommended amino acid solution.

##### Amino Acid Solution

Initiate an intravenous amino acid solution containing L-lysine and L-arginine (Table 1) 30 minutes before administering LUTATHERA. Use a three-way valve to administer amino acids using the same venous access as LUTATHERA or administer amino acids through a separate venous access in the patient's other arm. Continue the infusion during, and for at least 3 hours after LUTATHERA infusion. Do not decrease the dose of the amino acid solution if the dose of LUTATHERA is reduced [see *Warnings and Precautions* (5.4)].

**Table 1. Amino Acid Solution**

Item	Specification
Lysine HCl content	Between 18 g and 24 g
Arginine HCl content	Between 18 g and 24 g
Volume	1.5 L to 2.2 L
Osmolarity	< 1050 mOsmol

#### 2.4 Dose Modifications for Adverse Reactions

Recommended dose modifications of LUTATHERA for adverse reactions are provided in Table 2.

**Table 2. Recommended Dose Modifications of LUTATHERA for Adverse Reactions**

<b>Adverse Reaction</b>	<b>Severity of Adverse Reaction<sup>1</sup></b>	<b>Dose Modification</b>
Thrombocytopenia [see Warnings and Precautions (5.2)]	Grade 2, 3 or 4	Withhold dose until complete or partial resolution (Grade 0 to 1).  Resume LUTATHERA at 3.7 GBq (100 mCi) in patients with complete or partial resolution. If reduced dose does not result in Grade 2, 3 or 4 thrombocytopenia, administer LUTATHERA at 7.4 GBq (200 mCi) for next dose.  Permanently discontinue LUTATHERA for Grade 2 or higher thrombocytopenia requiring a treatment delay of 16 weeks or longer.
	Recurrent Grade 2, 3 or 4	Permanently discontinue LUTATHERA.
Anemia and Neutropenia [see Warnings and Precautions (5.2)]	Grade 3 or 4	Withhold dose until complete or partial resolution (Grade 0, 1, or 2).  Resume LUTATHERA at 3.7 GBq (100 mCi) in patients with complete or partial resolution. If reduced dose does not result in Grade 3 or 4 anemia or neutropenia, administer LUTATHERA at 7.4 GBq (200 mCi) for next dose.  Permanently discontinue LUTATHERA for Grade 3 or higher anemia or neutropenia requiring a treatment delay of 16 weeks or longer.
	Recurrent Grade 3 or 4	Permanently discontinue LUTATHERA.
Renal Toxicity [see Warnings and Precautions (5.4)]	Defined as: <ul style="list-style-type: none"> <li>• Creatinine clearance less than 40 mL/min; calculate using Cockcroft Gault with actual body weight, or</li> <li>• 40% increase in baseline serum creatinine, or</li> <li>• 40% decrease in baseline creatinine clearance; calculate using Cockcroft Gault with actual body weight.</li> </ul>	Withhold dose until complete resolution.  Resume LUTATHERA at 3.7 GBq (100 mCi) in patients with complete resolution. If reduced dose does not result in renal toxicity, administer LUTATHERA at 7.4 GBq (200 mCi) for next dose.  Permanently discontinue LUTATHERA for renal toxicity requiring a treatment delay of 16 weeks or longer.
	Recurrent renal toxicity	Permanently discontinue LUTATHERA.
Hepatotoxicity [see Warnings and Precautions (5.5)]	Defined as: <ul style="list-style-type: none"> <li>• Bilirubinemia greater than 3 times the upper limit of normal (Grade 3 or 4), or</li> <li>• Hypoalbuminemia less than 30 g/L with a decreased prothrombin ratio less than 70%.</li> </ul>	Withhold dose until complete resolution.  Resume LUTATHERA at 3.7 GBq (100 mCi) in patients with complete resolution. If reduced LUTATHERA dose does not result in hepatotoxicity, administer LUTATHERA at 7.4 GBq (200 mCi) for next dose.  Permanently discontinue LUTATHERA for hepatotoxicity requiring a treatment delay of 16 weeks or longer.
	Recurrent hepatotoxicity	Permanently discontinue LUTATHERA.
Other Non-Hematologic Toxicity	Grade 3 or 4	Withhold dose until complete or partial resolution (Grade 0 to 2).  Resume LUTATHERA at 3.7 GBq (100 mCi) in patients with complete or partial resolution. If reduced dose does not result in Grade 3 or 4 toxicity, administer LUTATHERA at 7.4 GBq (200 mCi) for next dose.  Permanently discontinue LUTATHERA for Grade 3 or higher toxicity requiring treatment delay of 16 weeks or longer.
	Recurrent Grade 3 or 4	Permanently discontinue LUTATHERA.

<sup>1</sup> National Cancer Institute, Common Toxicity Criteria for Adverse Events, version 4.03



## 2.5 Preparation and Administration

- Use aseptic technique and radiation shielding when administering the LUTATHERA solution. Use tongs when handling vial to minimize radiation exposure.
- Do not inject LUTATHERA directly into any other intravenous solution.
- Confirm the amount of radioactivity of LUTATHERA in the radiopharmaceutical vial with an appropriate dose calibrator prior to and after LUTATHERA administration.
- Inspect the product visually for particulate matter and discoloration prior to administration under a shielded screen. Discard vial if particulates or discoloration are present.

### Administration Instructions

- Insert a 2.5 cm, 20 gauge needle (short needle) into the LUTATHERA vial and connect via a catheter to 500 mL 0.9% sterile sodium chloride solution (used to transport LUTATHERA during the infusion). Ensure that the short needle does not touch the LUTATHERA solution in the vial and do not connect this short needle directly to the patient. Do not allow sodium chloride solution to flow into the LUTATHERA vial prior to the initiation of the LUTATHERA infusion and do not inject LUTATHERA directly into the sodium chloride solution.
- Insert a second needle that is 9 cm, 18 gauge (long needle) into the LUTATHERA vial ensuring that this long needle touches and is secured to the bottom of the LUTATHERA vial during the entire infusion. Connect the long needle to the patient by an intravenous catheter that is prefilled with 0.9% sterile sodium chloride and that is used exclusively for the LUTATHERA infusion into the patient.
- Use a clamp or pump to regulate the flow of the sodium chloride solution via the short needle into the LUTATHERA vial at a rate of 50 mL/hour to 100 mL/hour for 5 to 10 minutes and then 200 mL/hour to 300 mL/hour for an additional 25 to 30 minutes (the sodium chloride solution entering the vial through the short needle will carry the LUTATHERA from the vial to the patient via the catheter connected to the long needle over a total duration of 30 to 40 minutes).
- Do not administer LUTATHERA as an intravenous bolus.
- During the infusion, ensure that the level of solution in the LUTATHERA vial remains constant.
- Disconnect the vial from the long needle line and clamp the saline line once the level of radioactivity is stable for at least five minutes.
- Follow the infusion with an intravenous flush of 25 mL of 0.9% sterile sodium chloride.
- Dispose of any unused medicinal product or waste material in accordance with local and federal laws.

## 2.6 Radiation Dosimetry

The mean and standard deviation (SD) of the estimated radiation absorbed doses for adults receiving LUTATHERA are shown in Table 3. The maximum penetration in tissue is 2.2 mm and the mean penetration is 0.67 mm.

**Table 3. Estimated Radiation Absorbed Dose for LUTATHERA in NETTER-1**

Organ	Absorbed dose per unit activity (Gy/GBq) (N=20)		Calculated absorbed dose for 4 x 7.4 GBq (29.6 GBq cumulative activity) (Gy)	
	Mean	SD	Mean	SD
Adrenals	0.037	0.016	1.1	0.5
Brain	0.027	0.016	0.8	0.5
Breasts	0.027	0.015	0.8	0.4
Gallbladder Wall	0.042	0.019	1.2	0.6
Heart Wall	0.032	0.015	0.9	0.4
Kidneys	0.654	0.295	19.4	8.7
Liver*	0.299	0.226	8.9	6.7
Lower Large Intestine Wall	0.029	0.016	0.9	0.5
Lungs	0.031	0.015	0.9	0.4
Muscle	0.029	0.015	0.8	0.4
Osteogenic Cells	0.151	0.268	4.5	7.9
Ovaries**	0.031	0.013	0.9	0.4
Pancreas	0.038	0.016	1.1	0.5
Red Marrow	0.035	0.029	1.0	0.8
Skin	0.027	0.015	0.8	0.4
Small Intestine	0.031	0.015	0.9	0.5
Spleen	0.846	0.804	25.1	23.8
Stomach Wall	0.032	0.015	0.9	0.5
Testes***	0.026	0.018	0.8	0.5
Thymus	0.028	0.015	0.8	0.5
Thyroid	0.027	0.016	0.8	0.5
Total Body	0.052	0.027	1.6	0.8
Upper Large Intestine Wall	0.032	0.015	0.9	0.4
Urinary Bladder Wall	0.437	0.176	12.8	5.3
Uterus	0.032	0.013	1.0	0.4

\*N=18 (two patients excluded because the liver absorbed dose was biased by the uptake of the liver metastases)

\*\*N=9 (female patients only)

\*\*\*N=11 (male patients only)

### 3 DOSAGE FORMS AND STRENGTHS

Injection: 370 MBq/mL (10 mCi/mL) of lutetium Lu 177 dotatate as a clear and colorless to slightly yellow solution in a single-dose vial.

### 4 CONTRAINDICATIONS

None.

### 5 WARNINGS AND PRECAUTIONS

#### 5.1 Risk from Radiation Exposure

LUTATHERA contributes to a patient's overall long-term radiation exposure. Long-term cumulative radiation exposure is associated with an increased risk for cancer.

Radiation can be detected in the urine for up to 30 days following LUTATHERA administration. Minimize radiation exposure to patients, medical personnel, and household contacts during and after treatment with LUTATHERA consistent with institutional good radiation safety practices and patient management procedures [see *Dosage and Administration (2.1)*].

#### 5.2 Myelosuppression

In NETTER-1, myelosuppression occurred more frequently in patients receiving LUTATHERA with long-acting octreotide compared to patients receiving high-dose long-acting octreotide (all grades/grade 3 or 4): anemia (81%/0) versus (54%/1%); thrombocytopenia (53%/1%) versus (17%/0); and neutropenia (26%/3%) versus (11%/0). In NETTER-1, platelet nadir occurred at a median of 5.1 weeks following the first dose. Of the 59 patients who developed thrombocytopenia, 68% had platelet recovery to baseline or normal levels. The median time to platelet recovery was 2 months. Fifteen of the nineteen patients in whom platelet recovery was not documented had post-nadir platelet counts. Among these 15 patients, 5 improved to Grade 1, 9 to Grade 2, and 1 to Grade 3.

Monitor blood cell counts. Withhold, reduce dose, or permanently discontinue based on severity of adverse reaction [see *Dosage and Administration (2.4)*].



### 5.3 Secondary Myelodysplastic Syndrome and Leukemia

In NETTER-1, with a median follow-up time of 24 months, myelodysplastic syndrome (MDS) was reported in 2.7% of patients receiving LUTATHERA with long-acting octreotide compared to no patients receiving high-dose long-acting octreotide. In ERASMUS, 15 patients (1.8%) developed MDS and 4 (0.5%) developed acute leukemia. The median time to the development of MDS was 28 months (9 to 41 months) for MDS and 55 months (32 to 155 months) for acute leukemia.

### 5.4 Renal Toxicity

In ERASMUS, 8 patients (<1%) developed renal failure 3 to 36 months following LUTATHERA. Two of these patients had underlying renal impairment or risk factors for renal failure (e.g., diabetes or hypertension) and required dialysis.

Administer the recommended amino acid solution before, during and after LUTATHERA [see *Dosage and Administration* (2.3)] to decrease reabsorption of lutetium Lu 177 dotatate through the proximal tubules and decrease the radiation dose to the kidneys. Do not decrease the dose of the amino acid solution if the dose of LUTATHERA is reduced. Advise patients to urinate frequently during and after administration of LUTATHERA. Monitor serum creatinine and calculated creatinine clearance. Withhold, reduce dose, or permanently discontinue LUTATHERA based on severity of reaction [see *Dosage and Administration* (2.4)].

Patients with baseline renal impairment may be at greater risk of toxicity; perform more frequent assessments of renal function in patients with mild or moderate impairment. LUTATHERA has not been studied in patients with severe renal impairment (creatinine clearance < 30 mL/min).

### 5.5 Hepatotoxicity

In ERASMUS, 2 patients (<1%) were reported to have hepatic tumor hemorrhage, edema, or necrosis, with one patient experiencing intrahepatic congestion and cholestasis. Patients with hepatic metastasis may be at increased risk of hepatotoxicity due to radiation exposure.

Monitor transaminases, bilirubin and serum albumin during treatment. Withhold, reduce dose, or permanently discontinue LUTATHERA based on severity of reaction [see *Dosage and Administration* (2.2)].

### 5.6 Neuroendocrine Hormonal Crisis

Neuroendocrine hormonal crises, manifesting with flushing, diarrhea, bronchospasm and hypotension, occurred in 1% of patients in ERASMUS and typically occurred during or within 24 hours following the initial LUTATHERA dose. Two (<1%) patients were reported to have hypercalcemia.

Monitor patients for flushing, diarrhea, hypotension, bronchoconstriction or other signs and symptoms of tumor-related hormonal release. Administer intravenous somatostatin analogs, fluids, corticosteroids, and electrolytes as indicated.

### 5.7 Embryo-Fetal Toxicity

Based on its mechanism of action, LUTATHERA can cause fetal harm [see *Clinical Pharmacology* (12.1)]. There are no available data on the use of LUTATHERA in pregnant women. No animal studies using lutetium Lu 177 dotatate have been conducted to evaluate its effect on female reproduction and embryo-fetal development; however, all radiopharmaceuticals, including LUTATHERA, have the potential to cause fetal harm.

Verify pregnancy status of females of reproductive potential prior to initiating LUTATHERA [see *Dosage and Administration* (2.1)].

Advise females and males of reproductive potential of the potential risk to a fetus. Advise females of reproductive potential to use effective contraception during treatment with LUTATHERA and for 7 months after the final dose. Advise males with female partners of reproductive potential to use effective contraception during treatment and for 4 months after the final dose [see *Use in Specific Populations* (8.1, 8.3)].

### 5.8 Risk of Infertility

LUTATHERA may cause infertility in males and females. The recommended cumulative dose of 29.6 GBq of LUTATHERA results in a radiation absorbed dose to the testis and ovaries within the range where temporary or permanent infertility can be expected following external beam radiotherapy [see *Dosage and Administration* (2.6) and *Use in Specific Populations* (8.3)].

## 6 ADVERSE REACTIONS

The following serious adverse reactions are described elsewhere in the labeling.

- Myelosuppression [see *Warnings and Precautions* (5.2)]
- Secondary Myelodysplastic Syndrome and Leukemia [see *Warnings and Precautions* (5.3)]
- Renal Toxicity [see *Warnings and Precautions* (5.4)]
- Hepatotoxicity [see *Warnings and Precautions* (5.5)]
- Neuroendocrine Hormonal Crisis [see *Warnings and Precautions* (5.6)]

### 6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice.

The data in Warnings and Precautions reflect exposure to LUTATHERA in 111 patients with advanced, progressive midgut neuroendocrine tumors (NETTER-1). Safety data in Warnings and Precautions were also obtained in an additional 22 patients in a non-randomized pharmacokinetic substudy of NETTER-1 and in a subset of patients (811 of 1214) with advanced somatostatin receptor-positive tumors enrolled in ERASMUS [see *Warnings and Precautions* (5)].

**NETTER-1**

The safety data described below are from NETTER-1, which randomized (1:1) patients with progressive, somatostatin receptor-positive midgut carcinoid tumors to receive LUTATHERA 7.4 GBq (200 mCi) administered every 8 to 16 weeks concurrently with the recommended amino acid solution and with long-acting octreotide (30 mg administered by intramuscular injection within 24 hours of each LUTATHERA dose) (n = 111), or high-dose octreotide (defined as long-acting octreotide 60 mg by intramuscular injection every 4 weeks) (n = 112) [see *Clinical Studies (14.1)*]. Among patients receiving LUTATHERA with octreotide, 79% received a cumulative dose > 22.2 GBq (> 600 mCi) and 76% of patients received all four planned doses. Six percent (6%) of patients required a dose reduction and 13% of patients discontinued LUTATHERA. Five patients discontinued LUTATHERA for renal-related events and 4 discontinued for hematological toxicities. The median duration of follow-up was 24 months for patients receiving LUTATHERA with octreotide and 20 months for patients receiving high-dose octreotide.

Table 4 and Table 5 summarize the incidence of adverse reactions and laboratory abnormalities, respectively. The most common Grade 3-4 adverse reactions occurring with a greater frequency among patients receiving LUTATHERA with octreotide compared to patients receiving high-dose octreotide include: lymphopenia (44%), increased GGT (20%), vomiting (7%), nausea and elevated AST (5% each), and increased ALT, hyperglycemia and hypokalemia (4% each).

**Table 4. Adverse Reactions Occurring in ≥ 5% (All Grades) of Patients Receiving LUTATHERA with Octreotide in NETTER-1<sup>1</sup>**

Adverse Reaction <sup>1</sup>	LUTATHERA and Long-Acting Octreotide (30 mg) (N = 111)		Long-Acting Octreotide (60 mg) (N = 112)	
	All Grades %	Grades 3-4 %	All Grades %	Grades 3-4 %
<b>Cardiac disorders</b>				
Atrial fibrillation	5	1	0	0
<b>Gastrointestinal disorders</b>				
Nausea	65	5	12	2
Vomiting	53	7	9	0
Abdominal pain	26	3	19	3
Diarrhea	26	3	18	1
Constipation	10	0	5	0
<b>General disorders</b>				
Fatigue	38	1	26	2
Peripheral edema	16	0	9	1
Pyrexia	8	0	3	0
<b>Metabolism and nutrition disorders</b>				
Decreased appetite	21	0	11	3
<b>Musculoskeletal and connective tissue disorders</b>				
Back pain	13	2	10	0
Pain in extremity	11	0	5	0
Myalgia	5	0	0	0
Neck Pain	5	0	0	0
<b>Nervous system disorders</b>				
Headache	17	0	5	0
Dizziness	17	0	8	0
Dysgeusia	8	0	2	0
<b>Psychiatric disorders</b>				
Anxiety	12	1	5	0
<b>Renal and urinary disorders</b>				
Renal failure*	12	3	3	1
Radiation-related urinary tract toxicity**	8	0	3	0
<b>Respiratory, thoracic and mediastinal disorders</b>				
Cough	11	1	6	0
<b>Skin and subcutaneous tissue disorders</b>				
Alopecia	12	0	2	0
<b>Vascular disorders</b>				
Flushing	14	1	9	0
Hypertension	12	2	7	2

<sup>1</sup>National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE) Version 4.03. Only displays adverse reactions occurring at a higher incidence in LUTATHERA-treated patients [between arm difference of ≥5% (all grades) or ≥2% (grades 3-4)]

\*Includes the terms: Glomerular filtration rate decreased, acute kidney injury, acute prerenal failure, azotemia, renal disorder, renal failure, renal impairment

\*\*Includes the terms: Dysuria, micturition urgency, nocturia, pollakiuria, renal colic, renal pain, urinary tract pain and urinary incontinence



**Table 5. Laboratory Abnormalities Occurring in  $\geq 5\%$  (All Grades) of Patients Receiving LUTATHERA with Octreotide in NETTER-1\*<sup>1</sup>**

Laboratory Abnormality <sup>1</sup>	LUTATHERA and Long-Acting Octreotide (30 mg) (N = 111)		Long-Acting Octreotide (60 mg) (N = 112)	
	All grades %	Grade 3-4 %	All grades %	Grade 3-4 %
<b>Hematology</b>				
Lymphopenia	90	44	39	4
Anemia	81	0	54	1
Leukopenia	55	2	20	0
Thrombocytopenia	53	1	17	0
Neutropenia	26	3	11	0
<b>Renal/Metabolic</b>				
Creatinine increased	85	1	73	0
Hyperglycemia	82	4	67	2
Hyperuricemia	34	6	29	6
Hypocalcemia	32	0	14	0
Hypokalemia	26	4	21	2
Hyperkalemia	19	0	11	0
Hyponatremia	17	0	7	0
Hypoglycemia	15	0	8	0
<b>Hepatic</b>				
GGT increased	66	20	67	16
Alkaline phosphatase increased	65	5	54	9
AST increased	50	5	35	0
ALT increased	43	4	34	0
Blood bilirubin increased	30	2	28	0

\*Values are worst grade observed after randomization

<sup>1</sup>National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE) Version 4.03. Only displays laboratory abnormalities occurring at a higher incidence in LUTATHERA-treated patients [between arm difference of  $\geq 5\%$  (all grades) or  $\geq 2\%$  (grades 3-4)]

## ERASMUS

Safety data are available from 1214 patients in ERASMUS, an international, single-institution, single-arm, open-label trial of patients with somatostatin receptor-positive tumors (neuroendocrine and other primaries). Patients received LUTATHERA 7.4 GBq (200 mCi) administered every 6 to 13 weeks with or without octreotide. Retrospective medical record review was conducted on a subset of 811 patients to document serious adverse reactions. Eighty-one (81%) percent of patients in the subset received a cumulative dose  $\geq 22.2$  GBq ( $\geq 600$  mCi). With a median follow-up time of more than 4 years, the following rates of serious adverse reactions were reported: myelodysplastic syndrome (2%), acute leukemia (1%), renal failure (2%), hypotension (1%), cardiac failure (2%), myocardial infarction (1%), and neuroendocrine hormonal crisis (1%).

## 7 DRUG INTERACTIONS

### 7.1 Somatostatin Analogs

Somatostatin and its analogs competitively bind to somatostatin receptors and may interfere with the efficacy of LUTATHERA. Discontinue long-acting somatostatin analogs at least 4 weeks and short-acting octreotide at least 24 hours prior to each LUTATHERA dose. Administer short- and long-acting octreotide during LUTATHERA treatment as recommended [see *Dosage and Administration* (2.3)].

## 8 USE IN SPECIFIC POPULATIONS

### 8.1 Pregnancy

#### Risk Summary

Based on its mechanism of action, LUTATHERA can cause fetal harm [see *Clinical Pharmacology* (12.1)]. There are no available data on LUTATHERA use in pregnant women. No animal studies using lutetium Lu 177 dotatate have been conducted to evaluate its effect on female reproduction and embryo-fetal development; however, all radiopharmaceuticals, including LUTATHERA, have the potential to cause fetal harm. Advise pregnant women of the risk to a fetus.

In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2% to 4% and 15% to 20%, respectively.

## 8.2 Lactation

### Risk Summary

There are no data on the presence of lutetium Lu 177 dotatate in human milk, or its effects on the breastfed infant or milk production. No lactation studies in animals were conducted. Because of the potential risk for serious adverse reactions in breastfed infants, advise women not to breastfeed during treatment with LUTATHERA and for 2.5 months after the final dose.

## 8.3 Females and Males of Reproductive Potential

### Pregnancy Testing

Verify pregnancy status of females of reproductive potential prior to initiating LUTATHERA [see *Use in Specific Populations* (8.1)].

### Contraception

#### *Females*

LUTATHERA can cause fetal harm when administered to a pregnant woman [see *Use in Specific Populations* (8.1)]. Advise females of reproductive potential to use effective contraception during treatment and for 7 months following the final dose of LUTATHERA.

#### *Males*

Based on its mechanism of action, advise males with female partners of reproductive potential to use effective contraception during and for 4 months following the final dose of LUTATHERA [see *Clinical Pharmacology* (12.1) and *Nonclinical Toxicology* (13.1)].

### Infertility

The recommended cumulative dose of 29.6 GBq of LUTATHERA results in a radiation absorbed dose to the testis and ovaries within the range where temporary or permanent infertility can be expected following external beam radiotherapy [see *Dosage and Administration* (2.6)].

## 8.4 Pediatric Use

The safety and effectiveness of LUTATHERA have not been established in pediatric patients.

## 8.5 Geriatric Use

Of the 1325 patients treated with LUTATHERA in clinical trials, 438 patients (33%) were 65 years and older. The response rate and number of patients with a serious adverse event were similar to that of younger subjects.

## 8.6 Renal Impairment

No dose adjustment is recommended for patients with mild to moderate renal impairment; however, patients with mild or moderate renal impairment may be at greater risk of toxicity. Perform more frequent assessments of renal function in patients with mild to moderate impairment. The safety of LUTATHERA in patients with severe renal impairment (creatinine clearance < 30 mL/min by Cockcroft-Gault) or end-stage renal disease has not been studied.

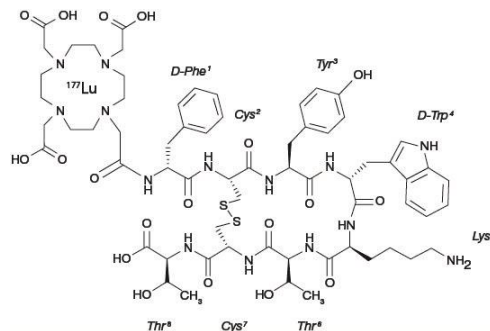
## 8.7 Hepatic Impairment

No dose adjustment is recommended for patients with mild or moderate hepatic impairment. The safety of LUTATHERA in patients with severe hepatic impairment (total bilirubin > 3 times upper limit of normal and any AST) has not been studied.

## 11 DESCRIPTION

LUTATHERA (lutetium Lu 177 dotatate) is a radiolabeled somatostatin analog. The drug substance lutetium Lu 177 dotatate is a cyclic peptide linked with the covalently bound chelator 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid to a radionuclide.

Lutetium Lu 177 dotatate is described as lutetium (Lu 177)-N-[(4,7,10-Tricarboxymethyl-1,4,7,10-tetraazacyclododec-1-yl) acetyl]-D-phenylalanyl-L-cysteinyl-L-tyrosyl-D-tryptophanyl-L-lysyl-L-threoninyl-L-cysteinyl-L-threonine-cyclic (2-7) disulfide. The molecular weight is 1609.6 Daltons and the structural formula is as follows:



LUTATHERA (lutetium Lu 177 dotatate) 370 MBq/mL (10 mCi/mL) Injection is a sterile, clear, colorless to slightly yellow solution for intravenous use. Each single-dose vial contains acetic acid (0.48 mg/mL), sodium acetate (0.66 mg/mL), gentisic acid (0.63 mg/mL), sodium hydroxide (0.65

mg/mL), ascorbic acid (2.8 mg/mL), diethylene triamine pentaacetic acid (0.05 mg/mL), sodium chloride (6.85 mg/mL), and Water for Injection (ad 1 mL). The pH range of the solution is 4.5 to 6.

### 11.1 Physical Characteristics

Lutetium (Lu 177) decays to stable hafnium (Hf 177) with a half-life of 6.647 days, by emitting beta radiation with a maximum energy of 0.498 MeV and photonic radiation ( $\gamma$ ) of 0.208 MeV (11%) and 0.113 MeV (6.4%). The main radiations are detailed in Table 6.

**Table 6. Lu 177 Main Radiations**

Radiation	Energy (keV)	I $\beta$ %	I $\gamma$ %
$\beta^-$	176.5	12.2	
$\beta^-$	248.1	0.05	
$\beta^-$	384.9	9.1	
$\beta^-$	497.8	78.6	
$\gamma$	71.6		0.15
$\gamma$	112.9		6.40
$\gamma$	136.7		0.05
$\gamma$	208.4		11.0
$\gamma$	249.7		0.21
$\gamma$	321.3		0.22

### 11.2 External Radiation

Table 7 summarizes the radioactive decay properties of Lu 177.

**Table 7. Physical Decay Chart: Lutetium Lu 177 Half-life = 6.647 days**

Hours	Fraction Remaining	Hours	Fraction Remaining
0	1.000	48 (2 days)	0.812
1	0.996	72 (3 days)	0.731
2	0.991	168 (7 days)	0.482
5	0.979	336 (14 days)	0.232
10	0.958	720 (30 days)	0.044
24 (1 day)	0.901	1080 (45 days)	0.009

## 12 CLINICAL PHARMACOLOGY

### 12.1 Mechanism of Action

Lutetium Lu 177 dotatate binds to somatostatin receptors with highest affinity for subtype 2 receptors (SSRT2). Upon binding to somatostatin receptor expressing cells, including malignant somatostatin receptor-positive tumors, the compound is internalized. The beta emission from Lu 177 induces cellular damage by formation of free radicals in somatostatin receptor-positive cells and in neighboring cells.

### 12.2 Pharmacodynamics

Lutetium Lu 177 exposure-response relationships and the time course of pharmacodynamics response are unknown.

#### Cardiac Electrophysiology

The ability of LUTATHERA to prolong the QTc interval at the therapeutic dose was assessed in an open label study in 20 patients with somatostatin receptor-positive midgut carcinoid tumors. No large changes in the mean QTc interval (i.e., >20 ms) were detected.

### 12.3 Pharmacokinetics

The pharmacokinetics (PK) of lutetium Lu 177 dotatate have been characterized in patients with progressive, somatostatin receptor-positive neuroendocrine tumors. The mean blood exposure (AUC) of lutetium Lu 177 dotatate at the recommended dose is 41 ng.h/mL [coefficient of variation (CV) 36 %]. The mean maximum blood concentration (C<sub>max</sub>) for lutetium Lu 177 dotatate is 10 ng/mL (CV 50%), which generally occurred at the end of the LUTATHERA infusion.

#### Distribution

The mean volume of distribution for lutetium Lu 177 dotatate is 460 L (CV 54%).

Within 4 hours after administration, lutetium Lu 177 dotatate distributes in kidneys, tumor lesions, liver, spleen, and, in some patients, pituitary gland and thyroid. The co-administration of amino acids reduced the median radiation dose to the kidneys by 47% (34% to 59%) and increased the mean beta-phase blood clearance of lutetium Lu 177 dotatate by 36%.

The non-radioactive form of lutetium dotatate is 43% bound to human plasma proteins.

### Elimination

The mean clearance (CL) is 4.5 L/h (CV 31%) for lutetium Lu 177 dotatate. The mean ( $\pm$  standard deviation) effective blood elimination half-life is 3.5 ( $\pm$ 1.4) hours and the mean terminal blood half-life is 71 ( $\pm$  28) hours.

### *Metabolism*

Lutetium Lu 177 dotatate does not undergo hepatic metabolism.

### *Excretion*

Lutetium Lu 177 dotatate is primarily eliminated renally with cumulative excretion of 44% within 5 hours, 58% within 24 hours, and 65% within 48 hours following LUTATHERA administration. Prolonged elimination of lutetium Lu 177 dotatate in the urine is expected; however, based on the half-life of lutetium 177 and terminal half-life of lutetium Lu 177 dotatate, greater than 99% will be eliminated within 14 days after administration of LUTATHERA [see *Warnings and Precautions* (5.1)].

### Drug Interaction Studies

The non-radioactive form of lutetium is not an inhibitor or inducer of cytochrome P450 (CYP) 1A2, 2B6, 2C9, 2C19 or 2D6 in vitro. It is not an inhibitor of P-glycoprotein, BCRP, OAT1, OAT3, OCT2, OATP1B1, OATP1B3, or OCT1 in vitro.

## **13 NONCLINICAL TOXICOLOGY**

### **13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility**

Carcinogenicity and mutagenicity studies have not been conducted with Lutetium Lu 177 dotatate; however, radiation is a carcinogen and mutagen.

No animal studies were conducted to determine the effects of lutetium Lu 177 dotatate on fertility.

### **13.2 Animal Toxicology and/or Pharmacology**

The primary target organ in animal studies using a non-radioactive form of lutetium Lu 177 dotatate (lutetium Lu 175 dotatate) was the pancreas, a high SSTR2 expressing organ. Pancreatic acinar apoptosis occurred at lutetium Lu 175 dotatate doses  $\geq$  5 mg/kg in repeat dose toxicology studies in rats. Pancreatic acinar cell atrophy also occurred in repeat dose toxicology studies in dogs at doses  $\geq$  500 mg/kg. These findings were consistent with high uptake of the radiolabeled peptide in the pancreas in animal biodistribution studies.

## **14 CLINICAL STUDIES**

### **14.1 Progressive, Well-differentiated Advanced or Metastatic Somatostatin Receptor-Positive Midgut Carcinoid Tumors**

The efficacy of LUTATHERA in patients with progressive, well-differentiated, locally advanced/inoperable or metastatic somatostatin receptor-positive midgut carcinoid tumors was established in NETTER-1 (NCT01578239), a randomized, multicenter, open-label, active-controlled trial. Key eligibility criteria included Ki67 index  $\leq$  20%, Karnofsky performance status  $\geq$  60, confirmed presence of somatostatin receptors on all lesions (OctreoScan uptake  $\geq$  normal liver), creatinine clearance  $\geq$  50 mL/min, no prior treatment with peptide receptor radionuclide therapy (PRRT), and no prior external radiation therapy to more than 25% of the bone marrow.

Two hundred twenty-nine (229) patients were randomized (1:1) to receive either LUTATHERA 7.4 GBq (200 mCi) every 8 weeks for up to 4 administrations (maximum cumulative dose of 29.6 GBq) or high-dose long-acting octreotide (defined as 60 mg by intramuscular injection every 4 weeks). Patients in the LUTATHERA arm also received long-acting octreotide 30 mg as an intramuscular injection 4 to 24 hours after each LUTATHERA dose and every 4 weeks after completion of LUTATHERA treatment until disease progression or until week 76 of the study. Patients in both arms could receive short-acting octreotide for symptom management; however, short-acting octreotide was withheld for at least 24 hours before each LUTATHERA dose. Randomization was stratified by OctreoScan tumor uptake score (Grade 2, 3 or 4) and the length of time that patients had been on the most recent constant dose of octreotide prior to randomization ( $\leq$  6 or  $>$  6 months). The major efficacy outcome measure was progression free survival (PFS) as determined by a blinded independent radiology committee (IRC) per RECIST v1.1. Additional efficacy outcome measures were overall response rate (ORR) by IRC, duration of response, and overall survival (OS).

Demographic and baseline disease characteristics were balanced between the treatment arms. Of the 208 patients, whose race/ethnicity was reported, 90% were White, 5% were Black, and 4% were Hispanic or Latino. The median age was 64 years (28 to 87 years); 51% were male, 74% had an illial primary, and 96% had metastatic disease in the liver. The median Karnofsky performance score was 90 (60 to 100), 74% received a constant dose of octreotide for  $>$  6 months and 12% received prior treatment with everolimus. Sixty-nine percent of patients had Ki67 expression in  $\leq$  2% of tumor cells, 77% had CgA  $>$  2 times the upper limit of normal (ULN), 65% had 5-HIAA  $>$  2 x ULN, and 65% had alkaline phosphatase  $\leq$  ULN. Efficacy results for NETTER-1 are presented in Table 8 and Figure 1.



**Table 8. Efficacy Results in NETTER-1**

	<b>LUTATHERA and Long-Acting Octreotide (30 mg) N=116</b>	<b>Long-Acting Octreotide (60 mg) N=113</b>
<b>PFS by IRC</b>		
Events (%)	27 (23%)	78 (69%)
Progressive disease, n (%)	15 (13%)	61 (54%)
Death, n (%)	12 (10%)	17 (15%)
Median in months (95% CI)	NR <sup>c</sup> (NE, NE)	8.5 (5.8, 9.1)
Hazard ratio <sup>a</sup> (95% CI)	0.21 (0.13, 0.32)	
P-Value <sup>b</sup>	< 0.0001	
<b>OS (Updated)</b>		
Deaths (%)	27 (23%)	43 (38%)
Median in months (95% CI)	NR (31.0, NE)	27.4 (22.2, NE)
Hazard ratio <sup>a,d</sup> (95% CI)	0.52 (0.32, 0.84)	
<b>ORR by IRC</b>		
ORR, % (95% CI)	13% (7%, 19%)	4% (0.1%, 7%)
Complete response rate, n (%)	1 (1%)	0
Partial response rate, n (%)	14 (12%)	4 (4%)
P-Value <sup>e</sup>	0.0148	
Duration of response, median in months (95% CI)	NR (2.8, NE)	1.9 (1.9, NE)

a: Hazard ratio based on the unstratified Cox model

b: Unstratified log rank test

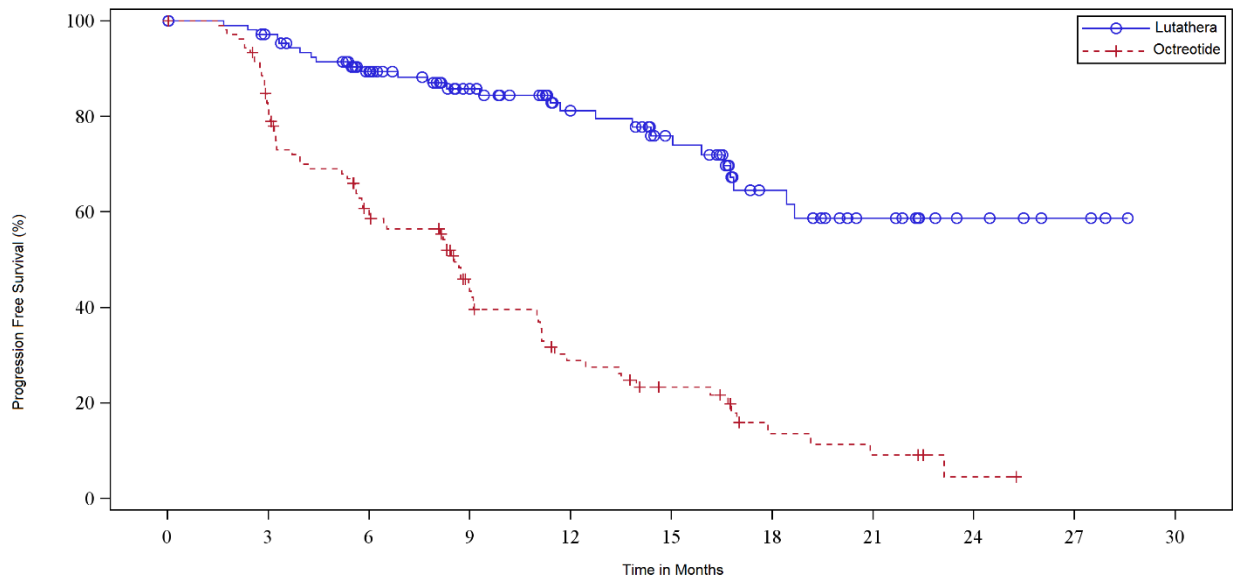
c: Median follow-up 10.5 months at time of primary analysis of PFS (range: 0 to 29 months)

d: Interim analysis of OS not statistically significant based on pre-specified significance criteria

e: Fisher's Exact test

NR: Not reached; NE: Not evaluable

**Figure 1. Kaplan-Meier Curves for Progression-Free Survival in NETTER-1**



Number at risk	0	3	6	9	12	15	18	21	24	27	30
Lutathera and Long-Acting Octreotide	116	102	84	66	48	38	22	13	6	3	0
Long-Acting Octreotide high dose	113	84	57	35	21	14	6	4	1	0	0

## 14.2 Somatostatin Receptor-Positive Gastroenteropancreatic Neuroendocrine Tumors (GEP-NETs)

The efficacy of LUTATHERA in patients with foregut, midgut, and hindgut gastroenteropancreatic neuroendocrine tumors (GEP-NETs) was assessed in 360 patients in the ERASMUS study. In ERASMUS, LUTATHERA was initially provided as expanded access under a general peptide receptor radionuclide therapy protocol at a single site in the Netherlands. A subsequent LUTATHERA-specific protocol written eight years after study initiation did not describe a specific sample size or hypothesis testing plan but allowed for retrospective data collection. A total of 1214 patients received LUTATHERA in ERASMUS, of which 601 (50%) were assessed per RECIST criteria. Of the 601 patients evaluated by investigators using RECIST criteria, 360 (60%) had gastroenteropancreatic neuroendocrine tumors (GEP-NETs). LUTATHERA 7.4 GBq (200 mCi) was administered every 6 to 13 weeks for up to 4 doses concurrently with the recommended amino acid solution. The major efficacy outcome was investigator-assessed ORR. The median age in the efficacy subset was 61 years (25 to 88 years), 52% were male, 61% had a baseline Karnofsky performance status  $\geq 90$  (60 to 100), 60% had progressed within 12 months of treatment, and 15% had received prior chemotherapy. Fifty five percent (55%) of patients received a concomitant somatostatin analog. The median dose of LUTATHERA was 29.6 GBq (800 mCi). Baseline tumor assessments were obtained in 39% of patients. The investigator assessed ORR was 16% (95% CI 13, 20) in the 360 patients with GEP-NETs. Three complete responses were observed (< 1%). Median DoR in the 58 responding patients was 35 months (95% CI: 17, 38).

## 16 HOW SUPPLIED/STORAGE AND HANDLING

LUTATHERA Injection containing 370 MBq/mL (10 mCi/mL) of lutetium Lu 177 dotatate is a sterile, preservative-free and clear, colorless to slightly yellow solution for intravenous use supplied in a colorless Type I glass 30 mL single-dose vial containing 7.4 GBq (200 mCi)  $\pm$  10% of lutetium Lu 177 dotatate at the time of injection (NDC# 69488-003-01). The solution volume in the vial is adjusted from 20.5 mL to 25 mL to provide a total of 7.4 GBq (200 mCi) of radioactivity.

The product vial is in a lead shielded container placed in a plastic sealed container (NDC# 69488-003-01). The product is shipped in a Type A package (NDC# 69488-003-70).

Store below 25 °C (77 °F).

The shelf life is 72 hours. Discard appropriately at 72 hours.

## 17 PATIENT COUNSELING INFORMATION

### Radiation Risks

Advise patients to minimize radiation exposure to household contacts consistent with institutional good radiation safety practices and patient management procedures [see *Dosage and Administration* (2.1), *Warnings and Precautions* (5.1)].

### Myelosuppression

Advise patients to contact their healthcare provider for any signs or symptoms of myelosuppression or infection, such as fever, chills, dizziness, shortness of breath, or increased bleeding or bruising [see *Warnings and Precautions* (5.2)].

### Secondary Myelodysplastic Syndrome and Acute Leukemia

Advise patients of the potential for secondary cancers, including myelodysplastic syndrome and acute leukemia [see *Warnings and Precautions* (5.3)].

### Renal Toxicity

Advise patients to hydrate and urinate frequently during and after administration of LUTATHERA [see *Warnings and Precautions* (5.4)].

### Hepatotoxicity

Advise patients of the need for periodic laboratory tests to monitor for hepatotoxicity [see *Warnings and Precautions* (5.5)].

### Neuroendocrine Hormonal Crises

Advise patients to contact their health care provider for signs or symptoms that may occur following tumor-hormone release, including severe flushing, diarrhea, bronchospasm, and hypotension [see *Warnings and Precautions* (5.6)].

### Embryo-Fetal Toxicity

Advise pregnant women and males and females of reproductive potential of the potential risk to a fetus. Advise females to inform their healthcare provider of a known or suspected pregnancy [see *Warnings and Precautions* (5.7), *Use in Specific Populations* (8.1, 8.3)].

Advise females of reproductive potential to use effective contraception during treatment with LUTATHERA and for 7 months after the final dose [see *Use in Specific Populations* (8.1, 8.3)].

Advise male patients with female partners of reproductive potential to use effective contraception during treatment with LUTATHERA and for 4 months after the final dose [see *Use in Specific Populations* (8.1, 8.3)].

### Lactation

Advise females not to breastfeed during treatment with LUTATHERA and for 2.5 months after the final dose [see *Use in Specific Populations* (8.2)].

### Infertility

Advise female and male patients that LUTATHERA may impair fertility [see *Warnings and Precautions* (5.8), *Use in Specific Populations* (8.3)].

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