Radium-223 dichloride

Version 1.1 Revised on 11/27/2015 Print date 11/27/2015

1. IDENTIFICATION OF THE MATERIAL OR MIXTURE AND OF THE COMPANY

Product Information:

Radium-223dichloride

Use : (1) Radiopharmaceutical#
(2) Technical sample of radium-223 for dose calibrator dial setting

Company
Bayer Pharma AG
Müllerstr. 178
D-13353 BERLIN

Tel.: +49 (0) 214 30 46440
Email: msds@bayerhealthcare.com

In case of emergency: +49 (0) 214 30 99300 (Bayer Safety Center)

2. POSSIBLE DANGERS

When handling radioactive materials, the following risks must be taken into consideration:

- External radiation exposure to radioactive sources/materials
- Contamination with radioactive material, for instance through skin contact.
- Internal radiation exposure after incorporation (intake) of a radioactive substance into the body by breathing or eating/drinking.

Other hazards which do not result in classification:

Radioactive.
Contamination Hazard.
Contains 0.69 ng per MBq radium-223 dichloride.
Activity: 2.56 MBq/ml at filling.
To be handled and administered only by authorized and trained personnel.

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016

3. COMPOSITION / INFORMATION ON INGREDIENTS

Aqueous solution: 15.5 MBq (419 μCi) per 6 ml-vial on the day of filling
($t_{1/2}$ = 11.4 d, shelf life 28 d).

Contains

Radium-223 dichloride (CAS-No. 444811-40-9) at reference day:	6.6 MBq per vial (1100 kBq per mL)
Sodium chloride (CAS-No. 7647-14-5)	Concentration 0.9 %
Sodium citrate, primary, non-aqueous (CAS-No. 18996-35-5)	Concentration 1 %
Water (CAS-No. 7732-18-5)	

4. FIRST AID MEASURES

General Information:
In the case of an accident with contamination, note the following when treating the accident victim:

Observe the requirements for radiation protection as far as medically justifiable. In life-threatening circumstances, conventional first aid has absolute priority. The person providing aid must wear protective clothing as applicable (such as protective gloves, protective suit, lab coat). As a rule, the level of contamination reached is such that the resulting external exposure for personnel assisting in the treatment of contaminated patients results in no harmful contamination. Because of the elevated danger of incorporation, any injury in which there is a possibility of contamination must be considered radioactively contaminated, until measurements show that this is not the case. In any case, when contamination is suspected, immediately inform the Radioprotection Unit in charge. Rinse the wound under running water. Place contaminated clothing and objects, for example, into plastic bags in a decontamination area and mark them accordingly.

After skin and eye contact:

Quickly beginning decontamination measures takes priority over determining the level of skin contamination through activity measurements. Suitable decontamination measures include lukewarm water and special soaps or washing lotion, EDTA or DTPA solution, and soft hand brushes as applicable. Continue the washing process for an adequately long time; then carefully dry the skin with absorbent material. In the case of eye contact, remove contact lenses and immediately rinse with lots of water for an adequately long period of time; including under the eyelids. The progress of decontamination is checked by means of activity measurement.

After ingestion:

Only in the case of swallowing should the first aid provider rinse the mouth and induce vomiting. Never pour anything into the mouth of an unconscious person. If radioactive substances can still be in the mouth or in the nose and throat area, ask the affected person to cough, clear his throat, and spit into prepared containers. The amount swallowed should be estimated and documented.

5. FIRE FIGHTING MEASURES

Suitable Fire Extinguishing Media:

Water spray nozzle, alcohol-resistant foam, solid extinguishing agent, or carbon dioxide.

Special hazards in firefighting:

Radioactive material can be released in a fire.

Special protective equipment for firefighting:

In the case of fire, wear a self-contained breathing apparatus. Use personal protective equipment.

More Information:

Prevent extinguishing water to reach surface bodies of water or the groundwater system. Ra-223 dichloride does not represent any additional fire load. Inform emergency personnel about the presence of radioactive materials.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

For cleaning work, wear disposable gloves, overshoes, protective glasses, and protective clothing.

Measures for Environmental Protection:

Prevent materials to reach surface bodies of water or the drainage/sewer system.

Cleaning Procedure:

Identify the soiled or contaminated area, mark it with the radiation symbol and the additional designation CONTAMINATION, and block it off as needed. Carefully remove liquid with absorbent paper. For surface decontamination, use water, aqueous EDTA solution, or diluted hydrochloric acid.

Additional Information:

Avoid spreading the contamination: do not touch anything without thinking, do not move around unnecessarily, do not disperse any liquids. Avoid touching contaminated objects with your hands. Use aids, such as tweezers or tongs. Mark the storage area for contaminated equipment with the radiation symbol and the added designation RADIOACTIVE. Cover heavily contaminated surfaces with foil until decontamination can be started. Alert people nearby, and evacuate the area. Get help! Call the radiation protection supervisor. Provide suitable marked containers for contaminated clothing as well as solid and liquid radioactive waste.

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016

7. HANDLING AND STORAGE

Handling:

When handling intact, closed glass vials of Radium-223 dichloride, there is a danger of external radiation exposure. The following measures are suitable for reducing exposure: Use suitable shielding. Maintain an adequate distance from the radioactive source. Minimize time spent in radiation areas. Incorporation can occur via swallowing, inhalation, skin or eye contact.

Measures to minimize internal radiation exposure: Open radioactive material should be handled in a well-ventilated area.

Personnel must have precise instruction in safe handling. Use easy-to-clean workrooms, facilities, and equipment, such as smooth, seamless work tables and floors. Cover workplace and laboratory tables with foil and absorbent paper. Fill and refill radioactive liquids only over an adequately large catch basin lined with absorbent paper. Before opening, check packaging and containers for damage, and measure contamination as applicable. Separate workplaces and equipment for active and inactive work. Do not touch any equipment or objects with contaminated gloves. Before touching handkerchiefs, door handles, light switches, telephone, writing materials, et cetera, take off gloves.

Exposure to radiation can be measured with standard dosimeters/detectors (probe and electronic dosimeters).

Storage:

Responsible persons at the site using Radium-223 dichloride must comply with all applicable safety regulations, including the ALARA principle (see section on Handling) as well as the requirements specified in the handling permit.

Store at room temperature. Storage must conform to the radiation protection regulations and specifications of the handling permit.

Storage class in accordance with the German Chemical Industry Association (VCI) Guidelines (version: May 2007): 7

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Hand Protection:

Wear chemical-resistant gloves of Baypren, nitrile rubber, or PVC.
Dispose of gloves properly.

Eye Protection:

Safety glasses with side shields.
Eyewash bottle with clean water.

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016

Skin and Body Protection:

Lab coat or similar.

Other protective measures:

Make sure that simple decontamination measures are available that can be carried out anywhere and immediately.
Suitable decontamination measures include lukewarm water and special soaps or washing lotion, EDTA or DTPA solution, and soft hand brushes as applicable.
Provide suitable marked and sealable containers for contaminated clothing as well as solid and liquid radioactive waste.

9. PHYSICAL AND CHEMCIAL PROPERTIES

Physical state:	liquid
Color and odor:	colorless and odorless
Boiling point / boiling range:	100 °C at 1,013 hPa
Density:	1 g/cm³ at 20 °C
Miscibility with water:	in all proportions
pH value:	6 - 8 at (20 °C)

More Information: Contains 0.69 ng per MBq of radium-223 dichloride
Activity: 2.56 MBq/ml when filling.
Half-life: 11.4 d
Decay products: Radon-219 → Polonium-215 → Lead-211 → Bismuth-211 → Thallium-207 → Lead-207
During the decay of Ra-223 to Pb-207, 95% of the energy is released in the form of alpha radiation; 4% as beta radiation, and 1% as gamma radiation.

10. STABILITY AND REACTIVITY

Conditions to Avoid:

No data available

Materials to Avoid:

No data available

Dangerous reactions:

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016

None known.

11. TOXICOLOGICAL INFORMATION

Other information on toxicity:

After injection, it is taken up predominantly by the bones. No specific intake in other organs has been found. Radium-223 is excreted primarily intestinally. Radium-223 is eliminated from the blood to more than 99% within 24 hours after administration.

If possible, minimize patient samples (blood, urine, stool, saliva, et cetera) in the first week after administration. To avoid contamination, inform the laboratory personnel. Normal hygiene measures for taking samples should provide appropriate radiation protection.

Acute oral toxicity:
LD50 in rats: > 4.14 MBq/kg

Subacute, subchronic, and long-term toxicity:
Lowest observed adverse effect level: 22 kBq/kg (rat)

Pharmaceutical Effect:
Anti-cancer drug

Additional Information:
Cremation of deceased patients after consulting the attending physician.

12. ECOLOGICAL INFORMATION

General Information:

Prevent contamination of surface water and groundwater.

13. DISPOSAL INSTRUCTIONS

Radioactive waste must be separated from non-active waste. The content of the waste container must be documented, for instance type of waste, nuclide, activity, date. Store Ra-223 waste (such as practice supplies, open and closed vials) in a secure area until the radioactivity decreases to the national threshold value. Opened packages must be stored at the recipient site to allow the radioactivity to decrease before disposal. Calculate the time to reaching the threshold value of the permissible level and document through measurements. Before disposal, remove all warnings against radiation from waste in which the radioactivity has sufficiently decreased. Contaminated sharp waste, such as broken glass or hypodermic needles, must be collected in puncture-proof containers for disposal. Dispose of waste in accordance with local regulations.

14. TRANSPORT INFORMATION

ADR/RID
UN number : 2915

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016

Proper Shipping Name	:	RADIOACTIVE MATERIALS, TYPE A PACKAGE
Number identifying the hazard	:	70
Hazard Label	:	7B

GGVS/GGVE (Hazardous Goods Regulations Road / Hazardous Goods Regulations Rail)

UN number	:	2915
Proper Shipping Name	:	RADIOACTIVE MATERIALS, TYPE A PACKAGE
Number identifying the hazard	:	70
Hazard Label	:	7B

ADNR

UN number	:	2915
Proper Shipping Name	:	RADIOACTIVE MATERIALS, TYPE A PACKAGE
Number identifying the hazard	:	70
Hazard Label	:	7B

IATA

UN number	:	2915
Proper Shipping Name	:	RADIOACTIVE MATERIAL, TYPE A PACKAGE
Class	:	7
Hazard Label	:	7B

IMDG

UN number	:	2915
Proper Shipping Name	:	RADIOACTIVE MATERIAL, TYPE A PACKAGE
Class	:	7
IMDG code	:	7B
EmS Number	:	F-I
Marine Pollutant	:	No

15. REGULATORY INFORMATION

Other Regulations:

Observe national and international regulations on the handling of radioactive materials.

#Implementation of NIST 2015 change for drug solution is scheduled for April 2016