Radium-226
(^{226}Ra)

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Fact Sheet 320-081

Division of Environmental Health
Office of Radiation Protection

Washington State Department of Health

WHO DISCOVERED RADIUM?

Radium was discovered by Marie Sklodowska Curie, a Polish chemist, and Pierre Curie, a French chemist, in 1898. Marie Curie obtained radium from pitchblende, a material that contains uranium, after noticing that unrefined pitchblende was more radioactive than the uranium that was separated from it. She reasoned that pitchblende must contain at least one other radioactive element. Curie needed to refine several tons of pitchblende in order to obtain tiny amounts of radium and polonium, another radioactive element discovered by Curie. One ton of uranium ore contains only about 0.14 grams of radium. Today, radium can be obtained as a byproduct of refining uranium and is usually sold as radium chloride ($RaCl_2$) or radium bromide ($RaBr_2$) and not as a pure material.

WHAT IS RADIUM-226 USED FOR?

In the 1920's radium was injected intravenously for a variety of ills, far from being cured, many of the patients later develop bone cancer or other malignant diseases. Radium-226 was also mixed with fluorescent zinc sulfide to make a luminous paint. This luminous material was used to paint timepieces, compasses and other devices during and after World War I. Apalastic anemia, leukemia and bone cancers developed in workers who repeatedly used their lips to make a point out of the paint brush bristles.

Radium is now used to produce radon, a radioactive gas used to treat some types of cancer.

WHERE DOES RADIUM-226 COME FROM AND WHERE IS IT FOUND?

Radium-226 is a decay product of thenatural uranium-238 decay chain. It is present in all rocks and soils in variable amounts.

IS RADIUM-226 HAZARDOUS?

Radium-226 decays by alpha making ingestion and inhalation the primary pathways of concern.

Radium-226 adheres quickly to solids and does not migrate far from its place of release. It is absorbed from the soil by plants and passed up the food chain to humans. Radium is chemically similar to calcium and, when ingested a small fraction is transferred across the small intestine and most is deposited in bone, which contains 70-95% of the total ingested body radium.

Radium is also about one million times more active than uranium. The lab notebooks used by the Curies are so highly contaminated they cannot be safely handled today.

Radium-226 decays by alpha particle radiation to an inert gas, radon-222, which also decays by alpha particle radiation. Due to the short half-life of radon-222, 3.8 days, there is a high probability it will decay in the body when breathed in, emitting alpha particle radiation in the body. Radium-226 and its decay products are responsible for a major fraction of the dose received by humans from naturally occurring radionuclides.

PROPERTIES OF RADIUM-226 (^{226}Ra)

Half-Life:

Physical: 1.60×10^3 years

Biological: Retention is described by a complicated power function equation

Principal Modes of Decay (MeV):

Alpha 4.78 (94.5%), 4.61 (5.55%)

Gamma 0.186 (3.5%)

Special Chemical and Biological Characteristics:

Deposits in the bone with nonuniform distribution, following the decay of ^{226}Ra in the bone.

Principal Organs:

Mineralized Bone Volume

Amount of Element in Body:

31 pCi with 27 pCi found in the skeleton

Daily Intake of Element in Food and Fluids:

2.3 pCi

Special Ecological Aspects:

Radium is chemically similar to calcium and is absorbed from the soil by plants and passed up the food chain to humans.

Sources

Jefferson Lab, http://education.jlab.org/itselemental/ele088.html
Environmental Radioactivity, Eisenbud, Merril & Gesell, Thomas, 1997

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