



EPA Facts About Americium-241

July 2002

What is americium-241?

Americium is a man-made radioactive metal that exists as a solid under normal conditions. Americium is produced when plutonium absorbs neutrons in nuclear reactors and nuclear weapons tests.

Americium occurs in several forms called isotopes. The most common isotope is americium-241.

What are the uses of americium-241?

Americium when blended with beryllium is used as a neutron source in the testing of machinery and in thickness gauges in the glass industry. Americium also is used as a radiation source in medical diagnostic devices and in research. It is commonly used in minute amounts in smoke detectors as an ionization source.

How does americium-241 change in the environment?

Americium-241 is formed in the environment by the decay of plutonium contamination from nuclear weapons production and testing. Americium-241 is an unstable isotope. As americium decays, it releases radiation and forms "daughter" elements. The first decay product of americium-241 is neptunium-237, which also decays and forms other daughter elements. The decay process continues until stable bismuth is formed.

The radiation from the decay of americium-241 and its daughters is in the form of alpha particles, beta particles, and gamma rays. Alpha particles can travel only short distances and generally will not penetrate the outer layer of human skin. Gamma rays can penetrate the body. Beta particles are generally absorbed in the skin and do not pass through the entire body. The time in which half the atoms of a radioactive substance disintegrate to another nuclear form is known as the half-life. The half-life of americium-241 is about 432 years.

How are people exposed to americium-241?

Americium has been released to the environment primarily by atmospheric testing of nuclear weapons. Concentrations of americium introduced into the environment through nuclear weapons production operations have been negligible compared with those released during atmospheric testing of nuclear explosives.

Weapon sites and industries that manufacture smoke detectors are potential sources of exposure from americium-241. Potential pathways of exposure include ingestion, inhalation, and the external pathway from gamma radiation.

How does americium-241 get into the body?

Americium can enter the body when it is inhaled or swallowed. When inhaled, the amount of americium that remains in the lungs depends upon the particle size and the chemical form of the americium compound. The chemical forms that dissolve easily may be absorbed through the lung and pass into the blood stream. The forms that dissolve less easily are typically swallowed where some may pass into the blood stream and the remainder will pass through the feces. However, some undissolved material may also remain in the lung.

Is there a medical test to determine exposure to americium-241?

Tests are available that can reliably measure the amount of americium in a urine sample, even at very low levels. These measurements can be used to estimate the total amount of americium present in the body. There are also tests to measure americium in soft tissues (such as body organs), feces, bones, and breast milk. Whole body testing and nasal smears may also be used to measure americium in the body. These tests are not routinely available in a doctor's office because special laboratory equipment is required.

How can americium-241 affect people's health?

Because americium emits alpha particles, americium poses a significant risk if enough is swallowed or inhaled. Once in the body, americium tends to concentrate primarily in the skeleton, liver, and muscle. It generally stays in the body for decades and continues to expose the surrounding tissues to radiation. This may eventually increase a person's chance of developing cancer, but such cancer effects may not become apparent for several years. Americium, however, also can pose a risk from direct external exposure.

What recommendations has the Environmental Protection Agency made to protect human health?

Please note that the information in this section is limited to recommendations EPA has made to protect human health from exposure to americium-241. General recommendations EPA has made to protect human health, which cover all radionuclides including americium-241, are summarized in the [Introduction](#) section of this booklet.

EPA has established a Maximum Contaminant Level (MCL) of 15 picocuries per liter (pCi/l) for total alpha particle activity, excluding radon and uranium, in drinking water. Americium-241 would be covered under this MCL.

For more information about how EPA addresses americium-241 at Superfund sites, please contact either:

EPA's Superfund Hotline
1-800-424-9346 or 1-800-535-0202
or EPA's Superfund Radiation Webpage
<http://www.epa.gov/superfund/resources/radiation/>