



Military Base

Radioactive Fallout From Nuclear Weapons Testing

- Detonating nuclear weapons above ground sends radioactive materials into the atmosphere from the ground level up to very high elevations.
- Fallout typically contains hundreds of different radionuclides.
- Since the end of aboveground nuclear weapons testing, radionuclides have largely decayed away.

About Radioactive Fallout From Nuclear Weapons Testing

Detonating nuclear weapons above ground sends radioactive materials into the atmosphere from the ground level up to as high as 50 miles! Large particles fall back near the explosion site, but lighter particles and gases travel into the upper atmosphere. They can circulate around the world for years, or even decades, until they gradually settle out or are brought back to the surface by precipitation. The height and spread of fallout depends on such factors as the type of weapon and weather patterns. Fallout typically contains hundreds of different radionuclides. Some stay in the environment for a long time because they have long half-lives. Some have very short half-lives and decay away in a few minutes or a few years. Certain radionuclides produce high levels of radiation. Both are potential risks to human health and the environment. However, very little radioactivity from weapons testing in the 1950s and 1960s can even be detected in the environment now.

Some of the fallout radionuclides detected by EPA's monitoring systems include:

- Americium-241ⁱ.
- Cesium-137ⁱⁱ.
- Iodine-131ⁱⁱⁱ.
- Strontium-90^{iv}.

When there is a nuclear detonation, people and other living things can be exposed to fallout through several pathways. External or direct exposure would come from fallout on the ground. Internal exposure would occur if radioactive particles were inhaled or ingested (swallowed). Ingestion would occur by eating contaminated crops or meat from livestock that had eaten contaminated plants.

Radionuclides that emit alpha and beta particles would pose a lower external exposure threat because they don't travel very far in the atmosphere and are not as penetrating as more energetic radiation. For example, alpha particles can be stopped by the dead cells on the skin's surface. However, gamma rays travel much



Above-Ground Nuclear Test conducted at the Nevada Test Site on May 25, 1953
(Source: Nevada Department of Environmental Protection)



farther in the atmosphere and can penetrate the body. They pose a much higher external exposure risk. Radionuclides that are inhaled or ingested would continue to emit radiation directly to living tissue, increasing the risk of harmful health effects such as cancer, caused by damage to DNA in the cells. The health risks from fallout have been described in many studies. One example is the Federal Radiation Council's 1962 report "health implications of fallout from nuclear weapons testing through 1961".^v

The U.S. conducted the first aboveground nuclear weapon test in southeastern New Mexico on July 16, 1945. Between 1945 and 1963, hundreds of aboveground blasts took place around the world. The number and size (yield) of blasts increased, particularly in the late 1950s and early 1960s. Following the signing of the Limited Test Ban Treaty of 1963 by the United States, the Soviet Union and Great Britain, most aboveground blasts ceased. Some above-ground weapons testing by other countries continued until 1980. Since the end of aboveground nuclear weapons testing, the day-to-day readings from radiation monitoring sites have fallen. For many years, analysis of typical samples shows risk levels far below regulatory limits. In fact, results are now generally below levels that instruments can detect.

Rules and Guidance

The main documents that govern nuclear weapons testing are treaties. There are three main treaties:

THE TREATY ON THE LIMITATION OF UNDERGROUND NUCLEAR WEAPON TESTS^{vi}

This treaty is also known as the Threshold Test Ban Treaty. It was signed in July of 1974 by the United States and the Union of Soviet Socialist Republics (USSR). It established a nuclear "threshold," by prohibiting test having a yield exceeding 150 kilotons (equal to 150 tons of TNT).

TREATY BANNING NUCLEAR WEAPON TESTS IN THE ATMOSPHERE, IN OUTER SPACE AND UNDER WATER^{vii}

The Test Ban Treaty of 1963 prohibits nuclear weapons tests "or any other nuclear explosion" in the atmosphere, in outer space and under water. It does not ban tests underground. The goal of the treaty is to end radioactive contamination of the environment.

NUCLEAR-TEST-BAN TREATY^{viii}

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a legally binding global ban on nuclear explosive testing. The CTBT was opened for signature in 1996. The United States has signed the treaty but it has not been ratified by the Senate.

What you can do

There is very little fallout left from nuclear weapons testing that occurred in the 20th century. Most of what is left decays very slowly and therefore gives off little radiation.

Where to learn more

You can learn more about radioactive fallout from nuclear weapons testing by visiting the resources available on the following webpage: <http://www3.epa.gov/radtown/fallout-nuclear-weapons-testing.html#learn-more>.

ⁱ <http://www2.epa.gov/radiation/radionuclides/americium.html>

ⁱⁱ <http://www2.epa.gov/radiation/radionuclides/cesium.html>

ⁱⁱⁱ <http://www2.epa.gov/radiation/radionuclides/iodine.html>

^{iv} <http://www2.epa.gov/radiation/radionuclides/strontium.html>

v http://www2.epa.gov/sites/production/files/2015-05/documents/frc_rpt3.pdf (13 pp, 350 K)

vi <http://www.state.gov/t/isn/5204.htm>

vii <http://www.state.gov/t/isn/4797.htm>

viii <http://www.state.gov/t/avc/c42328.htm>