



Destructive Effects

Section 1 www.AtomicBombMuseum.org/3_radioactivity.shtml

Major energy forms:

The major explosive energy forms that dominate research and reports on the atomic bombings are three:

Fireball: air absorbs heat, swells to a fireball with a 50-ft. radius and a temperature of 300,000 degrees C.

Shock Wave + Air Blast: 50% of total energy

Radioactivity: two kinds. *initial radiation* (explained above), and *induced radiation* (also called “residual radiation”).

Of these three energy forms, the most radically different, and most deadly over time, was the high level of radioactivity.

A deadly new threat: radioactivity

1. “Black rain”

The Hiroshima and Nagasaki explosions yielded some 200 different kinds of radioactive isotopes, that is, nuclear fission particles of uranium and plutonium that escaped fission. Following the explosions, these and other materials irradiated by neutrons from the bomb, were carried high into the atmosphere.

The mixing of enormous amounts of airborne irradiated materials combined with heat and thermal currents from the firestorms led to rainfall in both cities within 30-40 minutes of the bombings. As the fallout particles were mixed with carbon residue from citywide fires, the result was the awesome—and injurious—“black rain.”



*Atmospheric dispersion begins in Hiroshima. (HIMAT)

This “black rain” reached ground level as sticky, dark, dangerously radioactive water. It not only stained skin, clothing, and buildings, but also was ingested by breathing and by consumption of contaminated food or water, causing radiation poisoning.



*Black rain streaks on a wall. Chugoku Shimbunsha, *The Meaning of Survival* (1983), p. 24 (1).

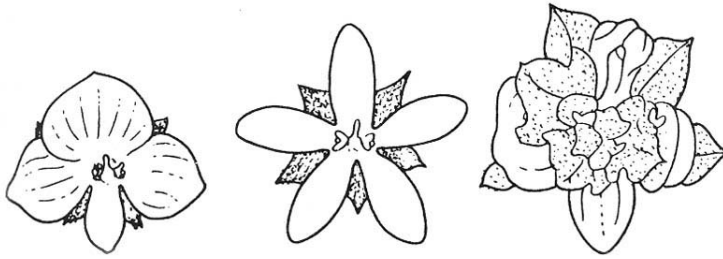
2. Initial radiation from the bombs

About 3% of the Hiroshima and Nagasaki bombs' energy was spent in generating *ionizing radiation*—high-energy particles and rays with enough energy to “ionize” neutral atoms, i.e., strip electrons away from them. Some of this ionized radiation was absorbed by the air, but neutrons (electrically neutral sub-atomic particles) and gamma and X-rays (extremely high energy forms of light) did reach the ground, and these rays damaged exposed living tissues. Close to ground zero of both explosions, dosages were high enough to be immediately lethal for persons not already killed by flash, blast, or fire.

3. Induced radioactivity

Initial bursts of radiation from the two bombs also created induced or residual radioactivity. Soil and other materials were irradiated in the blast areas. Absorption of “slow neutrons” by all kinds of substances caused the creation of new isotopes that then emitted ionizing radiation.

Japanese physicists examining the areas near ground zero in Hiroshima found unusually high levels of radioactivity in the soil, in the bones of a horse, and even in the sulphur content of electrical insulators on telephone poles. Eventually, a variety of unusual radioactive elements were found in soil, roofing tiles, asphalt, and concrete near ground zero in the two cities. There were many instances of radiation effects on animals and plants.



*Illustrations of malformed flowers; the far left is the normal blossom, the middle and far right examples show gradual distortion. (HN 85)

4. Radioactivity and living tissue

Living tissue may be exposed to ionizing radiation directly (emitted by explosion) or by exposure to, or ingestion of, fallout matter that emits residual radiation. The danger is the same either way.

Key: Ionizing radiation transforms a neutral atom into a charged atom that may bond to another atom, altering (i) the structure of the original molecule, (ii) the way it reacts chemically, and (iii) the function it performs when part of a living organism. The altered molecules may act as poisons, hindering the normal functions of the cells of which they are a part.

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