Radiation, Particles, Effects on Food, Human Health: Questions and Answers[1]

Radiation leaks from Tokyo Electric Power Co.'s damaged nuclear power plant in northeastern Japan have contaminated food, leading to concern about the safety of Japanese produce and long-term health effects.

Here are answers to some frequently asked questions about radiation and the way it can harm human health and contaminate food. The information is drawn from interviews today with George Dracoulis, professor emeritus in the department of nuclear physics at the Australian National University in Canberra, and Evan Douple, associate chief of research at the Radiation Effects Research Foundation in Hiroshima, Japan.

Q: What is radiation?
A: Radiation is energy emitted from a source. Nuclear energy is produced by splitting the nucleus of a uranium or plutonium atom. That creates other unstable nuclei, or isotopes, including iodine-131 and cesium-137, which continue to decay into other nuclei until they eventually reach a stable form. The time it takes for the radioactivity to drop to half the starting level is called the half-life of the isotope.

Decay emits radiation in the form of beta and gamma rays. Gamma rays are photons traveling at high speed and beta rays are electrons or positrons. Beta rays can be stopped by aluminum shielding, while gamma rays can only be stopped by a layer of lead.

In a nuclear accident, radioactive isotopes including iodine-131 and cesium-137, which are normally contained inside the fuel rods, may be released into the atmosphere as gases or particulates if the rods are damaged. These can be inhaled or ingested through contaminated food or water.

Q: How is radiation harmful?
A: Both beta and gamma rays can pass through human tissues, where they collide with other atoms, breaking up molecules and potentially damaging the DNA inside cells. When the body tries to repair the damage, mistakes may be made, creating the potential for cancer.

Q: What is the difference between a physical and biological half-life of a radio isotope?
A: Any radio isotope ingested has a biological half life, which differs from its physical half-life depending on how quickly the body eliminates it. Although the physical half-life of cesium-137 is 30 years, its biological half-life can be measured in weeks. High-energy gamma rays from cesium-137 inside the

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stomach or intestines may enable it to irradiate the body, and some material may be incorporated in bone and other tissues.

Q: Why is there concern about iodine-131?
A: I-131, the radioactive form of iodine, is a weak emitter of beta rays. If the exposure is external, the energy is deposited on the surface of the skin and isn't normally a health problem. If inhaled or ingested, I-131 is selectively taken up by the thyroid gland, where it continues to decay, emitting gamma radiation. At high concentrations it can cause cancer.

Q: Why is there concern about cesium-137?
A: Cesium is a solid particulate compound that can be deposited and cause contamination on clothing or on the ground. It also emits high-energy gamma rays. While it is eventually eliminated from the body, Cs-137 has a tendency to concentrate in bones.

Q: How far from the plant will radioactive particles travel?
A: That depends on the prevailing wind and weather. Radioactive elements are heavy and don't remain airborne very long.

Q: How do you know if food is contaminated?
A: A sensitive radiation detector can be used to detect food contaminated with radioactive particles. There is no externally visible sign or indication.

Q: Can contamination from one vegetable be passed to another?
A: Cross-contamination is possible through the movement of dust or liquid from a contaminated article to a non-contaminated article.