Radiation: What You Need to Know

By Kathiann M. Kowalski

Nuclear radiation can affect our health—for better or worse.

You might not know exactly how to describe it, but chances are good that you know the word radiation can have two very different connotations. On the one hand, radiation exposure was one of the most feared consequences after an earthquake and a tsunami dam-sequence damaged a nuclear reactor in Japan earlier this year. On aged the other hand, radiation may have helped someone you know fight a disease such as cancer. How can one word have such different meanings?

All Around Us

Radioactive materials give off invisible atomic particles or energy called nuclear radiation. “Radiation is always around us,” notes Dr. Ritsuko Komaki, a professor of radiation oncology at the MD Anderson Cancer Center in Houston.

Very high exposures to nuclear radiation can cause sickness and, in the worst cases, death. But most radiation around us isn’t something to worry about. Some normal amounts of nuclear radiation come from the sun, along with the sun’s heat, visible light, ultraviolet rays, and more. Tiny bits of nuclear radiation are in soil too. “Usually it’s a very low dose, and it’s not harmful,” says Komaki.
Activities such as mountain climbing or taking a long airplane ride expose you to slightly more radiation—because you’re closer to the sun. Experts generally don’t worry about those exposures either.

Nuclear reactors, such as those at the Fukushima Daiichi plant in Japan that was damaged by the 2011 earthquake and tsunami, split uranium atoms. That action releases energy. The energy is used to boil water, which in turn creates steam that moves turbines that make electricity. When everything works, the process doesn’t pollute the air thing or water. Nuclear plants’ fuel and certain wastes, however, are radioactive.

When emergency measures failed at Fukushima, explosions and fires released radioactivity into the environment. Cleanup will take years. Meanwhile, the accident has heightened fears about radiation.
Radiation’s Risks

After a nuclear accident, radiation levels in the area of the nuclear plant can be thousands of times higher than they were before. Very high exposures cause acute radiation syndrome. Symptoms can range “from not feeling right to seizures and even loss of consciousness and death,” says Dr. David Weinstock at Boston’s Dana-Farber Cancer Institute.

In addition to making people sick right away, too much radiation can damage cells and raise a person’s risk of developing cancer later in life. In 1986, a nuclear power plant exploded in Chernobyl, Ukraine. Years later, thyroid cancer rates rose among young adults nearby. (The thyroid gland helps control the body’s energy levels and other functions.) The young people had grown up drinking milk from cows that ate contaminated grass.

Authorities are checking radiation levels in various foods and water to prevent similar problems in Japan. The U.S. Food and Drug Administration (FDA) is also monitoring foods coming from Japan to the United States. While scientists found slightly higher radiation on the West Coast after the Fukushima accident, amounts were way below danger shima levels. “The Fukushima event really poses no risk to people in the United States,” says Weinstock.

On the Plus Side

Nuclear radiation can help us get—and stay—healthy too. A special type of radiation is used to treat some meats, fruits, and vegetables to kill bacteria that can make people sick, for instance.

In the same way that nuclear radiation’s energy can kill some of the body’s cells, it can also be used to kill cancerous tumors. “We are just targeting the cancer cells and protecting normal tissue surrounding the cancer,” explains Komaki, who primarily researches lung cancer. According to the National Cancer Institute, approximately half of all cancer patients receive some form of radiation therapy as part of their treatment.
Some forms of nuclear radiation can help doctors track down health problems in the first place. Torso X-rays and computed tomography (CT) scans use nuclear radiation to see inside the body. The benefits from being able to find health problems generally outweigh any tiny risks from exposure to radiation, but some accidents have happened. As a result, the FDA wants medical scanning equipment to have even more safeguards than it does now. Either way, experts say it’s a good idea to limit your exposure to nuclear radiation even when it’s part of a medical test. Always ask why any scan is necessary, especially if you think you have had that same test recently. “If there’s no justifiable reason for the extra radiation exposure, then don’t let yourself be exposed” if you can help it, says Kelly Classic, a health physicist at Minnesota’s Mayo Clinic and spokesperson for the Health Physics Society.

Scientists and health experts around the globe continue to study nuclear radiation. They hope to harness its powerful benefits to continue to help people. When it’s used intentionally, radiation can be a boon to human health. “There are hundreds of thousands to millions of people who are alive today because we’ve harnessed the power of radiation,” says Weinstock.

Could It Happen Here?

The United States hasn’t had a major nuclear emergency since an accident closed Pennsylvania’s Three Mile Island power plant in 1979. Will an accident happen here again? “Nobody can answer that question,” says physicist Kelly
Classic, a spokesperson for the Health Physics Society. But, she says, companies and communities are prepared. Power companies have regular safety drills for plants and nearby communities. People living nearby have access to emergency medicines such as potassium iodide in case of an accident. (That medicine temporarily blocks radioactive iodine from entering, and possibly harming, the thyroid gland.) Hospitals and emergency responders conduct regular drills on handling emergencies too.

Radon and Indoor Air

A radioactive gas called radon exists in soil all over Earth. It forms when naturally occurring radioactive materials such as uranium ring break down. Radon can seep into basements and floors, and buildup of the gas inside a home can make people sick. See whether the Environmental Protection Agency recommends testing for homes in your area. Visit www.epa.gov/radon/index.html.

No, Your Food Won’t Glow

Treating some types of meat and produce with one type of nuclear radiation can prevent disease. The process, called food irradiation, uses “enough to destroy the bacteria, but not enough to destroy the quality or the nutritional
content of the food,” explains food scientist Christine Bruhn at the University of California, Davis. It doesn’t make food radioactive—just as an X-ray won’t make you radioactive.

Nonetheless, critics worry about possible accidents at processing plants. Detractors also say irradiation benefits farmers more than consumers. In their view, farms should avoid overcrowding in the first place—cramped conditions crowding on factory farms, they assert, stress animals and promote the types of disease that irradiation is then used to destroy.

In any case, bacteria can still contaminate food after irradiation. The best way to prevent foodborne illness, whether the food has been treated borne with irradiation or not? Practice safe food handling at home.
1. What is one way radiation is used that is beneficial for our health?
   A to kill bacteria in foods that could make us sick
   B to disinfect surfaces like tables and door handles where bacteria often live
   C to zap our bodies with extra energy for sports and activities
   D to damage cells and eventually cause things like thyroid cancer

2. In the article, how does the author describe radiation?
   A as something to avoid at all costs
   B as something that’s less harmful than its reputation suggests
   C as something that can be both good and bad
   D as something that is helpful for human health and food safety

3. Which of the following conclusions about radiation is supported by the passage?
   A Radiation is more harmful than helpful.
   B Radiation is neither harmful nor helpful.
   C Radiation is more helpful than harmful.
   D Radiation is both helpful and harmful.

4. Read the following sentence: “You might not know exactly how to describe it, but chances are good that you know the word radiation can have two very different connotations.”

   In this sentence the word connotations means
   A denotations
   B meanings
   C connections
   D implications

5. This passage deals primarily with
   A the ways that radiation can kill bacteria that may be present in foods
   B the effects, both positive and negative, that radiation can have
   C the fact that too much radiation can be harmful for our health, even causing cancer or death
   D why we should be careful about and try to minimize our exposure to radiation
6. How does radiation help doctors identify health problems in patients?

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____________________________________________________________________________________
____________________________________________________________________________________

7. Why do you think the accident at Fukushima has “heightened fears about radiation”?

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____________________________________________________________________________________
____________________________________________________________________________________

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

The author describes both the negative and positive sides of radiation _____ people understand all sides of the issue.

A  so  
B  because  
C  but  
D  before  

9. Answer the following questions based on the sentence below.

Radiation can increase the risk factor of cancer by damaging cells.

What? radiation

(does) What? ___________________________________________________________

How? _________________________________________________________________
10. Read the vocabulary word and definition below and complete questions 10a, 10b, and 11.

**Vocabulary Word:** contaminated (con·tam·i·nat·ed): impure or unusable.

**10a.** Read the sentences below and underline the word **contaminated**.

1. After the oil spilled into the river, the water was contaminated.

2. By touching the evidence with bare hands instead of using gloves, the investigator contaminated the evidence.

3. The waste products from the large factory contaminated the water source nearby.

4. If you don’t wash your hands before touching food, the bacteria on your hands could cause the food to become contaminated.

5. Radiation from a nuclear power plant explosion caused the grass around the area to become contaminated.

**10b.** Which picture most likely represents contaminated air?

![Picture 1](image1.png)  ![Picture 2](image2.png)

**11.** Would you drink a liquid if someone told you it had been contaminated?

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