

What Is Radiation Therapy?

Radiation therapy is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. It works by damaging the DNA inside cancer cells so they stop dividing or die. There are two main types: external beam radiation, which comes from a machine, and internal radiation, which is placed inside the body.

This page is for anyone who has been told radiation therapy may be part of their cancer treatment. It explains how it works, the main types, and what to expect.

The simple version

Radiation therapy (also called radiotherapy) is a cancer treatment. It uses high doses of radiation to kill cancer cells and shrink tumors. At low doses, radiation is used in x-rays to see inside your body, such as x-rays of your teeth or broken bones. Radiation therapy uses much higher doses.

How it works

At high doses, radiation therapy kills cancer cells or slows their growth by damaging their DNA. Cancer cells whose DNA is damaged beyond repair stop dividing or die. When the damaged cells die, they are broken down and removed by the body.

Radiation therapy does not kill cancer cells right away. It takes days or weeks of treatment before the DNA is damaged enough for cancer cells to die. Then, cancer cells keep dying for weeks or months after radiation therapy ends.

Radiation damages the DNA in cancer cells so they stop dividing or die — but not instantly.

The two main types

There are two main types of radiation therapy: external beam and internal.

External beam radiation therapy comes from a machine that aims radiation at your cancer. The machine is large and may be noisy. It does not touch you, but can move around you. It sends radiation to a part of your body from many directions. It is a local treatment, which means it treats a specific part of your body. For example, when someone has lung cancer, radiation goes only to the chest, not to the whole body.

Internal radiation therapy places a source of radiation inside your body. The source can be solid or liquid:

- With a **solid source**, the treatment is called brachytherapy. Seeds, ribbons, or capsules that contain a radiation source are placed in or near the tumor. Like external beam radiation, it is a local treatment.
- With a **liquid source**, the treatment is a form of systemic therapy. Systemic means the treatment travels in the blood to tissues throughout your body. There it seeks out and kills cancer cells. You receive it by swallowing it or through a vein via an IV line. With systemic radiation, your body fluids, such as urine, sweat, and saliva, will give off radiation for a while.

Which type you have depends on many factors. These include the type of cancer, the size and location of the tumor, and how close it is to sensitive tissues. They also include your general health and whether you will have other treatments.

Why it is used and which cancers it treats

Radiation therapy is used to treat cancer and to ease cancer symptoms. When used to treat cancer, it can cure cancer, prevent it from returning, or stop or slow its growth. When used to ease symptoms, it is called palliative treatment. For example, it can shrink tumors to relieve pain, trouble breathing, or loss of bowel and bladder control.

External beam radiation therapy is used to treat many types of cancer. Brachytherapy is most often used for cancers of the head and neck, breast, cervix, prostate, and eye. Radioactive iodine (I-131), a systemic treatment, is most often used for certain thyroid cancers.

How it is used with other treatments

For some people, radiation may be the only treatment needed. But most often, it is used with other treatments such as surgery, chemotherapy, and immunotherapy. Radiation may be given before, during, or after other treatments to improve the chances that treatment will work.

When combined with surgery, radiation can be given at three points:

- Before surgery, to shrink the cancer.
- During surgery, so it goes straight to the cancer.
- After surgery, to kill any cancer cells that remain.

Radiation is often one part of a larger treatment plan.

Lifetime dose limits

There is a limit to the amount of radiation an area of your body can safely receive over the course of your lifetime. Depending on how much radiation an area has already received, you may not be able to have radiation therapy to that area a second time. But if one area has already received the safe lifetime dose, another area might still be treated if the distance between the two areas is large enough.

The planning session

Treatment does not start at the first visit. First comes a planning session, often called simulation. You lie in the position you will be treated in, and a scan maps the exact area. The team may add small marks on your skin, or build a mold or a fitted mask to hold you still. No radiation is given that day. See what happens during radiation simulation.

Eating and working during treatment

Radiation can cause side effects that make it hard to eat, such as nausea, mouth sores, and throat problems. Your body uses a lot of energy to heal during treatment. So it is important to eat enough calories and protein to maintain your weight. If you are having trouble, talk to your doctor or nurse, or speak with a dietitian.

Some people work full-time during radiation therapy. Others work part-time or not at all. You are likely to feel well enough to work when you first start. As time goes on, you may feel more tired or weak. After treatment ends, it may take a few weeks or several months to feel better.

When to get help sooner

- **Call 911 or go to an emergency department if** you cannot catch your breath, your chest hurts, you cannot swallow your own saliva, or you have a seizure or sudden confusion. Do not drive yourself.
- **Call 911 or go to an emergency department if** you are suddenly confused or very hard to wake, you bleed heavily, or you vomit blood or material that looks like coffee grounds. Do not drive yourself.
- **If chemotherapy is part of your plan, or you have low white cells, call your care team right away, day or night, if** your temperature is 100.4°F (38°C) or higher. CDC says to call your doctor immediately. Fever may be the only sign of an infection, and an infection can be life-threatening during chemotherapy. Also call right away for chills, a sore throat, mouth sores, burning when you urinate, redness at a catheter site, or any other sign of infection, even without a fever. A normal temperature is not permission to wait. If nobody picks up quickly, go to an emergency department and say you are having chemotherapy.
- **Call your care team the same day if** the treated skin turns raw, weeps or opens into a sore. NCI calls this a moist reaction, and it can get infected. Also call the same day for a temperature of 100.4°F (38°C) or higher when you are not having chemotherapy.
- **Call your care team within a day or two if** the treated skin itches, peels or feels sunburned and creams are not helping. Call too if nausea, mouth soreness or throat trouble is keeping you from eating and drinking normally. Do not wait for the next scheduled review to raise it.

Sources: [NCI — Skin and Nail Changes During Cancer Treatment](https://www.cancer.gov/about-cancer/treatment/side-effects/skin-nail-changes) (cancer.gov/about-cancer/treatment/side-effects/skin-nail-changes) and [CDC — Fever during cancer treatment](https://www.cdc.gov/cancer-preventing-infections/patients/fever.html) (cdc.gov/cancer-preventing-infections/patients/fever.html)

Source: National Cancer Institute (cancer.gov/about-cancer/treatment/types/radiation-therapy)

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