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# How Radiation Therapy Is Used to Treat Cancer

Radiation is one of the most common treatments for cancer. Other names for radiation treatment are *radiation therapy*, *radiotherapy*, *irradiation*, and *x-ray therapy*.

## What is radiation therapy?

Radiation therapy uses high-energy particles or waves, such as x-rays, gamma rays, electron beams, or protons, to destroy or damage cancer cells.

Your cells normally grow and divide to form new cells. But cancer cells grow and divide faster than most normal cells. **Radiation works by making small breaks in the DNA inside cells. These breaks keep cancer cells from growing and dividing and cause them to die.** Nearby normal cells can also be affected by radiation, but most recover and go back to working the way they should.

While [chemotherapy](#)<sup>1</sup> and other treatments that are taken by mouth or injection usually expose the whole body to cancer-fighting drugs, radiation therapy is usually a local treatment. This means it's usually aimed at and affects only the part of the body needing treatment. Radiation treatments are planned so that they damage cancer cells with as little harm as possible to nearby healthy cells.

Some radiation treatments (systemic radiation therapy) use radioactive substances that are given in a vein or by mouth. Even though this type of radiation does travel throughout the body, the radioactive substance mostly collects in the area of the tumor, so there's still little effect on the rest of the body.

## Who gets radiation therapy?

More than half of people with cancer get radiation therapy. Sometimes, radiation therapy is the only cancer treatment needed and sometimes it's used with other types of treatment. The decision to use radiation therapy depends on the type and stage of cancer, and other health problems a patient might have.

## What are the goals of radiation therapy?

Most types of radiation therapy don't reach all parts of the body, which means they're not helpful in treating cancer that has spread to many places within the body. Still, radiation therapy can be used to treat many types of cancer either alone or in combination with other treatments. While it's important to remember each cancer and each person is different, radiation is often the treatment of choice for the following purposes.

### To cure or shrink early-stage cancer

Some cancers are very sensitive to radiation. Radiation may be used by itself in these cases to make the cancer shrink or completely go away. In some cases, chemotherapy or other anti-cancer drugs may be given first. For other cancers, radiation may be used before surgery to shrink the tumor (this is called *pre-operative therapy* or *neoadjuvant therapy*), or after [surgery](#)<sup>2</sup> to help keep the cancer from coming back (called *adjuvant therapy*).

For certain cancers that can be cured either by radiation or by surgery, radiation may be the preferred treatment. This is because radiation can cause less damage and the part of the body involved may be more likely to work the way it should after treatment.

For some types of cancer, radiation and chemotherapy or other types of anti-cancer drugs might be used together. Certain drugs (called *radiosensitizers*) help radiation work better by making cancer cells more sensitive to radiation. Research has shown that when anti-cancer drugs and radiation are given together for certain types of cancer, they can help each other work even better than if they were given alone. One drawback, though, is that side effects are often worse when they are given together.

### To stop cancer from coming back (recurring) somewhere else

Cancer can spread from where it started to other body parts. Doctors often assume that a few cancer cells might already have spread even when they can't be seen on imaging scans like CT scans or MRIs. In some cases, the area where the cancer most often spreads to may be treated with radiation to kill any cancer cells before they grow into tumors. For instance, people with certain kinds of lung cancer may get radiation to the

head, even when there is no cancer known to be there, because their type of lung cancer often spreads to the brain. This is done to help prevent cancer from spreading to the head even before it can. Sometimes, radiation to prevent future cancer can be given at the same time that radiation is given to treat existing cancer, especially if the area the cancer might spread to is close to the tumor itself.

### **To treat symptoms caused by advanced cancer**

Sometimes cancer has spread too much to be cured. But some of these tumors can still be treated to make them smaller so that the person can feel better. Radiation might help relieve problems like pain, trouble swallowing or breathing, or bowel blockages that can be caused by [advanced cancer](#)<sup>3</sup>. This is called *palliative radiation*.

### **To treat cancer that has returned (recurred)**

If a person's cancer has returned (recurred), radiation might be used to treat the cancer or to treat symptoms caused by advanced cancer. Whether radiation will be used after recurrence depends on many factors. For instance, if the cancer has come back in a part of the body that has already been treated with radiation, it might not be possible to give more radiation in the same place. It depends on the amount of radiation that was used before. In other instances, radiation might be used in the same area of the body or a different area. Some tumors do not respond as well to radiation, so radiation might not be used even if they recur.

## **How is radiation therapy given?**

Radiation therapy can be given in 3 ways:

- [External radiation \(or external beam radiation\)](#)<sup>4</sup>: uses a machine that directs high-energy rays from outside the body into the tumor. It's done during outpatient visits to a hospital or treatment center. It's usually given over many weeks and sometimes will be given twice a day for several weeks. A person receiving external radiation is not radioactive and does not have to follow special safety precautions at home.
- [Internal radiation](#)<sup>5</sup>: Internal radiation is also called *brachytherapy*. A radioactive source is put inside the body into or near the tumor. With some types of brachytherapy, radiation might be placed and left in the body to work. Sometimes it is placed in the body for a period of time and then removed. This is decided based on the type of cancer. Special safety precautions are needed for this type of

radiation for a period of time. But it's important to know if the internal radiation is left in the body, after a while it eventually is no longer radioactive.

- **Systemic radiation<sup>6</sup>:** Radioactive drugs given by mouth or put into a vein are used to treat certain types of cancer. These drugs then travel throughout the body. You might have to follow special precautions at home for a period of time after these drugs are given.

The type of radiation you might get depends on the kind of cancer you have and where it is. In some cases, more than one type is used. Your cancer care team can answer specific questions about the type of radiation prescribed for you, how it affects your body, and any precautions that may be needed.

## Who gives radiation therapy treatments?

During your radiation therapy, a team of highly trained medical professionals will care for you. Your team may include these people:

- **Radiation oncologist:** This doctor is specially trained to treat cancer with radiation. This person oversees your radiation treatment plan.
- **Radiation physicist:** This is the person who makes sure the radiation equipment is working as it should and that it gives you the exact dose prescribed by your radiation oncologist.
- **Dosimetrist:** This person helps the radiation oncologist plan the treatment.
- **Radiation therapist or radiation therapy technologist:** This person operates the radiation equipment and positions you for each treatment.
- **Radiation therapy nurse:** This nurse has special training in cancer treatment and can give you information about radiation treatment and managing side effects.

You may also need the services of a dietitian, physical therapist, social worker, dentist or dental oncologist, pharmacist, or other health care providers.

## Does radiation therapy cause cancer?

It has long been known that radiation therapy can slightly raise the risk of getting another cancer. It's one of the possible side effects of treatment that doctors have to think about when they weigh the benefits and risks of each treatment. For the most part, the risk of a second cancer from these treatments is small and is outweighed by the benefit of treating the cancer, but the risk is not zero. This is one of the many reasons

each case is different and each person must be part of deciding which kind of treatment is right for them. The risk is different depending on where the radiation treatment will be in the body.

If your cancer care team recommends radiation treatment, it's because they believe that the benefits you'll get from it will outweigh the possible side effects. Still, this is your decision to make. Knowing as much as you can about the possible benefits and risks can help you be sure that radiation therapy is best for you.

## Does radiation therapy affect pregnancy or fertility?

**Females:** It's important not to become pregnant while getting radiation – it can harm the growing baby. If there's a chance you might become pregnant, be sure to talk to your doctor about birth control options.

If you are or might be pregnant, let your doctor know right away.

If the area getting radiation in your body includes the ovaries, it is possible that the dose of radiation can cause the ovaries to no longer work (sterility), and that you would be unable to have children. It is important to know the risk of this possibility in advance of receiving radiation therapy. If you are thinking about radiation therapy that will affect the ovaries, talk to your doctor about how this might affect having children in the future.

**Males:** Not much is known about radiation's effect on the children conceived by men while getting radiation therapy. Because of this, doctors often advise men to not get a woman pregnant during and for some weeks after treatment. Talk to your doctor to find out more about this.

If the area getting radiation includes the testicles, it is possible that the dose of radiation can cause the testicles to no longer work (sterility) and that you would be unable to have children. It is important to know the risk of this possibility in advance of receiving radiation therapy. There is no clear research about how sperm that is exposed to radiation affects future children made from that sperm. If you are thinking about radiation therapy that will affect the testicles, talk to your doctor about how this might affect having children in the future.

Learn more in [How Cancer and Cancer Treatment Can Affect Fertility](#)<sup>7</sup>.

## Questions to ask about radiation therapy

Before treatment, you'll be asked to sign a consent form saying that your doctor has

explained how radiation therapy may help, the possible risks, the type of radiation to be used, and your other treatment options. Before signing the consent form, be sure that you have had a chance to get all your questions answered. Here are some of the things you may want to ask about:

- What's the purpose of radiation treatment for my type of cancer? To destroy or shrink the tumor? To prevent or stop cancer spread? To lower the chance the cancer may come back?
- What's the chance that the cancer will spread or come back if I do – or don't – get radiation therapy?
- What type of radiation therapy will I get?
- Are there other treatment options?
- What can I do to be ready for treatment?
- Can I eat before treatment or do I need to avoid certain foods before getting treatment?
- Do I need to follow a certain diet while I'm on treatment?
- What will radiation treatment be like?
- How often is it given? How long will each treatment take? How long will I be on radiation?
- What should I do if I have trouble getting to a treatment because of ride problems or weather?
- How will the radiation affect the area near the cancer?
- How will I feel while I'm getting treatment? Will I be able to work? Go to school? Take care of my family?
- What side effects am I likely to have, when will they start, and how long will they last?
- Will any of these side effects affect how I do things, such as eat or drink, exercise, work, etc.?
- Will treatment and/or side effects change how I look?
- What long-term side effects might I have?
- Will I be at higher risk for any other health problems in the future?
- Will I be radioactive during or after my treatment?
- Are any special precautions needed during or after my treatment?

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html)

2. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html)
3. [www.cancer.org/treatment/understanding-your-diagnosis/advanced-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/advanced-cancer.html)
4. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/external-beam-radiation-therapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/external-beam-radiation-therapy.html)
5. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/internal-radiation-therapy-brachytherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/internal-radiation-therapy-brachytherapy.html)
6. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/systemic-radiation-therapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation/systemic-radiation-therapy.html)
7. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/fertility-and-sexual-side-effects/how-cancer-treatment-affects-fertility.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/fertility-and-sexual-side-effects/how-cancer-treatment-affects-fertility.html)

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Last Medical Review: December 27, 2019 Last Revised: December 27, 2019

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