

Radiation Therapy in Dogs, Cats, and Other Small Animals

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In veterinary medicine, radiation therapy was first attempted at the beginning of the twentieth century. During the last 50 years, large advances have been made. The use of histopathology, [MRI](#), and [CAT scans](#) has resulted in accurate diagnosis of the type and location of tumors. New technology has increased the effectiveness and decreased the side effects and risks of radiation therapy.

Under what conditions is radiation therapy used?

Radiation therapy can be used in combination with surgery and/or chemotherapy to provide permanent control or death of a tumor. It is used for tumors that have not spread to other sites in the body and offers a potential cure for some localized tumors. In other cases, radiation therapy can be used for its palliative effect (relieving the signs of disease). Even if the tumor can not be destroyed, at least shrinking the tumor may improve the quality of life of the animal by reducing pressure, bleeding, or pain.

Which tumors are commonly treated with radiation therapy?

Oral tumors and tumors within the nasal cavity often respond well to radiation therapy. Brain tumors have been successfully treated, as have small skin tumors, including some mast cell tumors and squamous cell carcinomas. Lymphoma in both [cats](#) and [dogs](#) has responded to radiation therapy, and it is often used in conjunction with chemotherapy. The management of bone tumors, including [osteosarcoma](#), has used radiation therapy as part of the regimen.

In considering good candidates for radiation therapy, issues that must be included in the decision-making process include:

- The owner's wishes, commitment, time, and financial resources
- The pet's overall health and presence of any other disease conditions
- The probability of control of the tumor, which must take into account its size, type, location, and any metastasis
- Availability of other treatments, e.g.; surgery, chemotherapy
- Predicted outcome of radiation and other treatments in relation to cosmetic effects and function

How does radiation therapy work?

Using radiation therapy, beams of photons, electrons, or gamma rays are focused on the tumor. When the photon, electron, or wave hits the nucleus of a cell, it alters it, destroying the ability of the cell to divide and grow. The slower growth rate and ultimate death of the cancer cells causes the tumor to shrink over time. Radiation affects both normal and cancer cells, but the radiation treatment is designed to produce the maximum effect on the tumor and minimize the effect on normal tissue.

What are the types of radiation therapy?

There are many types of radiation therapy. Some radioactive particles can be injected into the body and localize in specific tissues. Radiation therapy using iodine, which collects in the thyroid gland, has been used to treat thyroid disease, such as [hyperthyroidism](#) in cats.

"Brachytherapy" is the term used to describe the radiation therapy that is administered through radioactive implants. Implants of iridium-192 are the most commonly used. Radioactive wire containing iridium-192 can be placed using a large needle, or through minor surgery. This type of therapy has been used to treat nasal tumors in dogs and fibrosarcomas in cats.

Beams of radiation are the type of therapy most people are familiar with. A linear accelerator can be programmed to produce varying levels of photon or electron beams that are focused on a certain area on or within the body. Large orthovoltage machines, which are very large [x-ray](#) machines, form beams of electrons. Cobalt-60 machines produce gamma electromagnetic waves. These beams, or waves, are focused on the tumor, and when the actual burst of radiation therapy is over, no radioactivity remains in the body.

How is beam radiation therapy administered?

During the treatment, the animal will need to be anesthetized because he cannot move during the procedure. During the first session, the animal is placed on the table. Using radiographs (x-rays), MRIs, and CAT scans, the exact location of the tumor is located. Using mathematical formulas and mapping techniques, the machine is programmed and positioned to focus the beam on the tumor. Various points on the animal's skin may be marked to provide "landmarks" for subsequent treatments. This machine setup usually requires 30-60 minutes. The actual treatment time during the following sessions is very short, and the animal is usually anesthetized for only 10-15 minutes.

How often is radiation therapy administered?

When administered with curative intent, radiation therapy is given in small fractions over 2-5 weeks, depending on the size and location of the cancer, the pet's general health, and the type of cancer they have. For palliative effects, radiation therapy is given in large fractions, usually once weekly for three weeks.



What are the risks and side effects of radiation therapy?

Severe toxic effects of radiation therapy in pet animals are rare, and occur in less than 5% of the animals treated. Because the radiation affects all cells, some normal cells will be killed. Side effects of radiation therapy occur more often with curative attempts, and can be categorized into acute and chronic problems. Acute injuries begin during or shortly after the completion of therapy. They arise in tissues within the radiation therapy field that are growing and dividing rapidly. The most common acute effects are skin problems that mimic a severe sunburn, which sometimes causes the animal to scratch. Since the scratching will further traumatize the skin, medications may be prescribed to reduce the itchiness. Hair loss often occurs at the area where the beam penetrates and leaves the body. The hair will grow back with time, but may be darker or lighter.

Oral and nasal tumors may develop a foul odor as they die.

Chronic side effects arise from damage to tissues that slowly replace old, dying, or damaged cells (i.e., bone, retina, brain). Because these cells reproduce slowly, it takes a longer period of time for them to be replaced. Clinical syndromes such as the formation of bony sequestra, retinal lesions, and neurologic signs may appear, depending upon the area of the body being treated. If the eye is near the radiation field, a loss of tears ([keratoconjunctivitis sicca](#)) or vision may occur. Chronic side effects are dose limiting, meaning the dose of radiation may need to be limited if chronic side effects are observed. Veterinary radiation therapy protocols are designed to minimize long-term problems.

There is always a slight risk associated with general anesthesia, but the pet is monitored carefully while it is anesthetized, and the duration of anesthesia is generally short. Prior to radiation therapy, each animal is assessed through laboratory tests and a physical examination.

Radiation therapy in pets usually does NOT cause systemic side effects (tiredness, loss of appetite, nausea).

How much does radiation therapy cost?

Depending on the type and number of treatments, radiation therapy may cost \$900 - \$3,500. The cost is a result of the expensive and complex equipment needed, anesthetic and laboratory costs, and the expertise of the many veterinary health care professionals involved.