RADIATION THERAPY SIDE EFFECTS IN PETS

VIRGINIA VETERINARY CENTERS
BUSH VETERINARY NEUROLOGY SERVICE

Radiation therapy is a powerful tool used to treat cancer in animals, either alone or as part of a broader treatment plan. Like all treatments, it may come with side effects, depending on the area being treated and the normal tissues that receive radiation. This guide will help you understand what to expect during and after your pet's radiation therapy.

Adverse Radiation Effects (AREs)

Side effects from radiation are classified based on when they appear:

- Early (Acute) Effects: These typically appear around the second week of treatment and may continue for up to two weeks after therapy ends. Early effects often affect fast-dividing tissues such as skin and mucous membranes. These effects are temporary and usually resolve within 3 to 4 weeks.
- Delayed-Acute Effects: These occur between 2 to 6 months post-treatment and are usually due to inflammation or the body's response to dying tumor cells.
- Late Effects: These develop six months or more after radiation therapy and may be permanent. Late effects often affect slow-dividing tissues such as the brain, heart, bones, and spinal cord. In rare cases, a new tumor (secondary cancer) can develop within the previously treated area years after therapy.

Skin Effects

When treating tumors on or near the skin, redness and irritation can begin around week two. These acute skin reactions are similar to a bad sunburn and may include peeling, sensitivity, or moist desquamation (weeping sores). Hair loss in the treated area is common by week three and may be permanent or regrow with changes in color or texture. Pain and discomfort from these effects can usually be managed with prescribed pain medications. In some cases, the affected skin can become infected and may require antibiotic treatment. Prevent your pet from scratching or licking these areas with an E-collar, as trauma delays healing and increases the risk of complications. Late skin effects can include permanent hair loss, skin thickening, or pigment changes in the treated area.

Paw/Nail-Bed: Dogs treated at the paw pad or nail-bed often experience sloughing of a portion of the nail or paw pad. This sloughing can be uncomfortable, and we usually prescribe pain medications for a week or two to help minimize discomfort during the healing process.

Oral, Esophagus, and Tracheal Effects

Radiation in the jaw, nasal area, or skull can cause inflammation of the mouth and throat (mucositis), resulting in red, swollen, and ulcerated tissue. Pets may drool, have foul breath, eat less, or resist eating due to pain or changes in taste. The trachea and esophagus may also be affected, especially if the neck or chest is targeted. This can lead to coughing, vomiting, regurgitation, hoarse voice, louder breathing, or painful swallowing.

Many pets experience reduced appetite due to discomfort and taste changes. Offering soft or warmed foods–such as cooked chicken, turkey, hamburger, or baby food (without onion or garlic)–can help increase interest. Some pets prefer small, hand-fed bites. Feeding soft food during, and for 2–3 weeks after, treatment is recommended. In some cases, a feeding tube may be needed to maintain nutrition.

Transient irritation of the trachea or esophagus is not uncommon and typically resolves within 1–2 weeks post-treatment. Sucralfate may be used to soothe the esophagus during this time.

A rare late effect is fibrosis, a hardening of the trachea or esophagus. If this occurs, balloon procedures may be used to help open narrowed areas, although symptoms are uncommon.

Nasal Cavity Effects

Radiation often worsens pre-existing nasal discharge and sneezing during treatment, especially with nasal tumors. This typically improves 2 to 4 weeks after therapy ends, though chronic rhinitis may occur months to years later. A change in discharge color (yellow-green) may suggest infection and should be reported.

Radiation to the nasal or maxillary region can also increase the risk of osteoradionecrosis, a condition where bone tissue fails to heal properly. This is especially important for dental procedures, as trauma to irradiated areas may worsen complications. Pets that have received radiation to these regions should consult with a veterinary dental specialist before undergoing any dental work.

Radiation can also damage the nasal turbinates–structures responsible for humidifying and filtering inhaled air. Loss of turbinate function may result in long-term symptoms such as persistent nasal discharge, sneezing, and increased susceptibility to infections.

In rare cases, radiation may cause a palatal fistula, an abnormal opening between the nasal cavity and the mouth. This can lead to recurrent infections, discomfort, and food or water entering the nasal passages. Management of fistulas depends on the size and location and may be challenging.

Eye Effects

When radiation includes the eyes, inflammation (conjunctivitis, keratitis) or dry eye (KCS) can occur. KCS may arise 2 to 6 weeks after therapy and may be permanent. Cataracts may form within 6 to 12 months, potentially impairing vision. Treatments near the eye carry a risk of long-term complications, though we strive to minimize them. These include cataracts, corneal inflammation, retinal damage, conjunctivitis, and eyelid irritation. Some effects may be temporary, while others may be permanent. A veterinary ophthalmologist may recommend baseline and follow-up exams. Cataract surgery may be an option if blindness affects quality of life.

Ear Effects

Radiation affecting the skull or brain may involve one or both ears. The lining of the ear canal can become inflamed, producing discharge or leading to temporary hearing loss. In rare cases, permanent balance problems or chronic ear infections can occur.

Brain and Spinal Cord Effects

Pets treated for brain tumors are more likely to experience neurologic side effects, which are categorized by when they occur:

- **Acute Effects:** These occur during treatment or within two weeks after completion and are often related to repeated anesthesia or transient brain swelling. Symptoms may include mild lethargy, disorientation, or in rare cases, seizures. These effects are typically short-lived and resolve with supportive care.
- **Acute Delayed Effects:** Occurring in approximately 10%-30% of patients, these effects appear between 2 weeks and 4 months after treatment. They are believed to be caused by inflammation or edema in the brain from radiation or tumor breakdown. Symptoms may involve worsening of pre-existing neurologic signs or development of new ones such as ataxia or changes in behavior. Most cases respond well to corticosteroids and resolve over time.
- **Late Effects:** These arise 6 months or more following therapy and may include permanent neurologic deficits such as decreased mobility, weakness, paralysis, behavioral changes, cognitive decline, or seizures. These effects result from long-term tissue damage such as fibrosis or vascular injury. While less common, they may require chronic management with medications or physical therapy.

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Lung Effects

- **Pneumonitis:** This early late effect typically develops 6-12 weeks after radiation when lung tissue is near the treatment field. Pneumonitis is inflammation of the lung tissue and is usually asymptomatic, though mild coughing or changes in breathing can occur. Chest x-rays are recommended 2–3 months after radiation to screen for signs. If pneumonitis is seen on imaging, treatment with anti-inflammatory steroids is often started to reduce inflammation and limit long-term damage. Follow-up x-rays are typically done about a month later. Some patients may require multiple rounds of steroids and imaging. Even if small regions of fibrosis (scarring) develop, clinical signs are uncommon.
- **Fibrosis:** Fibrosis is permanent lung scarring that can occur 9 to 12 months post-radiation. This reduces lung flexibility and functional volume, but most pets tolerate the change well and maintain a normal quality of life, even with moderate reductions in lung capacity.

Heart Effects

- **Acute:** Radiation to the chest may cause short-term inflammation or changes in heart rhythm, though this is rare and typically subclinical.
- **Late:** Months to years later, radiation-induced heart disease (RIHD) may develop, especially if combined with cardiotoxic chemotherapy. This may include arrhythmias or decreased heart function.

Bladder and Colon Effects

- **Acute:** Radiation to the pelvic area may include the bladder, rectum, or colon. These tissues have rapidly dividing cells, making them sensitive to radiation.
    - Colitis can develop around the second week of treatment and last 2–4 weeks after radiation ends. Signs include diarrhea–sometimes with mucus or blood–and increased frequency of defecation. Long-term intermittent colitis is possible in some cases.
    - Cystitis (inflammation of the bladder) can cause straining to urinate, increased urgency, and blood in the urine (hemorrhagic cystitis). Medications or dietary changes may be recommended for symptom management.
- **Stress Colitis:** Diarrhea that begins within the first 1–3 days of therapy is typically due to stress from hospitalization rather than radiation. This is usually managed with oral medication and tends to improve as the pet adapts to the treatment routine.
- **Late:** Months after radiation, scar tissue may cause strictures in the colon or bladder. These can lead to difficulty defecating or urinating. Complete urinary obstruction is an emergency and requires immediate veterinary care.

Small Intestines

Radiation to the abdomen may cause diarrhea and increased bowel movements starting late in the second week of treatment, lasting a couple of weeks.

Feline Abdomen: Cats treated for abdominal tumors may develop vomiting, diarrhea, or reduced appetite. Around 50% show changes in blood counts. Older cats may be at risk for kidney damage.

Adrenal Gland Effects

Radiation therapy may be directed at the adrenal glands themselves, especially in cases of adrenal tumors, or the glands may be affected incidentally when treating nearby structures such as the spine or abdomen. Short-term effects may include fatigue and gastrointestinal upset. Based on animal studies, there is a potential for altered hormone production–such as changes in cortisol levels–months after treatment. While uncommon, adrenal insufficiency is a possible late effect and may require hormone monitoring or replacement therapy in some cases.

Pancreas Effects

When included in the radiation field, the pancreas may develop inflammation, leading to vomiting or diarrhea. Late effects on pancreatic function are not well understood.

Reproductive Effects

Radiation to the pelvis may cause temporary discomfort. Late effects include permanent infertility, especially in males. In females, ovarian damage may disrupt hormonal balance or cause sterility.

Musculoskeletal Effects

Radiation can affect bones and soft tissue months to years after treatment. Rarely, bone necrosis or fractures may occur. Fibrosis (scarring) in muscles may also develop.

Lymphedema

Radiation involving an entire limb can impair lymphatic drainage, causing limb swelling weeks to months post-treatment. Supportive care includes pain management and physical therapy.

Secondary Tumors

Rarely, a new tumor unrelated to the original cancer can develop in a previously treated area years later.

What to Watch For

Monitor your pet for:

- Appetite changes
- Drooling or swallowing problems
- Sneezing, coughing, or nasal/eye discharge
- Lethargy or behavior changes
- Difficulty walking or balance issues
- Changes in urination or defecation
- Red or irritated skin

This is not an exhaustive list, and unexpected side effects can occur.

Please contact your oncology team if you notice any of these signs. Most side effects can be managed with medications and supportive care, and your care team is here to guide you through every step.

Conclusion: Radiation therapy remains a cornerstone of cancer treatment in pets. Understanding potential side effects allows for early intervention and better overall care. We are committed to supporting both you and your pet through this process.