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In this Issue

In April we present an article on Immunotherapy as an effective treatment for cancer. Hope you gain insight into how this treatment is being used and can aid in treating canine cancer . This article is being reproduced with permission from the Cornell University College of Veterinary Medicine's DogWatch newsletter, published by Belvoir Media Group

Immunotherapy treatment

Immunotherapy helps the body use its own weapons

According to Dr. John Yannelli, associate professor of immunology at the University of Kentucky, close to 10% of the 70 million dogs in the United States will develop cancer. The risk increases with age. More than 50% of dogs over age 10 will suffer from some type of cancer, and 25% of those will die from cancer.

For some canine cancers, immunotherapy is more than the latest buzzword. It's an effective treatment. Traditional cancer therapies either destroy cancers via radiation or surgery, or as with chemotherapy, attack the dog's cancer while also damaging their immune system. A big plus to immunotherapy is that it can be specific — targeting only abnormal cells and not affecting other normal cells.

What is immunotherapy?

Immunotherapy uses your dog's own immune system to fight and destroy cancer cells. A healthy immune system recognizes and destroys abnormal cells every day.

While the immune system is normally triggered by the rapid rate at which cancer cells replicate, it can be overtaken by cancer cells. They can multiply at too quickly for the immune system to react, or the cancer cells can sometimes hide from the immune system and escape immediate recognition. In these cases, the immune system may need to be stimulated to recognize the cancer cells and attack them.

A developing therapy

There are some caveats to using immunotherapy. Much of the information on immunotherapy for dogs has been extrapolated from human studies, and the canine immune system has not been studied as extensively as the human one. The "workhorse cells" of canine immune systems, lymphocytes, have not been fully characterized. This can make it harder to predict which dogs and which cancers are most likely to respond to immunotherapy.

Dr. Kelly R. Hume, associate professor of oncology in the Department of Clinical Sciences, emphasizes that it is difficult to determine which patients will benefit from immunotherapy, as well as which therapies have trials and data backing their safety and efficacy.

“One challenge with immunotherapy is predicting which patients will respond,” says Hume. “There is a lot of research going on both to find ways to increase the number of patients that respond to immunotherapies and to identify biomarkers that will predict which patients will respond. Because there are very few immunotherapies available in veterinary medicine, there are not yet many hurdles to commercializing these products. Practitioners and owners need to be vigilant about requesting peer-reviewed efficacy and safety data on immunotherapy products that are commercially available.”

Immunotherapy seems to work best with a smaller “cancer load,” which means many cancers respond best after radiation, surgery or chemotherapy has helped shrink the cancer first. But that increases the cost of treatment and requires more owner compliance.

Limitations

In fairness to this evolving therapy, cancers in dogs are not as extensively identified as are human cancers from both appearance (phenotype) and genetic (genotype) perspectives. That makes it difficult to create unique immunotherapies that would be appropriate for an individual dog’s tumors. Different dog breeds show varying susceptibility to cancers, and there are even variations in how cancers develop and respond to therapy in different breeds or lines within a breed. Much cancer research involves collaboration with human medical researchers. Dr. Kristy Richards '90, a groundbreaking cancer researcher and associate professor of biomedical sciences, studied canine lymphoma and how the treatments could benefit both people and dogs. One immunotherapy area where there is a lot of research interest is chimeric antigen receptor (CAR) T cells.

T cells are one of the immune system's warriors that attack cancer cells and other pathogens. With CAR, an antibody becomes part of a T cell. Since it is on the surface, it can easily identify and bind with cancer cells. Of course, the T cell comes along with the antibody and can then kill the cancer cell. Richards described CAR as a “guided missile” heading for cancer cells.

Cancer vaccines

Cornell is participating in a national, multi-institutional study evaluating an osteosarcoma vaccine for dogs. “The results are being analyzed elsewhere and results are not available yet,” says Hume. But it’s one of the comparative oncology projects that will hopefully benefit both people and dogs.

For research on canine cancers, most of the work is done with patients with naturally occurring cancers. For many owners, participating in a clinical trial helps financially while also contributing to cancer knowledge. The first cancer vaccine to have widespread use is Oncept from Merial. This vaccine was designed to prevent metastases of melanoma. In dogs, melanomas tend to occur in dark-pigmented dogs such as Scottish Terriers and are not directly related to sun exposure. If the melanoma appears in the mouth or nail beds, it tends to be very aggressive with rapid spread to local lymph nodes and to the lungs. This vaccine includes DNA from the human melanocyte protein tyrosinase.

Human tyrosinase is similar to the same enzyme in dogs and is part of pigment production. It is present in most melanomas. So when this vaccine is given, the dog mounts an immune response that cross-reacts to both the human and canine tyrosinase, and goes after any melanoma cells. A rare side effect is that the immune system indiscriminately goes after a dog's normal pigment cells, as well as the cancer cells leading to depigmentation or a graying of the coat.

Some concern has been expressed over the use of this vaccine. In companion animals, the USDA reviews data on efficacy and safety of biological therapies like cancer vaccines, rather than the FDA. "The published data on the melanoma vaccine is a bit of a mixed bag," says Hume. "One U.S. study shows a significant benefit, another does not. We do use the vaccine at Cornell, and our experience seems to mimic what is published. Some dogs seem to benefit, but others do not. The dogs that seem to do best receive the vaccine in combination with other treatments, such as surgery and radiation therapy. There are some other things, such as tumor size and invasiveness, that we can use to help guide our decision making, but unfortunately there isn't a perfect biomarker to help us predict who will benefit and who won't."

Veterinary colleges in Wisconsin, California and Colorado are taking a different approach to canine cancer immunotherapy. They have started a five-year study using a universal "cancer vaccine" as a preventive measure.

In this case, the vaccine targets about 30 proteins found on cancer cells as a result of mutations. These proteins are not normally found on healthy dog cells, so the vaccine is designed to specifically target any abnormal cells that develop. The researchers hope to deter lymphoma, osteosarcoma, hemangiosarcoma and mast cell tumors (mastocytomas). These are fairly common and deadly canine cancers.

Autologous vaccines are being explored to help dogs with cancer. In an autologous vaccine, some of the dog's own tumor cells are extracted, deactivated and treated to stimulate an intense immune reaction. Multiple tumor antigens are present in the vaccine so theoretically the immune response should be very strong and very specific.

This immunotherapy requires your veterinarian to send a sample of the tumor to a laboratory that then creates the vaccine. Your dog eventually receives enough vaccine for a minimum of three weekly injections.

So far, the autologous vaccines have primarily been used against solid cancers such as anal sac adenocarcinomas and transitional cell carcinomas. Some dogs have seen regression of their tumors, others have had tumors stabilize and some have had no recurrence of a growth that was surgically removed. The Torigen Company has made personalized vaccines for more than 250 dogs and cats and will be publishing results soon.

Bottom line

The best response comes from attacking cancer on multiple levels: immunotherapy, surgery, chemo and radiation.

“I think the future of cancer therapy involves a multi-modal approach, meaning utilizing multiple different treatment strategies. There are some cancers where autologous vaccines might ultimately be part of a successful treatment approach,” says Hume.

“It’s always important to remember that cancer isn’t just one type of disease," she continues. "Therefore, treatment regimens need to be tailored to individual patients."

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