OSTEOSARCOMA

Stopping Metastatic Disease and Giving Dogs Longer, Healthier Lives

Morris Animal Foundation is dedicated to advancing the diagnosis and treatment of canine osteosarcoma, the most common type of malignant bone tumor in dogs. While safe and effective treatment options are available to treat the primary cancer, metastatic disease condemns most dogs to death within two years of diagnosis. Osteosarcoma aggressively spreads to other tissues resulting in a high mortality rate. Better treatments are desperately needed to slow or stop metastasis.

EVERY YEAR, IN THE UNITED STATES ALONE

10,000+
DOGS ARE DIAGNOSED WITH OSTEOSARCOMA

4,000 to 8,000
DOGS DIE FROM METASTATIC DISEASE

80%
OF DOGS DIE WITHIN TWO YEARS OF DIAGNOSIS

90% **OF DOGS NEWLY DIAGNOSED WITH OSTEOSARCOMA, CANCER HAS ALREADY METASTASIZED**

WHY THIS IS ONE OF THE TOP CANINE CANCERS WE NEED TO SOLVE

STAGNANT SURVIVAL STATISTICS

Despite advances in canine oncology in the last 30 years, there has been no notable progress in the treatment and survival of dogs with osteosarcoma. Most dogs survive less than one year after diagnosis due to cancer spread throughout the body. Less than 25 percent of dogs survive for two years after initial diagnosis and treatment with conventional therapies.

HIGH-RISK BREEDS

Many large and giant breed dogs are predisposed to osteosarcoma, including Rottweilers, golden retrievers, Irish wolfhounds, greyhounds, deerhounds, St. Bernards, mastiffs, Doberman pinschers, Great Danes, Irish setters and German shepherds.

METASTATIC DISEASE

Stopping cancer from spreading, also known as metastasis, is a major challenge faced by veterinary oncologists today. This is especially true for highly aggressive osteosarcoma. We need to know more about how this cancer develops, metastasizes and resists treatment if we are going to help dogs diagnosed with osteosarcoma live longer.

CHEMOTHERAPY RESISTANCE

Some osteosarcomas initially respond to chemotherapy but then become drug resistant and the cancer grows and spreads again. Often, chemotherapy drugs are given in combination which sometimes helps reduce the incidence of developing resistance to any one drug. Research is underway to investigate ways of overcoming chemotherapy resistance to improve treatment success.

COSTLY CLINICAL TRIALS

Clinical trials in veterinary medicine are less costly than human clinical trials, but they are still among the most expensive studies funded by Morris Animal Foundation. For example, the cost of running an animal health clinical trial looking at the treatment potential of a new drug, with control groups and patient follow-up, can easily surpass $1 million dollars. This is cost-prohibitive for many funding organizations, leaving veterinary researchers with few resources to turn to. Additionally, unlike human clinical trials, very little if any federal or state funding is available to support these critical research endeavors.

COMPARATIVE ONCOLOGY

Osteosarcoma in dogs has many similarities to osteosarcoma in children. Osteosarcoma is the most common form of bone cancer in children (though still rare; osteosarcoma occurs in dogs 10 times more frequently than in children). Only 70 percent of young people with osteosarcoma survive for five years after their diagnosis. While our focus is on improving the outcomes for dogs diagnosed with osteosarcoma, what we learn might help people, too. If we solve some of this cancer's challenges in dogs, biomedical researchers can potentially use these findings to save the lives of children with this aggressive cancer.

WHAT WE ARE DOING

Morris Animal Foundation has invested more than $7 million in decades of research to improve the quality and duration of lives of dogs diagnosed with osteosarcoma. Over the years, the Foundation's funding has helped researchers identify better treatments, optimize chemotherapies and control pain in dogs undergoing cancer surgery.

Amputation of the affected limb and limb-sparing surgery are the standard treatments for dogs with osteosarcoma. Chemotherapy following surgery can inhibit the spread and prolong survival, but it doesn't cure the disease. We need to do more.

THE SEARCH FOR NEW TREATMENTS

Thanks to the generosity of our donors, Morris Animal Foundation has the resources to support large-scale clinical trials. Currently, we are funding two treatment trials. The first is testing the drug rapamycin as a possible adjunct therapy to conventional therapies for osteosarcoma. The second is testing a new immunotherapy; a novel treatment that helps the body reprogram its own immune system to attack cancer cells. Both trials are aimed at slowing or stopping the spread of osteosarcoma in dogs. Preliminary results are promising. We also are funding research to identify new therapeutic targets.

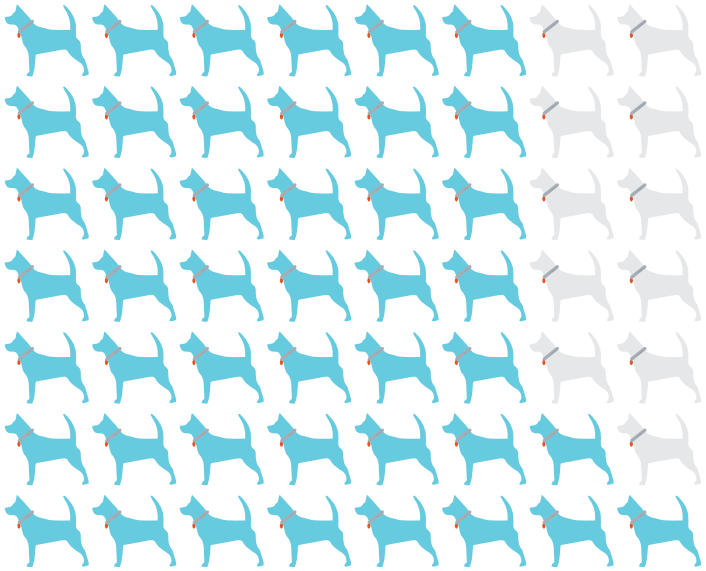
EARLY DIAGNOSIS IS KEY

Thanks to studies we funded, we now know that the behavior of osteosarcomas – whether tumors are categorized as aggressive – can be established early in the disease process, at or near the time of diagnosis. Our funded researchers recently developed a simple blood test that may be useful in early detection of osteosarcoma, screening at-risk dogs and monitoring relapse in dogs receiving treatment. This new test (under development) may one day help inform tailored therapies to maximize cancer treatments and limit unwanted side effects from chemotherapies for affected dogs.

ATTACKING METASTASIS

Renegade cells escape from virtually every tumor, but only certain cells from certain tumor types survive, grow and spread to other parts of the body. Our researchers have studied how osteosarcoma tumors send out small cargo bags, called vesicles, into the bloodstream that contain biologically active genes and proteins. When these small cargo bags reach other parts of the body, such as the lungs, they prepare and help make this site welcoming for renegade tumor cells. Researchers are looking at ways to target this key cancer spreading mechanism to stop osteosarcoma in its tracks.

EIGHT OUT OF TEN **DOGS DIE WITHIN TWO YEARS OF DIAGNOSIS**



TAKING RESEARCH TO THE NEXT LEVEL

With decades of funded research, we've not only gained a better understanding of osteosarcoma, we've also improved treatment of the primary tumor. But we can and must do more. Below are new research areas the Foundation is funding, with support from generous donors, to advance the treatment of osteosarcoma.

Immunotherapies

Heralded as a breakthrough to manage many human cancers, few studies have investigated this approach in dog cancers. We are supporting multiple studies, from clinical trials to combination treatments with immune stimulating agents. These are aimed at delaying the onset of cancer spread and may lead the way to finding alternative and more effective treatments for managing osteosarcoma in dogs.

Nanotechnologies that Directly Target the Tumor

Morris Animal Foundation is supporting pioneering research into delivering cancer drugs directly to the tumor via microscopic nanoparticles. While more work is needed, this evolving technology may help reduce multidrug resistance and negative side effects associated with conventional chemotherapy drugs.

Tailored, Individualized Medicine

We are exploring if cancer gene signatures – patterns of how genes are expressed within individual tumors – can predict whether a tumor will respond to a specific chemotherapy drug as a way of tailoring treatments and individual care needs of canine patients.

With your support, we can improve, and maybe even one day save, the lives of thousands of dogs diagnosed each year with osteosarcoma.

ABOUT MORRIS ANIMAL FOUNDATION

Morris Animal Foundation's mission is to bridge science and resources to advance the health of animals. Founded by a veterinarian in 1948, we fund and conduct critical health studies for the benefit of all animals.

Learn more at **morrisanimalfoundation.org**.

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