



## **Mast cell tumors of dogs and cats**

Older pets often develop cancer, and statistics suggest that cancer is the cause of death in 50 percent of dogs older than 10 years of age. Skin cancer is the most common type of cancer found in dogs, and mast cell tumors comprise about 20 percent of all canine skin cancers. Although cats have a lower incidence of skin cancer compared with dogs, mast cell tumors are still the second most common type of skin cancer in cats. Mast cell tumors can also develop in other organs, causing a particularly serious form of cancer.

This handout and accompanying webinar answers some of the most commonly asked questions about mast cell tumors in dogs and cats.

## **What is cancer?**

Cancer is defined as uncontrolled cell growth. It is important to remember that even though cancer is a *genetic* disease, it isn't always an *inherited* disease. This means that cancer arises from changes in a cell's genetic code that lead to uncontrolled cell growth. Individuals may have an inherited *tendency* to developing these changes, but other factors (such as the environment) also play a role in cancer's development.

## **What are the six characteristics of cancer?**

Cancers share six characteristics that define what cancer is and describe how it behaves. These characteristics are:

1. Cancer cells have sustained growth, meaning they grow for longer periods of time than normal cells.
2. Cancer cells don't respond to normal antigrowth control signals.
3. Cancer cells are resistant to death, so they live longer than normal cells.
4. Cancer cells continuously divide, whereas normal cells have a limited number of times they can divide.
5. Cancer cells are effective at making blood vessels, and by doing so, they can obtain nourishment and compete with normal cells for nutrients.
6. Cancer cells invade and spread.

## **What is a mast cell?**

Mast cells are a special type of white blood cell. They are concentrated in areas near the external environment, including the skin and airways. Mast cells contain granules that give them a typical microscopic appearance and make them easy to identify. These granules contain substances that are important components of normal mast cell function.

## **What do mast cells do in animals?**

Mast cells help protect the body against infections, which is why they tend to be located near the outside environment. They are also involved in allergic reactions (both good and bad). Mast cell granules contain chemicals that are secreted by the cells when they are stimulated. These substances include heparin (a blood thinner), histamine (important in allergic reactions), enzymes and chemicals that stimulate inflammation. Although most of us view inflammation negatively, it is actually one of the body's defense strategies. By causing inflammation, mast cells are trying to get the body's attention to address foreign material, such as parasites or allergens.

## **What are mast cell tumors?**

Mast cell tumors are collections of mast cells that form a solid tumor, either in the skin or internally in other organs. Because they contain inflammatory substances, mast cell tumors can sometimes be very irritating or can cause problems such as vomiting and stomach ulcers.

## **Who gets mast cell tumors?**

Any dog or cat can develop a mast cell tumor, but they are most commonly seen in Bulldogs and their descendants (Boston Terriers, Boxers and Pugs), Labrador and Golden Retrievers, Cocker Spaniels, Schnauzers, Staffordshire Terriers, Beagles, Rhodesian Ridgebacks, Weimeraners, Shar-Peis and Siamese cats.

## **How can I tell if my pet has a mast cell tumor?**

Mast cell tumors in the skin are often red in color because mast cell granules are filled with substances important in inflammation. However, mast cell tumors can look like just about any type of tumor, including fatty tumors. Because of this ability to mimic the appearance of many other types of skin problems, it is important to have a veterinarian check any new lumps or bumps. These tumors can be irritating, so pets will sometimes scratch or pick at them.

When mast cell tumors are growing internally, they are much harder to detect. Internally growing tumors often produce irritating substances that can cause vomiting and stomach ulceration. Unfortunately, there are no typical signs for internal mast cell tumors.

Dogs usually develop mast cell tumors on their trunks or limbs. Cats tend to develop them on their heads and necks. When mast cell tumors develop internally, they are often found in the spleen and intestines.

## **How are mast cell tumors diagnosed?**

As mentioned earlier, mast cells contain granules that are easily identified under a microscope. Occasionally, mast cell granules are difficult to find, but in general this is one of the few types of cancer that can be readily diagnosed by most general practitioners with a minimum of equipment. Internally growing mast cell tumors are trickier to diagnose, but even they can be discovered using ultrasound to look for suspicious growths.

## **What is staging and why is it important?**

Cancer staging is a way of evaluating the extent and severity of a patient's cancer in order to estimate the prognosis and to guide treatment. Staging involves evaluating the amount of cancer present, looking for evidence of tumor spread and evaluating whether the patient is feeling sick from the tumor itself. All these factors together are used to determine the stage of cancer.

## **Why are mast cell tumors given a "grade"?**

Mast cell tumors growing in the skin can take a variety of forms. Because they are such a diverse group, the grading system helps to predict how a mast cell tumor will behave. Although the system isn't perfect, it is widely used in veterinary medicine. If your dog is (or was) diagnosed with a mast

cell tumor, you would likely be told something about the tumor's grade. This grading system doesn't seem to work in cats, which have slightly different forms of mast cell tumors.

Canine mast cell tumors are divided into three grades, with grade 1 tumors being the most easily treated and least aggressive type and grade 3 tumors being the most aggressive type. Grade 2 tumors fall in between these two extremes. Most dogs have grade 1 or 2 tumors, which are more easily treated.

## **How are mast cell tumors treated?**

Surgery is the most effective treatment. If a mast cell tumor can be completely removed, prognosis can be excellent, especially for grade 1 tumors. Even if the tumor can only be reduced in size, the patient can achieve extended remissions. Higher grade mast cell tumors require big incisions to achieve disease-free, or "clean," margins, so surgeons must be skilled in these larger surgeries.

Margins in cancer treatment describe the edges of tumors that have been removed surgically. When surgeons cut out a tumor, they try to take some normal tissue as well. The idea is to completely remove the cancer, not leaving any cells behind that could begin growing again. After removing the tumor, the surgeon will identify the edges of the removed tissue for the pathologist, a doctor trained to look at tissues, to determine a diagnosis. The pathologist will not only decide what type of tumor is present and how aggressive it is, but will also look closely at the margins to see whether any tumor cells are along the edge. If the pathologist identifies cancer cells at the edge, this is usually a sign that the surgeon didn't remove all of the cancer. If the margin is "clean," the pathologist didn't find any obvious cells. This suggests the surgeon removed all of the cancer from that area. This system isn't foolproof, but many studies provide surgeons with guidelines for the ideal margins for removing certain types of tumors. Margin guidelines also factor into treatment decisions when growths are in areas that are difficult to address surgically, such as in the head or lower limbs.

When a grade 1 or grade 2 cannot be completely removed by surgery, radiation therapy is often very effective in combination with surgery to "debulk," or reduce, the tumor's size. Chemotherapy is also sometimes used after a debulking surgery, but results aren't always as good as using radiation therapy.

Unfortunately, there are few treatment options for grade 3 mast cell tumors, and most of them aren't very effective. The rapid spread of grade 3 tumors makes them less amenable to surgery or radiation treatment. Grade 3 tumors are also not very sensitive to most chemotherapy drugs.

## **What is the prognosis for dogs with mast cell tumors?**

A mast cell tumor's grade is highly correlated with long-term prognosis. Grade 1 tumors have the best prognosis and can often be cured, while grade 3 tumors have the worst. Most patients die of grade 3 tumors within a year. Prognosis also depends on the location of the tumor, the stage of the tumor and if the patient has any other signs, such as vomiting or poor appetite.

## **What is the prognosis for cats with mast cell tumors?**

The prognosis for cats depends on the location of the mast cell tumor. Mast cell tumors located in the skin tend to have a good prognosis, provided they are in a location that is surgically accessible. Tumors located in the spleen also have a surprisingly good prognosis, and many cats retain an

excellent quality of life for one to two years after spleen removal. Intestinal mast cell tumors are associated with a poor prognosis, and survival times are a few months at best.

### **What is Morris Animal Foundation doing to help?**

Mast cell tumor research has been a funding focus at Morris Animal Foundation for the last seven years, and many studies are currently underway. Research studies have been concentrated in three areas: development of methods to better predict which mast cell tumors are more likely to spread; identification of dogs at risk for the development of mast cell tumors; and identification of potential therapeutic targets for dogs. In addition to these basic grants, Morris Animal Foundation has funded four Fellowship Training Grants for young scientists studying mast cell tumors.

Golden Retrievers develop cancers at high rates and have a high incidence of mast cell tumors, so the Foundation anticipates that results from the multiyear Golden Retriever Lifetime Health Study will generate data on the genetics and behavior of mast cell tumors in a large population of dogs.

Morris Animal Foundation remains committed to finding the underlying mechanisms of mast cell tumor growth and developing more effective treatments for this common cancer.