Canine Mast Cell Tumors

What is a mast cell tumor?

Mast cells are found in connective tissue and contain small granules which carry histamine and heparin. When an animal has an allergic reaction, mast cells are important players. However, like almost all other cells in the body, mast cells can start to rapidly divide and form a tumor. Mast cell tumors (MCTs) are one of the most common types of skin cancers in dogs. Because most MCTs in cats are benign and cured by complete surgical removal, this guide will focus on canine MCTs. It is not yet known why MCTs are more often malignant and prevalent in dogs than in other species.

What does a mast cell tumor look like?

Many owners look for lumps and bumps on their pet during grooming or petting. There are a number of causes for both benign and malignant lumps on or under a dog's skin. Because any lump can be potentially serious, whether or not it is an MCT, owners should make their veterinarian aware of any new lumps that have developed. Dogs can have just one MCT or several, and they can look as innocent as an insect bite but are often raised and reddened and may be itchy. They may change in size over time, getting larger or smaller, but do not go away.

How can my veterinarian tell if my dog's bump is a mast cell tumor?

Because not all lumps need to be surgically removed, your veterinarian will probably recommend some tests to determine the best course of action. One of the first steps your veterinarian is likely to advise is fine needle aspiration. You may be familiar with this because of its use in human medicine. Your veterinarian will use a small needle to draw a few cells from the lump. By looking at the sample under the microscope, your veterinarian often is able to see what types of cells are present. Alternatively, your veterinarian may opt to send the slide to a laboratory to be reviewed by a clinical pathologist; this type of test is called cytology. Mast cell tumors are often relatively easy to recognize using fine needle aspiration.

Are all mast cell tumors the same?

No. As with other types of cancer in human and animal medicine, there are tumors that are more aggressive than others and ones that cannot be removed completely with surgery due to location. Biopsy or complete surgical removal of the mass is required to determine which tumors are likely to be more aggressive. A board certified veterinary pathologist examines the biopsy sample and provides a diagnosis and a grade that predicts prognosis (how the cancer will progress and the likelihood for recovery). The most common grading systems used are a three grade system (Grade I, Grade II, and Grade III) and a new two-tier system. At the Michigan State University Veterinary Diagnostic Laboratory, we use the new two tier grading system (high or low) to better predict prognosis. Close examination of various features of the cancer cells is the primary factor in determining whether the tumor is high grade (more likely to be aggressive, increased potential for mortality, may benefit from additional therapy) or low grade (less aggressive, less likelihood for negative long-term health effects, more likely to be cured by surgical excision alone). Based on grading, additional specialized testing (a mast cell tumor prognostic panel) may be recommended to help your veterinarian determine if, and what types of, additional therapy may benefit your pet.

What other tests or procedures are needed?

The pathologist may recommend performing an MCT prognostic panel, or portions of this panel, depending on the grade of the tumor. The results of this panel can help to further predict which tumors are likely to have benign behavior and which will likely be more aggressive and therefore require additional therapy. This panel is performed using the original biopsy specimen so no additional procedures need to be performed on your pet. The panel determines how fast the tumor cells are dividing, checks for abnormal expression of a protein called KIT, and determines if the tumor cells have a mutation in a gene called *c-Kit*. Two new drugs, toceranib phosphate (Palladia) and masitinib mesylate (Kinavet-CA1,) have recently been developed specifically for dogs and target cells with a mutation in *c-Kit*. These drugs are called tyrosine kinase inhibitors, or TKIs. This is the first type of "targeted drug therapy" in veterinary medicine. So there is new hope for dogs with aggressive mast cell tumors that have this mutation.

(Continued...)

Michigan State University Veterinary Diagnostic Laboratory
4125 Beaumont Road, Lansing, MI 48910 | 517.353.1683
animalhealth.msu.edu

MICHIGAN STATE UNIVERSITY | College of Veterinary Medicine

Because the skin is an organ that is made up of several layers, the depth of the tumor and whether or not it has metastasized (spread) to other tissues or organs (such as lymph nodes) are other critical factors in determining the most effective treatment plan. Surgical removal is almost always done, but complete removal may not be possible based on size and location. After surgical removal of the tumor, your veterinarian may send it to a laboratory such as ours for margin evaluation. Our laboratory uses digital photography and a standardized approach to provide veterinarians with the most accurate information for whether or not a mast cell tumor has extended to the surgical margins. If the margins are clean (there is no evidence that cancer cells were left behind), your veterinarian or veterinary oncologist may not recommend any further treatment. If the margins are not clean, additional surgery or radiation therapy may be needed.

Your veterinarian may also recommend additional tests to investigate whether the tumor has spread to the lymph nodes (usually the ones closest to the tumor site, sometimes referred to as "regional lymph nodes") or other organs, often the liver and spleen. If there is evidence of systemic involvement (the dog's body systems are affected), additional forms of chemotherapy may be recommended.

Is my dog going to be ok?

The word "cancer" can be scary to hear. In the case of the diagnosis of an MCT, the chances for recovery depend upon the grade of the tumor, the results of an MCT prognostic panel, whether or not complete surgical removal is possible, whether the cancer has spread to other tissues or organs, and the type of treatment that is pursued. In cases of complete surgical removal of low grade tumors that have favorable prognostic panel results, the prognosis is typically good, although some animals will develop other MCTs in the future (in the same area or elsewhere on the body). Unfortunately, high grade tumors do have an increased chance of mortality. If your pet is diagnosed with a high grade tumor, specialized diagnostic testing can assist you and your veterinarian in selecting the treatment options most likely to be effective for your pet.

For More Information

Advances in Surgical Tumor Pathology, *Diagnostic News,* Winter 2013, **http://www.animalhealth.msu.edu/News/2013_Winter.pdf**

Flowchart to Support Therapeutic Decision-Making Based on Prognostic Parameters for Canine Cutaneous Mast Cell Tumors, **http://animalhealth.msu.edu/Sections/Immunohistochemistry/WEBCD.IHC.REF.003.pdf**

Scientific Papers

Canine cutaneous mast cell tumors: A combined clinical and pathologic approach to diagnosis, prognosis, and treatment selection, **http://www.sciencedirect.com/science/article/pii/S1090023316300752**

Proposal of a 2-Tier Histologic Grading System for Canine Cutaneous Mast Cell Tumors to More Accurately Predict Biological Behavior, **http://vet.sagepub.com/content/48/1/147.full.pdf+html**

Cellular Proliferation in Canine Cutaneous Mast Cell Tumors: Associations with c-KIT and Its Role in Prognostication, **http://vet.sagepub.com/content/44/3/298.full.pdf+html**

The Role of c-KIT in Tumorigenesis: Evaluation in Canine Cutaneous Mast Cell Tumors, **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1578516/pdf/neo0802_0104.pdf**

Evaluation of prognostic markers for canine mast cell tumors treated with vinblastine and prednisone, **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2529280/pdf/1746-6148-4-32.pdf**

The Use of KIT and Tryptase Expression Patterns as Prognostic Tools for Canine Cutaneous Mast Cell Tumors, **http://vet.sagepub.com/content/41/4/371.full.pdf+html**

Multi-center, Placebo-controlled, Double-blind, Randomized Study of Oral Toceranib Phosphate (SU11654), a Receptor Tyrosine Kinase Inhibitor, for the Treatment of Dogs with Recurrent (Either Local or Distant) Mast Cell Tumor Following Surgical Excision, **http://clincancerres.aacrjournals.org/content/15/11/3856.full.pdf+html**

Michigan State University Veterinary Diagnostic Laboratory
4125 Beaumont Road, Lansing, MI 48910 | 517.353.1683
animalhealth.msu.edu

MICHIGAN STATE UNIVERSITY | College of Veterinary Medicine