



1333 Plaza Blvd, Suite E, Central Point, OR 97502 \* [www.mountainviewvet.net](http://www.mountainviewvet.net)

## **Mast cell tumor**

*Mast cell tumor, histiocytic mastocytoma, mast cell sarcoma*

### **Affected Animals:**

Mast cell tumors are very common in dogs. Dog breeds more commonly affected include boxers, Boston terriers, bullmastiffs, English setters, and golden retrievers. Older dogs are more commonly affected, but MCT can occur in any age or sex.

### **Overview:**

Mast cell tumors, or MCTs, are among the most common tumors in dogs, with the skin being the most common primary site for MCTs in this species. Mast cell tumors can occur anywhere in the body. The systemic form of mast cell tumors, with visceral, lymphatic or bone marrow involvement is referred to as mastocytosis. Despite the sometimes "benign" appearance, mast cell tumors tend to exhibit a very unpredictable biological behavior. Therefore many veterinary oncologists consider all mast cell tumors malignant until proven otherwise.

The mean age of dogs with mast cell tumors is nine years. Predisposition to mast cell tumors appears to occur in Boxers, Boston terriers, beagles, bulldogs, and Schnauzers. Although Boxers appear to be at a higher risk for development of MCTs, most tumors in this breed tend to be well differentiated.

When feasible, treatment involves addressing the tumor locally, with surgery and/or radiation treatment. In some cases, systemic treatment may be necessary, but is often not successful due to the extent of the disease.

### **Clinical Signs:**

The clinical signs of mast cell tumors in dogs are variable, and depend upon anatomic location. Tumors may originate in the dermis or in the subcutaneous tissues, and usually have overlying, intact skin, although ulceration can also occur. Palpation of these masses may produce Darier's sign, which is erythema, or redness, of the skin secondary to the release of histamine from the tumor. MCTs in dogs present as solitary or multiple masses. They are found primarily in the trunk, perineum, and extremities; and they are less common in the head and neck region. Variations in tumor size, even on a daily basis, are a relatively common historical sign in dogs with MCTs, as local swelling occurs and subsides. The affected area may be painful or sensitive to touch, especially if there is ulceration or marked swelling. Limbs may become swollen, with pitting edema, secondary to regional lymph node involvement and obstruction to venous and lymphatic fluid return from the tissues below.

Vomiting, diarrhea, poor appetite and weight loss may be noted in patients with systemic involvement. Stools may be melanic or darkened by the presence of digested blood,

produced from gastrointestinal erosion or ulceration. Anaphylactic shock, with rapid heart rate, pale mucous membranes, weak pulses and collapse occurs in some patients that experience massive release of tumor substances into the blood stream.

**Symptoms:**

See Clinical Signs.

**Description:**

Mast cell tumors are among the most common tumors in dogs. They may occur anywhere in the body, and may be benign or malignant. Mast cell tumors, or MCTs, arise from mast cells, which are normal components of the body. Mast cells originate in the bone marrow and migrate to various locations throughout the body, especially in connective and vascular tissues. Mast cells in dogs normally contain histamine and heparin; these substances play a significant role in the inflammatory response to various disease processes, and in wound healing. Histamine released from mast cell tumors causes some of the signs and symptoms of the disease, and may produce secondary disease as well.

How a mast cell or clone of mast cells becomes an MCT is not known. A genetic link is strongly suggested by the relatively frequent occurrence of mast cell tumors in certain breeds of dog, especially Boxers. Chronic inflammation has been suspected as a facilitator of tumor formation; mast cells tend to concentrate in chronically inflamed tissues. Viruses have been proposed as a cause based on an experimental model. However, no supporting evidence for a viral cause has been identified thus far.

In dogs, the skin and subcutaneous tissues are the most common locations for mast cell tumors. Up to one out of five MCTs occur in the skin. These tumors are classified as the cutaneous form. These masses arise in or beneath the skin, and vary in size. Palpation of the tumor may result in the release of histamine, which causes local redness, hives and itchiness of the skin. Although MCTs located elsewhere are more likely to be malignant, cancerous, cutaneous-form mast cell tumors are not uncommon in dogs.

The systemic form of MCTs -- called mastocytosis -- is a second class of these neoplasms, or growths. These mast cell tumors form in organs and other deep tissues of the dog, including the intestines, spleen, lymphatics, and other tissues of the reticuloendothelial system. The systemic forms of MCTs are more likely to produce signs and symptoms of systemic disease; gastrointestinal tumors may produce ulceration of the stomach and duodenum, and associated symptoms of diarrhea, vomiting, anorexia, and melena.

Mast cell tumors in the preputial, perineal, and inguinal regions tend to demonstrate more malignant behavior. MCTs can metastasize, or spread, to any part of the dog's body. However, metastatic mast cells will most likely spread to the regional lymph nodes, spleen, and liver. Spread to the lungs is not common.

**Diagnosis:**

Microscopic study of aspirated or excised tissues provides important diagnostic information. A provisional diagnosis of mast cell tumor based on history, physical exam findings, and clinical signs is often confirmed with evaluation of tumor samples obtained by the fine-needle aspirate technique. Granulated mast cells are easily identified in fine-needle aspirates of mast cell tumors. Mast cells are round and typically contain large, purple cytoplasmic granules. However, undifferentiated tumor cells may not always be identified with this method.

Examination of excised MCT-tissues allows histologic grading and determination of the completeness of excision; it may be required for a definitive diagnosis in undifferentiated MCTs. Special staining techniques aid the pathologist in determining the diagnosis and extent of tissue invasion. Histologic classification of mast cell tumors typically follows the system based on the degree of differentiation and infiltration; it classifies MCTs as well differentiated, or grade I, moderately differentiated, or grade II, and poorly differentiated, or grade III. High-grade tumors have indistinct granules, with variable staining. The cells may be bizarrely shaped, rather than round, and are variably sized.

Additional diagnostic studies may be conducted to help identify the presence of metastatic, or spreading, disease. Diagnostic evaluation should include abdominal x-rays or ultrasonography to identify hepatomegaly, or liver enlargement, splenomegaly, or splenic enlargement, or lymph node involvement. Ultrasound may be more sensitive than abdominal x-rays in assessing the spread of mast cell tumors. Thoracic x-rays can detect lymph node disease in the chest.

A complete blood count, or CBC, can detect the presence of cytopenias, including low platelet count, low red blood cell count, and low white blood cell count. The CBC will also demonstrate mastocytosis, or elevated mast cell count, which suggests spread of the mast cell tumor into bone marrow. White blood cells may be elevated due to circulating inflammatory compounds or to the presence of gastrointestinal ulceration. The recognition of mast cells in circulation can be improved by concentrating the white blood cell fraction of blood in a buffy coat preparation.

### **Prognosis:**

Multiple factors determine the prognosis for dogs with mast cell tumors. Dogs with rapidly growing tumors have a poorer prognosis than dogs with slow-growing masses. Animals with MCT-associated systemic signs □ loss of appetite, vomiting, dark, tarry stools, gastrointestinal ulcers □ have a poorer prognosis. Location of the tumor also has an impact on prognosis. Mast cell tumors in the inguinal and perineal areas appear to be more aggressive than mast cell tumors at other locations. Well-differentiated tumors tend to have a better prognosis than undifferentiated tumors. Prognosis is better if the tumor is in an early, localized clinical stage, rather than in an advanced stage where the tumor cells have spread. Dogs with tumors recurring after local surgical excision generally have a poorer prognosis. Breed also may determine prognosis; MCTs in boxers tend to be less aggressive than in other breeds.

Early detection and aggressive treatment of mast cell tumors may result in a complete cure in dogs. Even dogs with multiple mast cell tumors, or with recurrent mast cell tumors in different regions of the body, may have a good, long-term prognosis if treated early and aggressively.

### **Transmission or Cause:**

The etiology, or cause, of mast cell tumors in dogs and cats is unknown. Some breed predisposition suggests a heritable cause. Other proposed causes of MCTs include chronic inflammation and viral infection, although no proof exists to support a viral etiology.

### **Treatment:**

All mast cell tumors should be treated regardless of their size. The type of treatment selected depends on the clinical stage, histologic grade, size and location of the tumor. Aggressive, local surgical excision is the primary therapeutic approach; other treatment

methods are employed adjunctively, or in certain situations. Establishing a definitive diagnosis and treatment plan prior to instituting therapy is therefore extremely important in dogs with mast cell tumors.

Ideally, the goal of surgery is to remove the entire tumor mass and any tissue surrounding it, including lymph nodes, that may harbor spreading tumor cells. Wide excisional margins, at least three centimeters in all directions, should be obtained where feasible. Excised tissue is submitted to a pathologist for careful histopathologic evaluation. The tissue margins are examined for evidence of incomplete tumor excision.

In cases where the pathologist reports incomplete excision, either additional surgery or radiation therapy may be necessary. If adequate surgical margins are impossible to obtain despite aggressive surgery, radiation should be considered as an additional treatment.

Chemotherapy may be employed if surgery and radiation treatments fail to eliminate all of the tumor cells, or if these local treatment methods are not feasible. Prednisone has been shown to be efficacious in certain cases of mast cell tumors. This response appears to be variable, but complete responses have been demonstrated. Chemotherapy has been partially successful with lomustine (CCNU) and possibly a combination protocol consisting of vinblastine, cyclophosphamide, and prednisone.

For cases where surgery alone, or surgery with radiation therapy, have a good chance of completely eliminating the tumor and any metastatic, or spreading, disease, then these local treatment approaches should be attempted first.

**Prevention:**

Since the etiology of mast cell tumors is unknown except for heredity, preventive measures do not currently exist. Owners may detect tumors at an early stage by petting and grooming their dogs.