

# Mammary Cancer

## Disease Information

### Mammary Cancer

Breast cancer has distinct cellular, genetic, and molecular factors involved in its progression and growth. Mammary tumors are seen in the canine population with a low frequency, but similarities of the canine and human patient regarding disease biology and treatment options are evident.

### Canine Breast Cancer

Mammary tumors are among the most common tumors in female canines. The incidence of these tumors is correlated with overall life expectancy and hormonal influence. Mammary cancer is usually seen in canines between the ages of 10 and 11 years. Between 41 and -53 percent of tumors are considered malignant. The most common histological types include carcinomas, solid carcinomas, tubular carcinomas, papillary carcinomas, and anaplastic carcinomas. Carcinoma in situ is not predominantly recognized in the canine population. Hormonal influence plays a large role in canine mammary malignancy. It is known that dogs undergoing ovariectomy prior to the first estrus have a 0.05 percent risk for developing malignant tumors. This risk increases to 26 percent if an ovariectomy is performed after the second estrus. Normal canine mammary tissue contains progesterone and estrogen receptors, as do many benign tumors. Approximately half of malignant tumors have these receptors expressed. This finding suggests that a loss of steroid dependency may occur during the cancer progression. Increases in growth hormone (GH), acting through insulin-like growth factor 1 (IGF-1) that increases, are induced by progestins. These increases may stimulate mammary cell proliferation as well.

Many genes are known to be involved in breast cancer formation and progression. Oncogenes expressing for growth factor receptor c-erb-2 (c-neu) have overexpression of mRNA in the majority of canine malignancies, but not benign growth. BRCA1 occurrence, a genetic alteration, is seen in some canine mammary malignancies. It is thought that obesity and diet may also play a role in the development of canine mammary cancer.

### Prognostic Factors

Tumor size (greater or less than 3 cm.)  
Lymph node involvement  
Distant metastasis presence  
Histologic type (carcinomas versus sarcomas)  
Tumor grade  
Degree of invasion  
Intravascular growth  
Steroid hormone receptor activity  
S-phase fraction  
DNA aneuploidy  
AgNORs

#### Treatment

Treatment options, depending on the disease stage, can include surgery, radiation, chemotherapy, or a combination of these modalities. Mammary tumors can metastasize to regional lymph nodes, lung, liver, and, rarely, bone. Surgery is the first treatment of choice for all canines. No optimal chemotherapy agent is reported to be effective in canines. However, doxorubicin alone or in combination with cyclophosphamide or single-agent cisplatin has shown some antitumor activity. Chemotherapy may be justified in canines with large, lymph node positive, high-grade tumors following surgery. The issue of ovariectomy at the time of mammary tumor removal remains unresolved at this time. Antiestrogens, such as tamoxifen, have conflicting results and are associated with numerous side effects in canines.

#### Comparative Oncology

Comparative aspects may exist to make canine mammary neoplasia a model for human breast cancers. However, some differences do exist. Most canines have a lobular histology rather than the ductal carcinoma *in situ* seen in humans. Breast cancers in the United States are seen in the absence of the uterus and its hormonal influence. Also, it may be that intact dogs represent the breast cancer disease more closely than the spayed female canine population.