

ANIMAL MODEL OF HUMAN DISEASE	Breast Cancer
	<b>Animal Model:</b> Feline Mammary Carcinoma

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#### **Biologic Features**

Mammary tumors are not uncommon in the cat, forming the third most frequent (17%) group of cancer disease after skin tumors and lymphosarcoma.<sup>1</sup> The annual incidence in California was estimated at 12.8 per 100,000 cats (male and female).<sup>2</sup> The great majority of mammary tumors, especially in older cats, are mammary carcinomas. The highest rate is in the 10–12-year-old group.<sup>1,3,4</sup> Intact female cats were found to have in California approximately a sevenfold higher relative risk of developing mammary cancer than neutered females.<sup>2</sup>

The most important clinical sign is a nodule in a mammary gland that may also involve adjacent glands.<sup>3,4</sup> The regional lymph nodes may be enlarged. Later in the course of the disease, dyspnea, due to pulmonary and/or pleuritic metastases, often develops. Most cats with mammary tumors treated by surgery eventually die of recurrent disease or metastatic disease or both.<sup>3,4,5</sup> The prognosis of cats treated by surgery alone is very poor, the average postsurgical survival period being 7.7 months.<sup>3</sup> Factors associated with the prognosis, which was expressed in the 1-year survival rate, are tumor volume ( $P<0.01$ ), lymphatic permeation ( $P<0.01$ ), degree of differentiation ( $P<0.005$ ), degree of pleomorphism ( $P<0.005$ ), and number of mitoses ( $P<0.0001$ ). The frequently encountered infiltration of lymphocytes and plasma cells was not found to be associated with the prognosis.<sup>3</sup>

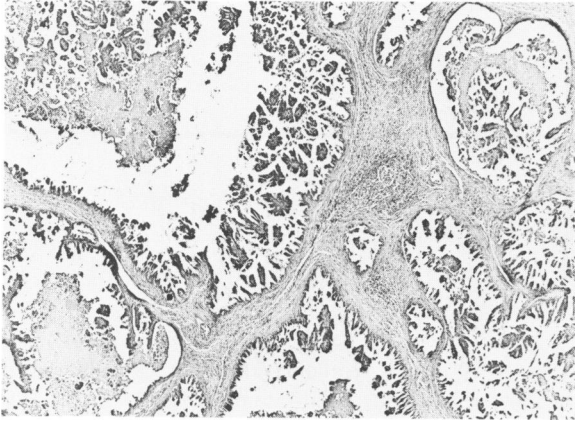
Most carcinomas contain necrotic areas (Figure 1), and the growth is usually highly infiltrative. Lymph and blood vessels are frequently (25%)

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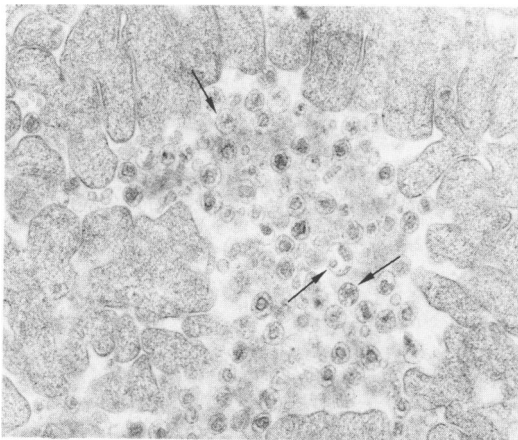
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**Figure 1**—Papillary carcinoma showing extensive necrosis. Lymphoid foci in the stromal tissue. (With a photographic reduction of 56%)

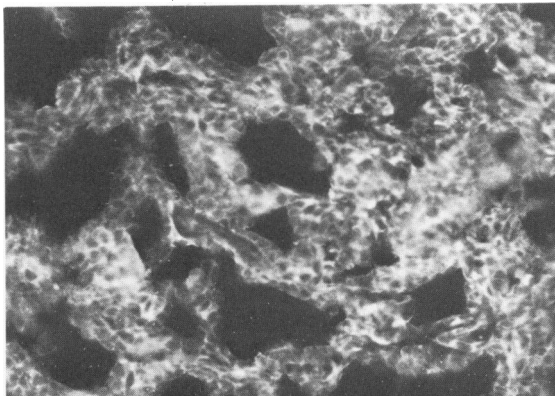
involved.<sup>3</sup> The degree of differentiation differs between carcinomas but often also within the same neoplasm.

The etiology of feline mammary cancer is still rather obscure. It has been reported that of a total of 7 intact female cats receiving semi-annual injections of progesterone, 3 developed a mammary adenocarcinoma.<sup>6</sup> Virus-like particles have been detected in feline mammary carcinomas.<sup>7</sup> In a later study<sup>8</sup> C type (Figure 2) particles were found in 6 of 24 feline mammary carcinomas but not in benign mammary tumors or normal mammary glands. Of 51 mammary carcinomas, 11 showed fluorescence (Figure 3) with the antifeline leukemia virus serum but not with the anti-serum against mouse mammary tumor virus, Mason-Pfizer monkey virus, and rat R35-mammary tumor virus (P). Recently the same group of workers<sup>9</sup> reported on the finding of feline leukemia virus (FeLV) antigens



**Figure 2**—Glandular cavity with many C-type particles. Nucleoids are sometimes granular and irregular (arrows). ( $\times 60,000$ ) (with a photographic reduction of 45%)

**Figure 3**—Feline mammary carcinoma; cytoplasmic immune fluorescence (IF) reaction with feline leukemia virus (FeLV) antiserum. (With a photographic reduction of 55%)



(35%) and of RD-114 virus antigens (55%) in feline mammary carcinomas. Intracisternal A particles (Figure 4), indistinguishable from those known to occur in some types of mouse mammary tumors, were found in 30% of feline mammary carcinomas tested by electron microscopy.

The injection of cell-free intraperitoneal homogenates in newborn kittens has not yet resulted in the development of either mammary carcinoma or lymphosarcoma.<sup>8</sup>

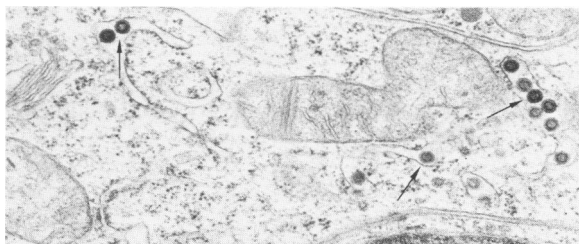
#### Comparison With Human Disease

Feline mammary cancer has many factors in common with the human disease. In both species surgery alone seems to be insufficient in a relatively large percentage of cases. Metastasis along lymph and blood vessels is frequent in cats and women.

The histologic features of feline mammary carcinoma are more similar to human mammary carcinoma than those of murine and canine mammary carcinomas.

Cats with mammary carcinoma are usually presented in a later stage of disease than women with breast cancer. Estrogen receptors in feline mammary carcinomas are very unusual (2/20<sup>10</sup> and 0/40 [own data]), whereas

**Figure 4**—Intracisternal A particles in cisternae of endoplasmic reticulum. ( $\times 60,000$ ) (with a photographic reduction of 55%)



in women in  $\pm 70\%$  of mammary carcinomas estrogen receptors are detectable.<sup>11</sup>

#### Usefulness of the Model

Feline mammary carcinoma, because of its biologic similarity to human mammary cancer, is a potential model for new modes of therapy, eg, immunotherapy.<sup>4</sup> Etiologic studies (viruses, hormones) of feline mammary cancer, in comparison with those in other animals, may contribute to a better understanding of the possibly complex etiology of human mammary cancer.

#### Availability

Feline mammary cancer is not uncommon. The pooling of cases from private veterinary practices and veterinary medical schools may provide sufficient material for further studies.

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