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## Some Benign and Malignant Neoplasms of Michigan Cottontail Rabbits

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### ABSTRACT

Neoplasms were found in 19 of 170 cottontail rabbits (*Sylvilagus floridanus mearnsii*) necropsied at the Wildlife Pathology Laboratory, Michigan Department of Conservation, 1950-1956. Nine tumors were benign; eight fibromas and one lipoma. Six malignant lymphomas, one nephroblastoma and three undiagnosed but apparently malignant tumors, also were found. Of particular interest is the high ratio of malignant to benign neoplasms. Gross and microscopic characteristics for the neoplasms are described and a case history involving a malignant lymphoma is discussed.

### INTRODUCTION

This report lists the neoplasms found in routine necropsies of cottontail rabbits (*Sylvilagus floridanus mearnsii*) at the Wildlife Pathology Laboratory, Michigan Department of Conservation, 1950 through 1966. Cottontails were received from two major sources; hunters curious about observed abnormalities and persons finding sick or dead rabbits.

Numerous reports exist on benign tumors of cottontails, but to our knowledge, Bell and Chalgren<sup>1</sup> have reported the only previous case of a malignant tumor in cottontails.

### RESULTS

Diagnoses of tumors were made in nineteen of 170 cottontails examined (Table 1). Three of the cases had no specific diagnoses, but the multiple "masses" invading the surrounding areas suggested malignancy. Of the remaining 16 tumor cases, nine were benign—eight fibromas and one lipoma. The other seven cases were malignant—six lymphomas and one nephroblastoma.

This high proportion of malignancy contrasts to other reports of much lower frequencies for malignant tumors in wildlife.<sup>1 2 3 4</sup>

Although the sex and age data are scanty, the majority of malignant tumors occurred in adult females but a lymphoma was also diagnosed in a six-month old juvenile female. Juvenile, as used here, refers to rabbits less than one year old. Fibromas were also found in juvenile cottontails.

No significance was attributed to the state-wide origin of the tumor specimens.

### DESCRIPTION

#### Fibroma:

The gross and microscopic descriptions of cottontail fibromas are discussed elsewhere<sup>5 6</sup> and these will not be included in this report. The fibromas were diagnosed on gross examination alone and it is only assumed that these were similar to those described by Shope<sup>9</sup>.

#### Lipoma:

*Specimen 54-233:* The animal was

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caught and killed by a dog. The rabbit was in excellent body condition with much visceral and subcutaneous fat.

*Gross lesions:* Two large masses of fatty tissue were located on the right rear leg (Fig. 1). One mass covered the area of the stifle (3 x 1 inches); the other mass measured 3 x 2 inches and was anterior to the femoral muscles.

*Microscopic lesions:* The tumor consisted of fat cells showing greater variation in size and shape than the normal fat cells of obesity. Areas of fat necrosis also existed, primarily at the tumor's periphery.

Unless located in a potentially dangerous area, lipomas are of limited significance. The large size of the tumor and its location on this otherwise healthy rabbit could have contributed to its being killed by the dog.

#### Nephroblastoma:

*Specimen 65-42:* This emaciated animal was found dead.

*Gross lesions:* A large mass was located on the area of the right kidney (weight, 55 grams). The apparently normal left kidney weighed 5 grams. On cross-section, the tumorous right kidney was dark red, pulpy, and faintly lobulated.

*Microscopic lesions:* A highly cellular fibroblastic tissue almost completely replaced all normal kidney structures. A few septa of connective tissue were scattered about. Many areas of fibroblastic tissue were lined with epithelial cells (Fig. 2). Sloughed epithelial cells from postmortem degeneration were also observed.

Predominantly a neoplasm of the young, nephroblastomas have been found in adult animals<sup>8</sup>, as is the case here. Whether the tumor caused the rabbit's

TABLE 1. *Neoplasms Found in Cottontail Rabbits (Sylvilagus floridanus mearnsii); Wildlife Pathology Laboratory, Rose Lake Wildlife Research Center*

Lab. No.	Neoplasm	Location	Rabbit	
			Age*	Sex
51-226	not diagnosed	lungs, trachea	—	—
54-228	fibroma	hind foot	—	—
54-232	fibroma	hind foot	—	—
54-233	lipoma	hind leg	—	—
57- 7	fibroma	fore, hind feet	A	F
58-110	malignant lymphoma, histiocytic type	spleen, abdominal wall	J	F
59- 38	fibroma	supraorbital skin	F	M
59-131	not diagnosed	multiple abdominal masses	—	F
59-148	fibroma	fore foot	—	—
60-226	fibroma	hind foot	J	M
60-231	not diagnosed	multiple abdominal masses	A	F
60-278	fibroma	fore, hind foot	—	—
62-227	fibroma	fore, hind foot	—	—
63- 18	malignant lymphoma, lymphocytic type	liver	—	—
63- 77	malignant lymphoma, lymphocytic type	abdominal wall	A	F
64-396	malignant lymphoma, histiocytic type	liver, spleen	A	F
65- 42	nephroblastoma	kidney	A	—
66- 18	malignant lymphoma, lymphocytic type	kidney, adrenal	—	F
66-T-05	malignant lymphoma, lymphocytic type	kidney, liver, adrenal gland, spleen, GI tract	A	F

\* A = Adult

J = Juvenile

death is unknown. The large size of the tumor and the animal's poor body condition, free of other trauma or disease signs, suggest a causal relationship.

#### Malignant Lymphoma

Attempts to subdivide tumors of lymphoid tissue into separate entities has led to a multiplicity of names. Our terminology is based upon that of Smith and Jones<sup>10</sup>.

Two subclasses of malignant lymphoma were diagnosed; the lymphocytic type and the histiocytic type. Microscopically, the former consists of normal-appearing lymphocytes either infiltrating among normal tissue structures or completely replacing all normal tissue anatomy (Fig. 3). The lymphoid cells of histiocytic type lymphomas are large and pleomorphic, with large vesicular nuclei, often containing prominent nucleoli. Greater than normal amounts of cytoplasm also occur. No significance was given to which subclass of malignant lymphoma was found.

Of the six lymphoma cases, three were hunter kills, two were found dead and case T-05, discussed below, was a captive experimental animal. Three of the animals with lymphoma were emaciated while the juvenile rabbit with a lymphoma was in good body condition.

The gross and microscopic lesions described for specimen T-05 are illustrative of those of the other malignant lymphomas. The latter differed from T-05 merely to the extent of neoplastic involvement and location (Table 1).

*Specimen T-05:* This female cottontail, at least 3½ years old, was a captive penned animal for the last 2½ years. Two months before death, an excessive loss of weight began. At death, the animal was very emaciated. Hematocrit values taken at this time were significantly reduced. A leukocyte differential count made two weeks before death indicated above normal numbers of lymphocytes.

*Gross lesions:* The stomach, upper

small intestine, and adrenal glands were edematous. Both kidneys were swollen. Raised, pale white foci, ranging in size from 3 mm to 2 cm spotted the entire

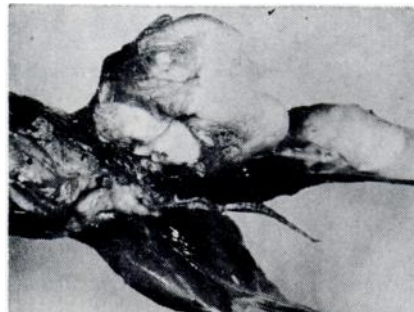


FIGURE 1. Lipoma on rear leg of cottontail rabbit.

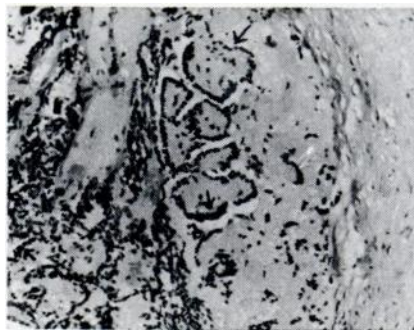


FIGURE 2. Nephroblastoma of cottontail rabbit. Arrows indicate epithelial cells. 100X.



FIGURE 3. Malignant lymphoma invading liver of cottontail rabbit. 100X.

liver. The spleen, normally quite small relative to the stomach, equaled the stomach in size (4 x 2 inches) and was merely a white mass instead of the normal reddish-purple color.

**Microscopic lesions:** Both the stomach and upper small intestine had numerous lymphocytes infiltrating the lamina propria. Sloughing of the mucous membranes was seen in a few areas, indicating some postmortem degeneration. The serosal surface of the colon was edematous and filled with lymphocytes, macrophages, fibrin, and red blood cells. Scattered necrotic foci and groups of lymphocytes were present in the medulla of the adrenal gland. Much of the normal architecture of the liver was replaced by masses of lymphocytes (Fig. 3). The bile ducts especially were surrounded by lymphocytes. Blood vessels contained excessive numbers of lymphocytes. The most severe lesions were seen in the spleen: there were scattered large necrotic areas, much hemorrhage and amyloid, and masses of lymphocytes formed the major cellular elements.

It is doubtful whether the animal could have lived as long under natural wild conditions.

#### DISCUSSION

Few conclusions are possible about the significance of neoplasms in wildlife populations. Increased research will, very probably, revise some present theories. One such revision could occur regarding the Shope fibroma in cottontails. Until recently, this tumor has not been implicated as a cause of cottontail mortality<sup>5</sup>. In adult *Sylvilagus* spp., its natural host, the fibroma virus causes a localized, self-limiting reaction<sup>9</sup>. Yuill and Hanson<sup>11</sup>, however, were able to kill nestling cottontails less than six days of age with intradermal injections of the virus. As this route of infection is similar to that of the suspected natural vector, the mosquito<sup>7</sup>, this new insight into fibromas merits further study.

Because studies such as Flux's survey of the frequency of ovarian tumors in wild hare populations<sup>4</sup> are few, necropsy reports offer an initial step toward understanding the significance of tumors to wildlife populations.

#### ACKNOWLEDGEMENTS

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