

# The Ocular Lesions of Naturally Occurring Lymphocystis in Fish

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## ABSTRACT

Six cases of ocular lymphocystis, a virus disease, are described. Lymphocystis is generally known as a benign, unique, giant cell disease of fishes causing nodules on the skin and fins. It has been studied extensively because of the virus-host cell relationship that results in extreme size and lack of quick cellular destruction or stimulation to neoplasia.

Lymphocystis cells were found behind or in one or both eyes and were also found on the cornea or adjacent skin surfaces. A retrolbulbar mass produced extreme exophthalmos. Uveal (choroid and iris) masses were present in most cases. Optic nerve involvement was also seen. It is probable that the virus reached the eye by the blood with the resulting masses forming in situ rather than by direct extension from skin lesions.

maladie comme une condition bénigne et unique en son genre; elle provoque la formation de cellules géantes qui produisent des nodules sur la peau et les nageoires. Cette maladie a suscité une étude approfondie à cause d'une relation entre le virus et la cellule hôte, relation qui se traduit par la formation de cellules de très grandes dimensions, mais par l'absence de destruction cellulaire rapide ou d'évolution vers la néoplasie.

Les auteurs ont observé de ces cellules géantes en arrière d'un ou des deux yeux, ainsi que sur la cornée et les surfaces cutanées adjacentes. Une masse rétro-bulbaire produisit une exophthalmie très prononcée. Dans la plupart des cas, des masses semblables affectaient la choroïde et l'iris, ainsi que le nerf optique. Le virus aurait atteint l'oeil par la voie sanguine plutôt que par propagation directe à partir des lésions cutanées, provoquant la formation de nodules dans la région oculaire.

## RÉSUMÉ

Les auteurs décrivent six cas de la maladie lymphocystique oculaire, une affection virale des poissons. On considère généralement cette

## INTRODUCTION

Lymphocystis virus is a large icosahedral DNA virus which induces a marked hypertrophy of affected connective tissue cells (11). Cells sometimes increase many thousands fold in size from an original diameter of ten microns to 2,000 microns or more. The disease has been seen in over sixty-five species of fish in fresh water, marine and aquarium environments around the world during the last hundred years. It is generally known as a benign, giant cell disease of fishes causing nodules resembling masses of tiny eggs or cauli-

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flower-like growths on the skin, particularly the fins. Inclusion bodies composed of Feulgen positive material are notable in the cytoplasm although their position varies somewhat between fish species. The disease has been studied extensively because of the unique, viral host cell relationship. The interest of oncologists and other scientists has been aroused by the lack of quick cellular destruction or stimulation to neoplasia as well as the extreme growth of cells. Lowe (5) was apparently the first to describe infections of lymphocystis, and Weissenberg (12, 13, 14, 15, 16) studied both natural and experimentally induced infections. Templeman (9) gave a brief history and summarized the more important aspects of the disease. Nigrelli and Ruggieri (7) reviewed the literature and noted that lymphocystis cells had previously been observed on fins, skin, gills, pharynx, ovary, spleen, heart and alimentary tract. Visceral involvement was considered to occur only in experimental cases until recently when two descriptions of ocular lesions came to our attention. One was a somewhat friable papillary growth on the skin at the lower edge of the eye toward the lateral canthus (2). The other was unilateral exophthalmus in two fish from a Georgia survey (8). In these fish, lesions occurred in the choroid and there was an associated retinopathy. No other lymphocystis lesions were found in these fish.

In 1966 one of us (TWD) noticed small whitish nodules on the skin and cornea of a sand seatrout *Cynoscion arenarius*, caught in the Gulf of Mexico off Texas. Since the eyes are frequently involved in systemic diseases it was postulated at a meeting in 1972 that lymphocystis, during the viremia, could involve various ocular structures (1). In this paper we document the various locations of lymphocystis cells within the eyes of fish mentioned previously (3).

## MATERIALS AND METHODS

Five silver perch (*Bardiella chrysura*) with ocular lesions were captured from the estuarine waters of Mississippi Sound in Davis Bayou off Ocean Springs, Missis-

sippi (cases 1 to 5). The sand trout (*Cynoscion arenarius*) was captured off the Texas Gulf Coast in 1966 (case 6). Affected fish were examined externally and internally with the aid of a dissecting microscope and were then fixed intact in neutral, phosphate buffered 10% formalin. Ocular tissues from the fish were embedded in paraffin, sectioned at six microns and stained with hematoxylin and eosin or hematoxylin, phloxine and saffranin.

## RESULTS

Table I presents a breakdown of the prevalence of eye lesions during collections by one of us (ARL). Lesions in sites other than the eyes were reported elsewhere (4). Isopod infestation was common in affected fish. A nematode was found in the eye socket next to the lymphocystis lesion in one case. Nematodes were also found in the orbit outside the globe when there was no evidence of lymphocystis. These nematodes were identified as *Philometra* spp.

### CASE 1

*Gross pathology* — A large white mass measuring 10 x 10 x 8 mm was found posterior to the left eye (Figs. 1 and 2) on the nasal border of the globe. It had pro-

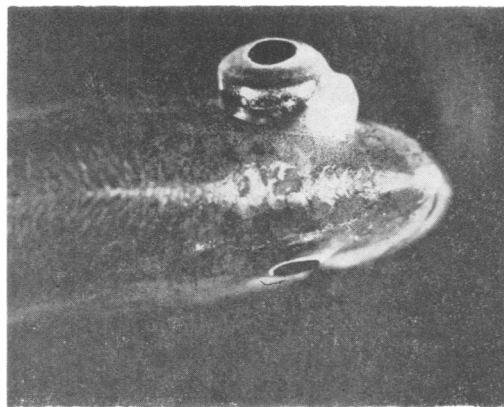


Fig. 1. Exophthalmus of left eye with mass at medial canthus.

**TABLE I. Prevalence of Spontaneous Lymphocystis Infected *Bairdiella chrysura***

	Year	
	1972	1973
Total fish examined.....	798	125
Number with spontaneous infections.....	41(5.1%)	21(16.8%)
Number with ocular infections.....	4(0.5%)	1(0.8%)
% Affected with ocular infections.....	4/41 = 9.8%	1/21 = 4.8%
% With ocular lesions and with visceral lesions.....	4/4 = 100%	1/1 = 100%
% With ocular lesions and with gill lesions.....	3/4 = 75%	1/1 = 100%
% With ocular lesions and with isopod.....	4/4 = 100%	1/1 = 100%
% With ocular lesions and with nematode.....	1/4 = 25%	0/1 = 0%

duced extreme exophthalmos. A small patch of cells was also seen on the external ocular muscle of the right eye.

*Histopathology* — A large mass of typical lymphocystis cells extended into the ocular muscles. Some muscle degeneration was evident. The mass was about the size of the globe and was entirely outside the scleral cartilage. Some of the lymphocystis cells were collapsed and extremely basophilic and mononuclear inflammatory cells were present at the periphery of the mass.

*Other infected sites* — On the left side of the body.

**CASE 2**

*Gross pathology* — Nodules were found behind both eyes.

*Histopathology* — Lymphocystis cells were found in the extraocular muscles with no host reaction around them. The globe itself was not affected.

*Other infected sites* — Both sides of the body, all fins, both gills, pseudobranchs, nostrils, spleen, mesenteries, kidney, heart, liver, ovary.

**CASE 3**

*Gross pathology* — Lymphocystis cells were found on skin around both eyes, behind the left eye and on the right cornea and conjunctiva.

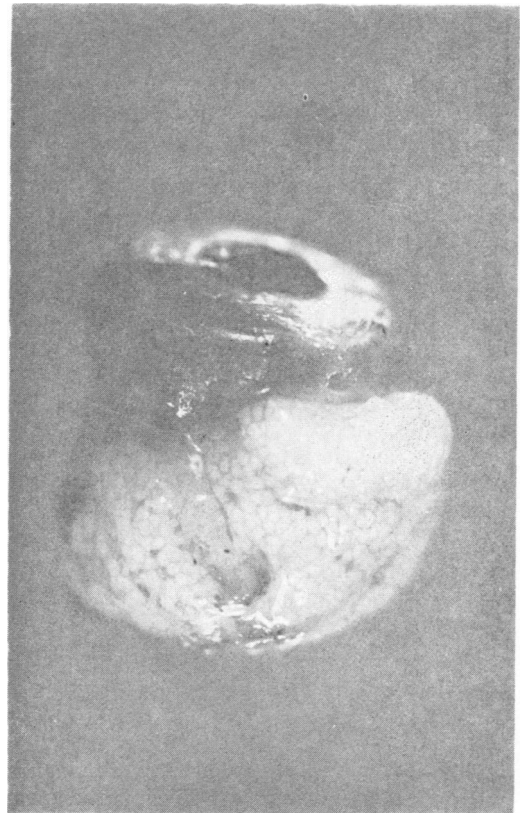
*Histopathology* — Lymphocystis cells were present at the limbus. A minimal mononuclear infiltrate was present adjacent to some collapsed lymphocystis cells.

*Other infected sites* — Both sides of the body, all fins, both gills, pseudobranchs,

nostrils, roof of the mouth, spleen, mesenteries, kidney and testes.

**CASE 4**

*Gross pathology* — Lymphocystis cells were evident behind both eyes, on the surface of the right iris and the skin near the limbus.



**Fig. 2. Enucleated eye with large mass of lymphocystis cells.**

## DISCUSSION

Naturally occurring lymphocystis disease has been associated with skin abrasions and ectoparasitic infestation in the presence of virus (4, 6). The cells in visceral organs were considered by Nigrelli (6) to be displaced elements but their development *in situ* was considered possible. The size of a lymphocystis mass depends on the number of cells originally infected and the time since infection. Internal infections have been considered exceptional with few cells rather than large masses the rule (10).

Smith (8) described lymphocystis cells in the choroid of the eye in two species of fish, *Cynoscion regalis* and *Stellifer lanceolatus*. Exophthalmos was seen in both cases in the one eye affected. There was a marked infiltration of lymphocytes in the area and some central retinopathy associated with the lesions. In these fish there were no other sites of lymphocystis infection suggesting to Smith that these were primary sites of infection. We had one case of exophthalmos. In our series the presence of lymphocystis cells in the eye as well as in other organs suggests a systemic disease. All tissues of the eye were involved including iris, cornea, choroid, ocular muscles, retrobulbar tissues and optic nerve. Lymphocystis cells were also seen in meninges of the brain adjacent to the optic nerve. There was no retinal degeneration as described by Smith (8) in any fish we examined. Smith's cases had unilateral but ours often had bilateral involvement. A mononuclear inflammatory infiltrate was un-

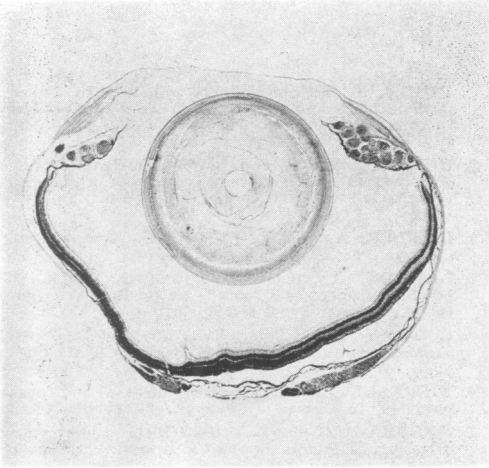


Fig. 3. Section of eye with lymphocystis cells in iris.

**Histopathology** — Many lymphocystis cells were seen in the retrobulbar tissues and the muscles of the head, optic nerve and in the meninges of the brain near the hypophysis. Individual lymphocystis cells were evident in the choroid gland and in the choroid near the ora serrata. A mass of lymphocystis cells was evident in the iris (Figs. 3 and 4).

**Other infected sites** — Both sides of the body, all fins, both gills, pseudobranchs, nostrils, lateral line pits, spleen, mesenteries, kidney, heart and liver.

### CASE 5

**Gross pathology** — Lymphocystis masses were found behind both eyes and on the surface of the left eye.

**Histopathology** — Typical lymphocystis cells were evident in the choroid at the ora serrata, behind the globe in the retrobulbar space and in the tissue at the limbus.

**Other infected sites** — Both sides of the body, all fins, both gills, lateral line pits and the roof of the mouth.

### CASE 6

**Gross pathology** — Individual lymphocystis cells were present on the corneal surface and a mass of cells was found at the medial canthus.

**Histopathology** — Typical lymphocystis cells were evident at the edge of the cornea.

**Other infected sites** — Skin and fins.



Fig. 4. Detail of lymphocystis cells from Fig. 3.

common in our series (cases 1 and 3) and minimal when present although prominent in Smith's two cases. When present, lymphocytes were probably an indication of some host response to the virus.

The frequency of lymphocystis cells in the uvea does suggest a hematogenous spread to the eye especially in the absence of corneal or periocular trauma. Large cells would not be transported easily into the eye. It is probable that virus reached the retrobulbar and other ocular tissues by the blood. Passage into the blood through the gills is the most probable means of entry for the virus even though Smith's two cases had no gill involvement with lymphocystis. Isopod injury to the gills would assist in virus entry and this was seen in our series. Corneal lesions in our cases were probably direct extensions from surface skin masses. The significance of the retrobulbar nematodes found in this study is not known but since some fish with ocular lymphocystis had no nematodes and others had nematodes but no lymphocystis it is doubtful that there is a relationship between them.

#### ACKNOWLEDGMENTS

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#### BOOK REVIEW

TEXTBOOK OF LARGE ANIMAL SURGERY. Edited by F. W. Oehme and J. E. Prier. Published by The Williams & Wilkins Company, Baltimore, Maryland. 1974. 608 pages. Price \$26.50.

The editors have achieved their stated goal and have produced a practical and updated text covering most of the common surgical conditions of the horse and food producing animals. The format is logical and the systems approach permits ready

access to specific procedures. While the important systems have been included the proper emphasis has been placed on the more important ones in so far as surgical conditions are concerned.

This first edition provides large animal veterinarians with a ready reference source for many of the conditions that previously were only available in texts pertaining to the specific species. It is therefore a text that will be of value to students and graduates engaged in large animal practice. — F. D. Horney.