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Source: Journal of Wildlife Diseases, 21(1) : 61-64

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-21.1.61

propriate positive and negative controls, the MG RPA is a reliable, effective field test. The presence of HI antibody is not a diagnostic prerequisite, but would indicate the occurrence of a very recent exposure.

Unfortunately, the relationship between detectable antibody and the carrier state of mycoplasma in wild turkeys is unknown. Until more research is conducted, it can only be assumed that an MG reactor is a carrier of the disease and may be infectious for other wild and domestic birds. Control programs for MG in translocated turkeys, similar to those in Wisconsin, Michigan, Wyoming, and California should be instituted as a necessary precaution.

Research funds were provided by the Wisconsin Department of Natural Resources, Madison, Wisconsin, the Welder Wildlife Foundation, Sinton Texas, and the College of Agricultural and Life Sciences, University of Wisconsin, Madison, Wisconsin.

Journal of Wildlife Diseases, 21(1), 1985, pp. 61–64

Infection of *Exophiala salmonis* in Atlantic Salmon (*Salmo salar* L.)

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There have been three previous reports of infections of *Exophiala salmonis* in salmonids in fresh and saltwater (Carmichael, 1966, Sabouraudia 5: 120–123; Ajello, 1975, Pan Am. Health Organ. Sci. Publ. 304: 126–130; Richards et al., 1978, J. Fish Dis. 1: 357–368), one in error (Ajello, pers. comm.). This note describes the first report of infection by *E. salmonis* in the United States.

Over a 4-mo-period (April–June 1982), three adult Atlantic salmon (University of Rhode Island Accession No. M112, M151, and M657) with similar lesions were necropsied at the Comparative Aquatic Pathology (CAP) Laboratory, University of Rhode Island. Originally obtained from hatcheries in East Orland, Maine and New Brunswick, Canada, these fish had been held at the University Aquaculture Center in a partial reuse system for up to 20 mo prior to death. City water was maintained at 12 to 18 ppt salinity by the addition of rock salt. Fish were fed raw calf's liver supplemented with vitamins.

Tissues from fish were fixed in 10% neutral buffered formalin, paraffin embedded, sectioned at 6 μm and stained with hematoxylin and eosin. Special stains included periodic-acid Schiff (PAS) and Grocott's silver stain (Luna, 1968, Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology, Washington, D.C., 258 pp.).

Accession No. M112 had a reddish discoloration 3.0 mm in diameter on the surface of the liver which extended into the parenchyma. Postmortem examination of M151 revealed petechial hemorrhages throughout the viscera. The pyloric cecae contained approximately 50 adult cestodes (*Eubothrium* sp.). The posterior kidney capsule was thickened and the parenchyma mottled gray. Accession No. M657 was cachexic. An ulceration (1.0 cm

Received for publication 9 December 1983.

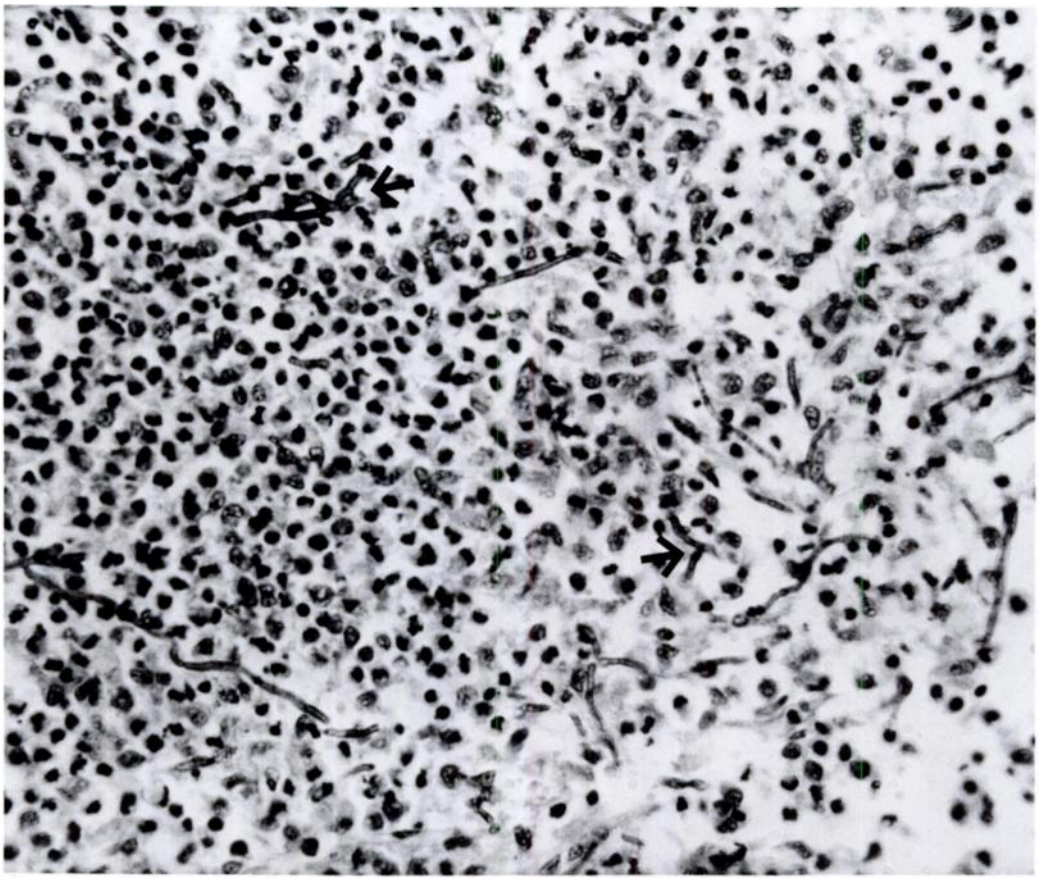

FIGURE 1. Central portion of two microabscesses in the posterior kidney of an Atlantic salmon. Septate, branching fungal hyphae (arrows), masses of polymorphonuclear cells, and macrophages are present. PAS stain. ×400.

diameter) was present just posterior to the right pectoral fin. Petechial hemorrhages were present on the ventral surface between the pectorals. The hindgut contained four adult cestodes (*Eubothrium* sp.). The posterior kidney was swollen and its capsule opaque. The kidney had three raised gray areas 1.0 cm in diameter. When cut a white opaque fluid appeared. The surrounding parenchyma was red to black and of a watery consistency.

Accession No. M112 had microscopic changes in the intestine, kidney and liver. The intestinal mucosa was sloughed and there was focal hemorrhage, necrosis and eosinophilic granulocytic inflammation in the submucosa. Kidney lesions consisted of focal tubular necrosis, nephrocalcinosis and a diffuse granulomatous interstitial nephritis reminiscent of bacterial kidney disease (Wolke, 1975, *In* Pathology of Fishes, Ribeln and Migaki (eds.), Univ. Wisconsin Press, Madison, Wisconsin, pp. 33–116). There was a focal acute hepatitis of fungal etiology. Necrotic tissue was infiltrated with polymorphonuclear leucocytes (PMN's) (70%), macrophages (30%) and numerous light brown, branching septate hyphae. Hyphae were frequently up to 30.0 μm wide. Septae were 8.0 to 10.0 μm apart. The fungus was PAS and Grocott positive.

Accession No. M151 had an eosinophilic granulocytic gastritis and enteritis, pos-

sibly in response to the cestodiasis. The posterior kidney contained masses of fungal hyphae identical to M112, most often within multifocal microabscesses. The center of the abscesses contained a high percentage of polymorphonuclear leucocytes (90%), while the periphery was characterized by fibroblastic proliferation and mononuclear cell infiltration.

Focal congestion occurred in the liver, spleen, and kidney of M657. Nephrocalcinosis, abscesses, focal interstitial hemorrhage and large accumulations of melanin were present in the kidney. Blood vessels frequently contained histiocytes and PMN's. The abscesses had a central zone of liquefactive necrosis, fungal elements and leucocytes (Fig. 1). Bordering this zone were masses of PMN's (70%), histiocytes (20%) and lymphocytes (10%), as well as necrotic interstitial and tubular epithelial cells. Mononuclear cells predominated at the periphery. Fibroblastic proliferation was scant.

The kidney of M657 was cultured on Corn Meal Agar (CMA). Raised, mouse to dark gray colonies 7–10 mm in diameter appeared after 10 days incubation at 25 C. Microscopic morphology was examined by the slide culture method (Riddell, 1950, Mycologia 42: 265–270). Annellides characteristic of *Exophiala* sp. (Campbell and Stewart, 1980, The Medical Mycology Handbook, John Wiley and Sons, New York, 436 pp.) produced conidia which accumulated in balls at the tips (Fig. 2). The fungus was identified as *Exophiala salmonis* Carmichael.

For experimental inoculations *E. salmonis* was grown in the dark on CMA at 25 C for 3 wk. Hyphal and spore suspensions were prepared as by Blazer and Wolke (1979, J. Fish Dis. 2: 145–152). Three juvenile rainbow trout (*Salmo gairdneri*) (total lengths 13.0, 15.4, and 24.0 cm) were injected intraperitoneally (IP) with 0.2 ml of the hyphal suspension. Two juvenile rainbow trout (total lengths 15.5 and 17.0 cm) were injected IP with

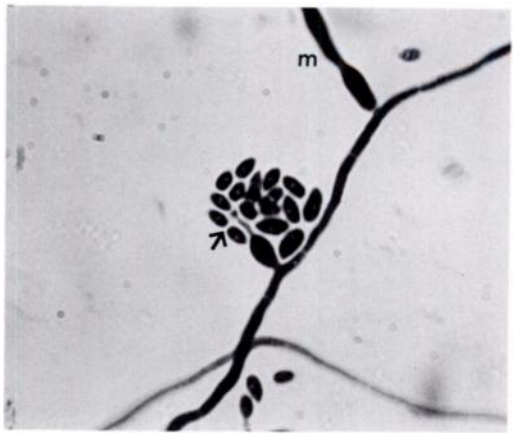

FIGURE 2. Eight-day-old slide culture of *Exophiala salmonis* showing cylindrical to clavate conidia accumulating at the tip of an annellide. Note cytoplasmic protrusion (arrow) at the apex of the annellide and a chain of moniliform cells (m). 1.0% aqueous phloxine, 10.0% KOH stain. ×1,000.

0.2 ml (1.6×10^3 spores) of the spore suspension. The fish were kept in a flow through system in the CAP laboratory with the same water source as the Aquaculture Center. Twelve days post-inoculation the fish were killed, the kidneys cultured, and tissues fixed for light microscopic examination. Histological examination of experimental fish revealed no evidence of fungal elements in any tissue. CMA kidney cultures were negative after 1 mo incubation at 25 C. The inability to experimentally infect fish is consistent with previous reports (Carmichael, 1966, op. cit.).

Natural infections of *E. salmonis* have been reported to produce systemic chronic granulomatous lesions (Carmichael, 1966, op. cit.; Richards et al., 1978, op. cit.). The lesions found in these Atlantic salmon were acute and are best described as abscesses, with the predominant cell type the polymorphonuclear leucocyte. There has been some debate as to whether fish are able to produce a purulent exudate. However, abscesses and purulent exudates have been previously reported in fish (Fijan, 1968, Bull. Wildl. Dis. Assoc. 5: 109–110; Finn and Nielson, 1971, J. Fish

Biol. 3: 463–478; Blazer and Wolke, 1979, op. cit.).

A review of the phaeohyphomycoses of fish (Ajello, 1975, op. cit.; Neish and Hughes, 1980, Fungal Diseases of Fishes, Snieszko and Axelrod (eds.), TFH Publications, Neptune City, New Jersey, 158 pp.; Ellis et al., 1983, J. Fish Dis. 6: 511–523) shows interesting parallels to the cases herein reported. The mycoses are systemic in nature and occur only in captive or hatchery-raised fishes. It appears that individuals that are immunosuppressed or otherwise compromised are predisposed to these opportunistic pathogens. The Atlantic salmon in this study had not fed well in captivity, and had just undergone an unsuccessful spawning period. The cestode infections could have weakened the fish, and provided a route of entry for the fungus with subsequent hematogenous spread to the kidney.

Exophiala salmonis has been isolated from soil (DeHoog, 1977, Studies in Mycology No. 15, Centraalbureau voor Schimmelcultures, Baarn, pp. 103–104). The rock salt used to maintain salinity was stored outdoors in contact with soil. The fungus could have entered the system via the salt. Fish when placed in water of increased salinity will swallow water for osmoregulation (Moyle and Cech, 1982, Fishes: An Introduction to Ichthyology, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 593 pp.).

The authors thank Dr. L. T. Smith for providing the fish, R. O. Bennett for isolation of the organism and Drs. L. Ajello and A. Padhye of the Center for Disease Control for identification of the fungus. Contribution No. 2173 of the Agricultural Experiment Station, University of Rhode Island.

Journal of Wildlife Diseases, 21(1), 1985, pp. 64–65

Prevalence of *Oslerus osleri* (Cobbold, 1879) in Coyotes (*Canis latrans* Say) from Connecticut

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The coyote has been observed with increasing frequency in the northeastern United States and may serve as an additional wild reservoir for diseases and parasites transmissible to man and domestic animals. *Oslerus osleri* (=*Filaroides osleri*) is a tracheal nematode reported from many species of wild canids and domestic dogs in North America, Europe, Africa, Asia, and Australia (Mills, 1967, J. Small Anim. Pract. 8: 37–43; Pence, 1978, Proc. Helminthol. Soc. Wash. 45: 103–110; Morrison and Gier, 1978, J. Wildl. Dis. 14: 314–316; 1979, J. Wildl. Dis. 15: 557–559; Dunsmore and Spratt, 1979, Vet. Parasitol. 5: 275–286; Pence and Custer, 1981, *In* Worldwide Furbearer Conference Proceedings, Vol. II, Chapman and Pursley (eds.), Worldwide Furbearer Conference, Inc., Frostberg, Maryland, pp. 760–845; Foreyt and Foreyt, 1982, J. Parasitol. 67: 284–286; Seesee et al., 1983, J. Wildl. Dis. 19: 54–55). Since there are no previous reports of *O. osleri* infection in coyotes in the northeastern United States, the pres-

Received for publication 28 February 1984.