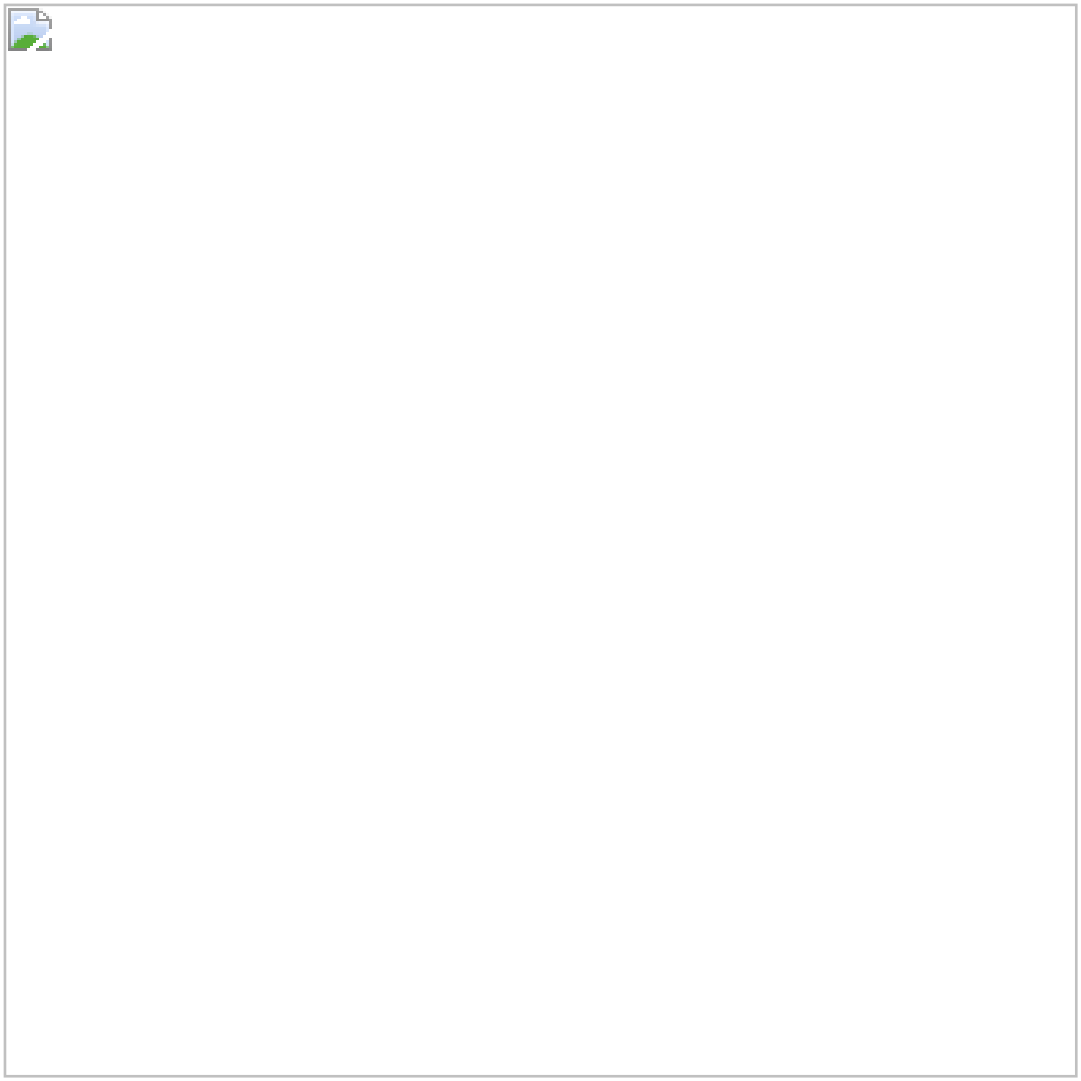

SYSTEMIC MYCOSIS IN CHANNEL CATFISH *

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SYSTEMIC MYCOSIS IN CHANNEL CATFISH*

Internal fungus infections of freshwater fish seem to be relatively rare. Only a few such cases have been reported in the United States. Wood et al (1955. J. Infect. Dis., 97: 262-267) described a mycosis-like granuloma and reviewed earlier American literature on systemic mycoses in fish. Scott (1964, Develop. Industr. Microbiol., 5: 109-123) summarized his experiences and work on external mycoses, which are more common than the internal ones. An epizootic of an apparently undescribed mycosis of channel catfish *(Ictalurus punctatus,* Rafinesque) was encountered in a small privately owned pond in Central Alabama.

In April the pond owner noticed that channel catfish had skin lesions. On the advice of the state fishery biologist, five live fish, each weighing 800 to 1,000 gm., were brought for examination to the personnel of the Cooperative Fish Parasite and Disease Project at Auburn University Agricultural Experiment Station. The findings described and the epizootic character of the disease prompted advice to the owner to destroy the fish population and disinfect the pond.

Round or irregular ulcers, varying in diameter from 2 to 15 mm, up to 5 mm deep, were found on the body in four of the five fish. The edges of the ulcers and the exposed muscular tissue did not appear to be inflamed. In one fish, the anus was inflamed, half-opened and protruding.

Numerous soft nodules of varying size, up to 25 mm in diameter, were found in all visceral organs of fish with skin lesions. Massive granulomatous adhesions of organs, absence of serous membranes on the ragged surface of nodules and diffuse peritonitis with hemorrhagic and purulent exudate indicated a severe infection spreading both by hematogenous means and by extension. In the fish with no external ulcers, the internal pathological changes were less advanced: Nodules were present in kidney (Figure 1), liver, intestinal wall and adipose tissues. Peritoneal changes were confined to a few small adhesions of the liver.

FIGURE 1. *Mycotic abscesses in kidneys. Reduced to 4/5 of natural size.*

In the smears and KOH mounts from nodules of each of the five fish, fungus hyphae were present in large numbers. They were tubular, branched and septate. Material from kidneys and livers was plated on brain heart infusion agar (Difco), Mueller-Hinton medium (Difco) and *Cytophaga* agar of Anacker and Ordal (1958, Jour. Bacteriol., 78: 25-32). After incubation at 25C, numerous, relatively small, dark colonies of fungus developed on all plates. A few aeromonads and enterobacteria were isolated from the liver. Acid fast or gram-positive bacteria were not present in smears or on plates. The fungus was identified as belonging to the family *Dematiaceae,* order *Moniliales.*

The pathogenicity of the fungus was tested on channel catfish, white catfish and bluegills. Five fish of each species were injected intraperitoneally with a suspension obtained from the fungus growth on the slanted Mueller-Hinton medium which had been incubated for seven days at 25C. The fish were kept at

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18C. The first channel and white catfish died 13 days after injection and the first bluegill died after 19 days. All fish were dead within a month. Peritonitis and abscesses in internal organs developed in all fish. In several catfish, the abdominal wall was perforated and the anus was inflamed. Fungal hyphae were present in large numbers in all dead fish and the organism was re-isolated from one of the experimental channel catfish.

Sections of formalin fixed and paraffin embedded organs of fish from the pond in which the epizootic occurred, were stained by hematoxylin and eosin (H. and E.) and by periodic acid-schiff reaction (PAS). In H. and E. stained sections hyphae were distinguishable but PAS showed them very clearly. Abscesses contained caseous, or a mixture of caseous and purulent material with numerous fungal hyphae. Hyphae often penetrated radially from the necrotic center into the surrounding tissue, causing degeneration and necrosis around them. Granulomatous tissue, including histiocytes and giant cells and irregularly scattered widened capillaries, formed the thick wall of large abscesses (figure 2). Small necrotic centers were abundant within the granulomatous wall of large nodules. Microscopic abscesses of a granulomatous and purulent type were found in the organs also.

In the only published report on fish mortality caused by a dematiaceous mold, Carmichael (1966, Saboraudia, 5, (part 2): 120-123) described a *Phialophora*-like fungus which caused three epizootics of cerebral mycetoma in cut-throat trout *(Salmo clarkii)*. This fungus was placed in a new genus and named *Exophiala salmonis* (Carmichael). The dematiaceous fungus from channel catfish did not affect the central nervous system. It had an affinity for internal organs, especially kidney and liver, and for skin tissue. At 37C our isolate grew scantily, but Carmichael was unable to grow *E. salmonis* at this temperature. I sent the isolate to: J. J. Ellis, ARS Culture Collections Investigations, Fermentation Laboratory, U.S. Department of Agriculture; C. S. Hodges, Southeastern Forest Experiment Station, U.S. Department of Agriculture; and J. W. Carmichael. According to Ellis it showed characteristics similar to those of the genus *Phialophora*. Comparing it with the published data from Carmichael, Hodges believed that it was not *E. salmonis*, but that it was a similar organism. Mrs. K. Wilson from Dr. Carmichael's laboratory judged our isolate to be closely related to *E. salmonis*.

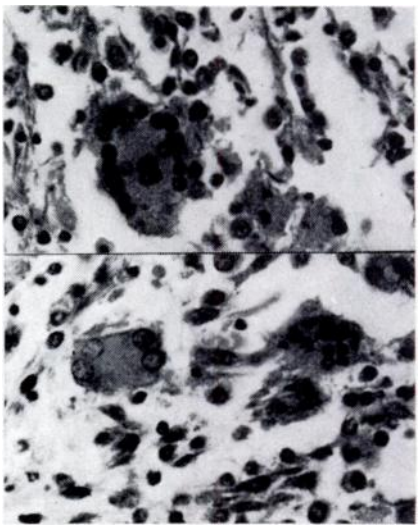

FIGURE 2. *Giant cells from an abscess in kidneys. H and E X 1200.*

When compared to other described internal mycoses in fish, the disease found in these catfish seems to be closest, but not identical to the case described by Otte (1964, Wiener Tierarztl. Monatschr. 51: 171-175). He isolated a fungus, related to the genus *Pullularia*, from the liver of marine fish *Trigon pastinacea*, L. and found it to be pathogenic for carp *(Cyprinus carpio* L.).

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