Ichthyophonus

I. Causative Agent and Disease

Ichthyophonus hoferi, the causative agent reported for the disease ichthyophoniasis, may actually comprise several different species yet to be identified. Although once considered a member of the fungi, *Ichthyophonus* was recently reclassified as a protozoan member of the class Mesomycetozoea, a highly diverse group of organisms having characteristics of both animals and fungi. The route of infection is probably through the intestinal tract. As with most diseases, the severity is dependent on the general stress and health of the fish host. Once within the body, *Ichthyophonus* is a systemic pathogen localizing in major organ systems including the heart.

II. Host Species

A wide range of marine and anadromous fish species in North America and Europe are susceptible to *Ichthyophonus*. The organism has also been reported from amphibians and reptiles.

III. Clinical Signs

The gross clinical signs of *Ichthyophonus* can be confused with other visually similar conditions. A strong inflammatory response against the parasite often results in visible granulomas encapsulating the macrospores of the organism. These granulomas contain host lymphocytes, macrophages, neutrophils, and fibrous connective tissue that appear as white, yellow or brown foci in infected tissues such as the spleen, liver, kidney, skeletal muscle and especially the heart.

IV. Transmission

Ichthyophonus is an obligate pathogen and considered to be of marine origin. The organism has been experimentally transmitted to Chinook salmon by feeding infected herring tissues. There also is speculation that herring become infected by feeding on copepods that are somehow infected with the organism.

V. Diagnosis

Microscopic diagnosis is made by wet mounts of infected tissues, usually lesions of the heart or muscle. Tissue explant cultures using a liquid *Ichthyophonus* medium can increase detection in lightly infected fish that are not clinically diseased. Microscopic or histological examination of infected tissues can demonstrate the various sized characteristic macrospores and hyphae of the organism. PCR is also available to diagnose *Ichthyophonus* and may be useful when the organisms are no longer viable for culture.

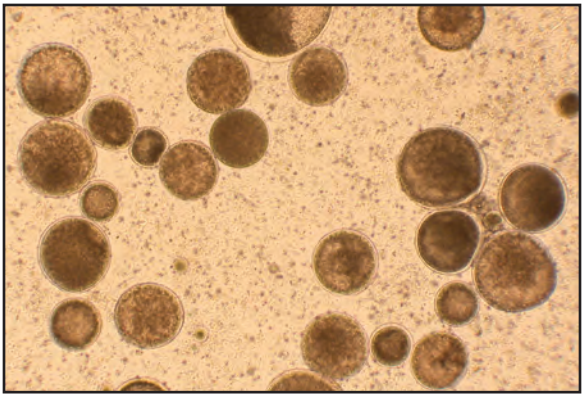
VI. Prognosis for Host

Some species, such as Atlantic herring, are more susceptible to *Ichthyophonus* infections and have sustained mass mortality from the disease. Other species and some stocks within a species have more resistance to exposure and may become infected with the parasite without serious consequences. In experimental studies with juvenile herring death from injection of *Ichthyophonus* macrospores can occur in 80% of the fish within 60 days. Other field studies of adult Pacific herring have suggested the pathogen can persist for long periods without initiating rapid disease or mortality.

VII. Human Health Significance

This parasite is a pathogen only for poikilothermic animals. Therefore, there are no human health concerns associated with *Ichthyophonus*.

Ichthyophonus granulomatous lesions in salmon muscle



Ichthyophonus resting spores, phase contrast microscopy