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A Comprehensive Study on Diagnosis Precaution and Treatment of Fungus Diseases in Aquatic Fish Species

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Abstract: ***This study investigates the common fungus diseases in fish, their causes, and the impact of environmental stresses. The paper also discusses various diagnostic methods and suggests control measures to prevent these diseases, with focus on Black Gill diseases (Furarium) Res diseases (Aflatoxicosis), Saprolegniasis, Branchiomycosis, Ichthyophonus disease and EUS (Epizootic Ulcerative Syndrome) fungal diseases in fish. Fungal infections (fungal infections are called mycoses) are among the most common diseases seen in temperate fish. Fungal spores are found in all fish ponds and create problems in stressed fish. Poor water quality can also lead to an increase in fungal infections in an otherwise healthy fish population. Most fungal infections only attack the external tissues and only few fungal infections that will infect the internal organs of fish.***

Keywords: Fungus, Diseases, Treatment, Fishes, Aquatic Fish

1. Introduction

According to *Eduardo M. Leaño* many diseases of aquatic animals are caused by organisms that are part of the normal biota of their surrounding environment. Fungi and fungal - like organisms (straminipilous organisms) occur in most waters. They are either saprobes that colonize decaying organic matter, or parasites, which attack a great variety of aquatic organisms leading to disease outbreaks. Among the parasitic species, many are known to be important causative agents of aquatic animal diseases. They are generally opportunistic invaders, but once established, are often fatal and difficult to treat. Thus, fungi and straminipilous organisms may be prob - lematic pathogens under stressful conditions in an aquaculture system. Fungi constitute a group of heterotrophic organisms, which contain no chloro - phyll and are historically compared to plants. They are usually filamentous and multicellular, although some are non - filamentous and unicellular. The filaments known as hyphae (sing. hypha) constitute the body of a fungus. These filaments elongate by apical growth (growth is active at hyphal tips), in con - trast to intercallary growth of other filamentous organisms. The hyphae are either septate (divided by cross walls) or non - septate (coenocytic, without cross walls). They branch successively behind the tips, resulting in a net - work of hyphae called mycelium (pl. mycelia). Fungi are a group of organisms called heterotrophs that require living or dead matter for growth and reproduction. Fungi are present everywhere - - in saltwater or fresh water, in cool or warm temperatures. In most cases, fungi serve a valuable ecological function by processing dead organic debris. However, fungi can become a problem if fish are stressed by disease, by poor environmental conditions, receive poor nutrition, or are injured. If these factors weaken the fish or damage its tissue, fungus can infest the fish. All fungi produce spores - - and it is these spores which readily spread disease. The fungal spore is like a seed which is resistant to heat, drying, disinfectants and the natural defence systems of fish the most common fungal diseases are discussed here. They are known as Black Gill diseases (Furarium) Res diseases (Aflatoxicosis), Saprolegniasis, Branchiomycosis, Ichthyophonus disease and EUS (Epizootic Ulcerative Syndrome).

Aim and objective

The purpose of this study is to This article could improve disease management skills of fish farmers in aquaculture practices and provide a comprehensive overview of fungus diseases in fish, focusing on their causes, diagnosis, and control measures. This research aims to contribute to the improvement of fish health and aquaculture productivity.

Significance of the Article

In this paper we knowing the causes of fish diseases, their significance, and how to control the fish diseases in aquaculture will provide lot of information towards disease problems and better health management strategies in fresh water aquaculture production. This article could improve disease management skills of fish farmers in aquaculture practices. And also this article could improve disease management skills of fish farmers in aquaculture practices, thereby contributing to the sustainability and productivity of aquaculture.

2. Material and Methods

Sources of Data

Studies Various Books & Research Paper,

Major Fungal Diseases of Fish

Mycotic infections among freshwater fish species are commonly caused by straminipilous organisms. The pathogens can infect eggs, fry, fingerlings, and adult fish. Stress factors such as mechanical injury after handling, exposure to extreme pH levels, prolonged exposure to low water temperatures, lack of food, and presence of other microbial infections (e. g. bacterial, viral) increase the susceptibility of fish to fungal infections. Infection is normally restricted to su - perficial tissues and, unless the fish can be treated, the condition is usually lethal. Listed

below are fungal diseases of freshwater fish caused by zoosporic stramenopiles.

1) Black Gill Disease

Causative Agent: *Fusarium solani*

Species Affected: All *Penaeus* species

Effects on hosts:
Infection usually starts on damaged tissues such as wounds, gills damaged from chemical treatments or pollutants, and lesions resulting from other dis - ease processes. Once infection is established, it is usually progressive with 30% remission rate. Lesions may also serve as a route of entry for other opportunis - tic pathogens.

Diagnosis:
Microscopic examination of wet mounts of infected tissues will reveal the pres - ence of canoe - shaped macroconidia (Fig.4 - 8). *Fusarium* spp. are ubiquitous soil fungi. Infection may begin at different loci and spread slowly. *Fusarium solani* is an opportunistic pathogen of penaeids and are capable of establishing infection in shrimps compromised by other stresses or overcrowding.

Prevention and Control:
Preventive measures include the elimination of sources of *Fusarium* conidio - phores and destruction of infected individuals. Several fungicides show prom - ise *in vitro* but none proved to be effective in actual field trials.

2) Aflatoxicosis (Red Disease)

Causative Agent:
Aflatoxin produced by *Aspergillus flavus* and other *Aspergillus* spp. which are common contaminants of not - properly stored or expired feeds.

Species Affected:
Penaeus monodon, other p*enaeus* spp.

Gross Signs:
Yellowish, and eventually reddish discoloration of the shrimp body and appendages can be observed among pond - cultured shrimp juveniles. Affected animals become lethargic with weak swimming activity near pond dikes. Soft shelling can also be observed.

Diagnosis:
Affected shrimps will not survive for more than 30 seconds when collected from the feeding trays. There will also be loss of appetite. Confirmation is by chemical analysis for the presence of aflatoxin in the suspected feed/ ingredient.

Effects on Hosts:
Histopathologically, necrosis in the tubule epithelium that proceeds from proximal portion of the tubules to peripheral tubule tips in the hepatopancreas can

Prevention and Control:
Do not use moldy feeds. Feeds should be properly stored (for not more than 6 months) in dry and well - ventilated areas to prevent, or at least minimize growth of fungal contaminants.

3) Saprolegniasis
Saprolegniasis is a fungal disease of fish and fish eggs most commonly caused by the *Saprolegnia* species called "water molds. " They are common in fresh or brackish water. *Saprolegnia* can grow at temperatures ranging from 32° to 95°F but seem to prefer temperatures of 59° to 86°F. The disease will attack an existing injury on the fish and can spread to healthy tissue. Poor water quality (for example, water with low circulation, low dissolved oxygen, or high ammonia) and high organic loads, including the presence of dead eggs, are often associated with *Saprolegnia* infections.

Disease Signs
Saprolegniasis is often first noticed by observing fluffy tufts of cotton - like material - - coloured white to shades of grey and brown - - on skin, fins, gills, or eyes of fish or on fish eggs. These areas are scraped and mounted on a microscope slide for proper diagnosis. Under a microscope, Saprolegnia appears like branching trees called hyphae. With progression of infection fish usually becomes lethargic and less responsive to external stimuli. So fish under such conditions is a target to predators.

Management and Control
Saprolegniasis is best prevented by good management practices - - such as good water quality and circulation, avoidance of crowding to minimize injury (especially during spawning), and good nutrition. Once *Saprolegnia* is identified in an aquatic system, sanitation should be evaluated and corrected. Common treatments include potassium permanganate, formalin, and povidone iodine solutions. Over treatment can further damage fish tissue, resulting in recurring infections. Environmental management is essential for satisfactory resolution of chronic problems. Bath treatment in NaOH (10 - 25g/lit for 10 - 20min), KmNO4 (1g in 100lit of water for 30 - 90 min), CuSO 4 (5 - 10g in 100 lit water for 10 - 30min).

4) Branchiomycosis
Branchiomyces demigrans or "Gill Rot" is caused by the fungi *Branchiomyces sanguinis* (carps) and *Branchiomyces demigrans* (Pike and Tench). Branchiomycosis is a pervasive problem in Europe, but has been only occasionally reported by U. S. fish farms. Both species of fungi are found in fish suffering from an environmental stress, such as low pH (5.8 to 6.5), low dissolved oxygen, or a high algal bloom. *Branchiomyces* sp. grow at temperatures between 57° and 95°F but grow best between 77° and 90°F. The main sources of infection are the fungal spores carried in the water and detritus on pond bottoms.

Disease Signs
Branchiomyces sanguinis and *B. demigrans* infect the gill tissue of fish. Fish may appear lethargic and may be seen gulping air at the water surface (or piping). Gills appear striated or marbled with the pale areas representing infected and dying tissue. Gills should be examined under a microscope by a trained diagnostician for verification of the disease. Damaged gill tissue with fungal hyphae and spores will be present. As the tissue dies and falls off, the spores are

released into the water and transmitted to other fish. High mortalities are often associated with this infection.

Carp with branchiomycosis (gill mycosis): Photo Bayerische Biologische Versuchsanstalt (Adopted from Fish pathology by Reichenbach - Klinke's)

Management and Control

Avoidance is the best control for Branchiomycosis. Good management practices will create environmental conditions unacceptable for fungi growth. If the disease is present, do not transport the infected fish. Great care must be taken to prevent movement of the disease to noninfected areas. Formalin and copper sulphate have been used to help stop mortalities; however, all tanks, raceways, and aquaria must be disinfected and dried. Ponds should be dried and treated with quicklime (calcium oxide). A long term bath in Acriflavine Neutral or Forma - Green for seven days helps this condition. Ponds should be dried and treated with quicklime (calcium oxide) and copper sulphate (2 - 3kg / ha). Dead fish should be buried.

5) Icthyophonus Disease

Icthyophonus disease is caused by the fungus, *Icthyophonus hoferi.* It grows in fresh and saltwater, in wild and cultured fish, but is restricted to cool temperatures (36° to 68°F). The disease is spread by fungal cysts which are released in the faeces and by cannibalism of infected fish.

Disease Signs

Because the primary route of transmission is through the ingestion of infective spores, fish with a mild to moderate infection will show no external signs of the disease. In severe cases, the skin may have a "sandpaper texture" caused by infection under the skin and in muscle tissue. Some fish may show curvature of the spine. Internally, the organs may be swollen with white to grey - white sores.

Diseased fish shows curious swinging movements hence the disease is called as swinging disease. Along with liver, particularly severely affected organs are: - spleen (salmonids), heart (herring), kidney (salmonids), gonads, brain (salmonids), gills (salmonids), and musculature and nerve tissue behind the eyes (sea fish).

(Adopted from Fish pathology by Reichenbach - Klinke's)

Management and Control

There is no cure for fish with *Icthyophonus hoferi;* they will carry the infection for life. Prevention is the only control. To avoid introduction of infective spores, never feed raw fish or raw fish products to cultured fish. Cooking helps destroy the infective life stage. If Icthyophonus disease is identified by a trained diagnostician, it is important to remove and destroy any fish with the disease. Complete disinfection of tanks, raceways, or aquaria is encouraged. Ponds with dirt or gravel bottoms need months of drying to totally eliminate the fungus.

6) EUS (Epizootic Ulcerative Syndrome)

Causative agent: *Aphanomysis invadans (*Fungus), *Aeromonas hydrophilla (*Bacteria), *Rhabdovirus (*virus)

Species affected: Indian Major Carps, Snakehead and Catfishes

Symptoms:

Infection start as a red spot in the skin then it eventually becomes an ulcer. As it progresses, the ulcerative area gets eroded. In infected *Channa striatus* swim with a disintegrated caudal peduncle and eroded head due to the high general resistance to infections. The smaller freshwater fishes such as minnows die much before the infection can erode any organs.

Treatment: In the initial stage application of sodium chloride treatment is effective. CIFA produced a CIFAX, for controlling of EUS. Prevent entry of wild fishes and birds. Maintain water temperature during winter season and water exchange.

3. Conclusion

Disease issue has become a prime constrain for the sustainable aquaculture. The fish farmers are having little or no expertise in aquaculture health management strategies. So knowing the causes of fish diseases, their significance, and how to control the fish diseases in aquaculture will provide lot of information towards disease problems and better health management strategies in fresh water aquaculture production. This article could improve disease management skills of fish farmers in aquaculture practices. Fungal diseases are often indicative of a more serious problem. Saprolegniasis is a common fungal disease which affects the external surfaces of fish. It can be eliminated easily after the primary cause of illness has been identified and corrected. On the other hand, Branchiomycosis, a relatively new problem and has caused high mortalities in cultured fish, and is difficult to control. Ichthyophonus disease is a systemic fungal disease and once it enters the fish, there is no cure. The best control for all fungal infections is good management: good water quality, good nutrition and proper handling. However, knowledge on fungal diseases is rudimentary consisting primarily of the identification and pathology of etiological agents. Detection of fungal infections relies only on the observation of gross pathology, histological examinations, and standard mycological isolation and identification procedures. As a result, there are some cases where the implicated fungal pathogen cannot be demonstrated as the primary cause of a particular disease. In such cases, the fungal pathogen is usually regarded as secondary invader. Continued research in basic mycology is still an essential resource for fish pathologists in diagnosing diseases caused by fungi. Although fungi reportedly affect very few species, fungal diseases, if not properly controlled or prevented, can still pose a threat to the aquaculture industry.

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