

# Bacterial Diseases in Fish

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Causes of fish disease	
Non-Infectious Diseases	Infectious Diseases
Nutritional Diseases	Viral Diseases
Environmental Diseases	Bacterial Diseases
Chemical Diseases	Parasitic Diseases
Physiological Diseases	Fungal Diseases

## Predisposing Factors for Bacterial Diseases

- 1- Overcrowding with low oxygen and high secreted ammonia is the major cause of disease
- 2- Bad management
- 3- Environmental contamination (bad water quality)
- 4- Fish feed diets unbalanced with the requirements of the fish
- 5- Injuries of fish

## Bacterial Infections: What are Bacteria?

Bacteria are microscopic single celled organisms that can reproduce rapidly.

They are naturally present in aquarium water.

Fish in good health kept in good water conditions can fight bacterial infections.

Fish are most prone to such infections if in poor condition as a result of bad or sudden changes in water quality, overcrowding, bad handling or transportation.

A poor diet lacking in sufficient protein, fatty acids and vitamins can reduce fish resistance to such disease.

## When the Bacteria become Pathogen?

This bacteria only become pathogens when fishes are physiologically unbalanced, nutritionally deficient, or there are other stressors, poor water quality, overstocking, which allow opportunistic bacterial infections to proceed.

Some of these bacterial pathogens Some of these bacterial pathogens of fishes are fastidious and require special growth media for laboratory culture. Others grow at different temperatures, dependent upon the aquatic environmental temperature of the fish.

## Gram-negative bacteria:

Most bacteria commonly isolated from fish are Gram-negative bacilli. May be rapidly fatal.

### 1. *Aeromonas salmonicida*

skin nodules (furunculosis) and ulcers secondary septicemia is common

### 2. *Aeromonas hydrophila*

always present in the water symptoms similar to *A salmonicida* hemorrhagic septicemia

### 3. *Flavobacterium columnare* (previously known as *Flexibacter columnaris*)

always present in the water gill erosion skin lesions starting as shallow, white erosions and progressing to yellowish-brown ulcers typically found on dorsal area

### 4. *Pseudomonas fluorescens*

lesions similar to *Aeromonas*

#### 1. *Edwardsiella sp. (tarda and ictaluri)*

initially - small ulcers and hemorrhages in the skin and muscles or pinpoint skin hemorrhages later large abscesses with stinky, gas-filled cavities in muscles lesions similar to *Aeromonas*

#### • Rods

#### *Nocardia*

raised masses in mouth, gills, and skin which eventually ulcerate granulomas in organs

## Gram-positive Bacteria

### Aerobic, bacilli

*Mycobacterium (fortuitum and marinum)* wasting away granulomas in many tissues and organs, including the skin Treatment is largely ineffective.  
can be transmitted to humans

### Cocci

(*Streptococcus (iniae and dysgalactiae)*)

## Bacterial Hemorrhagic Septicemia

**Etiology:** *Aeromonas hydrophila*

Gram negative motile rods Effects many freshwater species and usually is associated with stress and overcrowding

Disease is transmitted via contaminated water or diseased fish

## The clinical signs and lesions are variable

1-The most common finding is hemorrhage in skin, fins, oral cavity and muscles with superficial ulceration of the epidermis. Occasionally cavity ulcers are observed.

2-Diffuse bleeding on the skin, exophthalmos and bleeding in the eyes

3-Patchial hemorrhages on the gill associated. With necrosis of the tips of the gills

4-Bleeding on internal organs (Liver, kidneys, gonads and muscles.

5-Exophthalmus and ascites are commonly observed. Splenomegaly and swollen kidneys are common. Histologically, multifocal areas of necrosis in the spleen, liver, kidney and heart with numerous rod shaped bacteria are observed.

## Diagnosis

Bacteriology employs specialized media (such as Ampicillin Dextrin Agar or Rimmelar Shoots Agar)) plates for bacterial culture and identification

## Treatment

Oxytetracycline (Terramycin) has been the drug of choice for treating motile aeromonad septicemias in fishes. The drug is approved for use with pond fishes It is administered in feed at a daily rate of 50 to 75 mg/kg of fish for 10 days.

## Gentamycin Sulfate Powder 100%

USE: Probably the most powerful gram-negative anti-bacterial on the market today. Effective in fresh and salt water aquariums. Only 1 dose is usually required. One of the few through the gills drugs that is absorbed into the blood stream

### **DOSAGE:**

1/4 teaspoon per 40 gallons of water. Only one dose is necessary. Treat one time and leave in water for 7-10 days. If water changes are done, replace the medication according to how much water was changed

## **Bacterial Gill Disease**

This disease is caused by a variety of bacteria. *Flexibacter columnaris*, *Flexibacter psychrophilus*, *Cytophagy psychrophila* and various species of *Flavobacterium* (all are gram negative rods) are the primary bacteria involved in this disease.

Fry are the most susceptible to the disease, however, all ages may be affected. Clinically the fish become anorectic, and face the water current. Prominent hyperplasia (mucus and epithelial) of the gills is evident on gross and microscopic examination. A disease that may affect any fish cultured intensively. BGD is caused by a number of different bacteria that infect the gills of fish. The disease is characterized by the presence of large numbers of filamentous bacteria on the gills accompanied by clubbing and fusing of the gill filaments. This reduces the ability of the gills to supply oxygen to the blood and results in mortality if left unchecked. This reduces the ability of the gills to supply oxygen to the blood and results in mortality if left unchecked.

### **Predisposing Factors of BGD**

1-Overcrowding, accumulation of metabolite waste products (particularly ammonia), organic matter in the water, and an increase in water temperature may all be predisposing factors. The onset of BGD is usually linked to a decline in environmental conditions in combination with overcrowding.

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## Gross Lesion of BGD

1-an external infection with lesions appearing on the body surface and gills.

2-Whitish ulcerations, erosion of the gill lamellae and hemorrhages may also be observed.

Microscopically one observes proliferation of the epithelium that result in clubbing and fusion of the lamella. Necrosis of the gill lamella occurs in serious cases.

Histologically

there is extensive epithelial hyperplasia, and sometimes mucous metaplasia. The interlamellar spaces can be filled with masses of debris and bacterial growth. The bacterial growth consists mainly of gram-negative rods.

Treatment

The best treatment is prevention through maintenance of optimum rearing densities and keeping rearing units as clean as possible to prevent the growth of bacteria..

*Yersinia ruckeri* (Enteric red mouth)

Gram negative motile rod

**The bacteria affects the most susceptible fish .**

**Clinically this disease manifest itself as a septicemia with exophthalmus, ascites, and hemorrhage and ulceration of the jaw, palate, gills and operculum. Hemorrhage of the musculature and serosal surfaces of the intestines, splenomegaly, and kidney swelling are common.**

**Histologically**

numerous bacterial colonies admixed with inflammatory cells are observed in many areas of necrosis involving the liver, spleen and kidney.

**The disease is transmitted by contact with diseased or carrier fish, and contaminated water. Bacteria persist in asymptomatic fish and in some birds.**

## Columnaris Disease

*Flexibacter columnaris* (Columnaris disease or Saddleback disease)

Gram negative slender rods (3-8 microns)

**Clinical Signs and gross lesion of Columnaris**

**The disease is a serious disease of fish**

**Characterized by:**

- Skin lesion
- Fin erosion
- Gill necrosis

Gills are a common site of damage and may be the only affected area

Fish may become lethargic, exhibit a loss of appetite, and hang at the surface. In general, gross signs of columnaris disease are easily recognized and include frayed fins, depigmented lesions on the skin, This is a highly communicable disease. Lesions usually first appear as small white spots on the caudal fin and progresses towards the head. The caudal fin and anal fins may become severely eroded. As the disease progresses, the skin is often involved with numerous gray white ulcers.

The gill lesions are characterized by necrosis of the distal end of the gill filament that progresses basally to involve the entire filament. *Flexibacter columnaris*

infections are frequently associated with stress conditions. Predisposing factors for Columnaris disease are high water temperature (25°C-32°C.), crowding, injury, and poor water quality (low oxygen and increased concentrations of free ammonia).

### **Treatment**

Environmental improvements, especially increased oxygenation, control of organic addition, etc., are the most valuable supportive therapy. Practical control of outbreaks of columnaris is possible with a number of drugs, including copper sulphate (0.5–1.0 ppm) and potassium permanganate (2–3 ppm) in pond treatment. Various other treatments are also employed including dip treatment for 1–2 minutes in 1:2000 copper sulphate solution. If the fish are able to feed, incorporation of oxytetracycline in the feed at the rate of 8 g/100 kg of fish/day for 10 days is also effective

### ***Mycobacterium* species Tuberculosis**

Gram positive, acid fast rods (*M. marinum*, *M. chelonae* and *M. fortuitum* are the most common *Mycobacterium* species involved.)

All species of fish are affected. This disease affects both saltwater and freshwater aquariums as well as fish raised for food (**up to 10 to 25% of pen raised fish**).

**Clinical signs of tuberculosis are quite variable.**

The most common signs are anorexia, emaciation, vertebral deformities, exophthalmus, and loss of normal coloration. Numerous variably sized granulomas are often observed in various organs throughout the body. Often numerous acid fast bacteria are observed in the granulomas

The aquatic environment is believed to be the source of initial infection with fish becoming infected by ingestion of bacterial contaminated feed or debris. Once an aquarium is infected with this disease, it is difficult to remove except by depopulation of the aquarium and disinfecting the tank. Remember this is a zoonotic disease (atypical mycobacteriosis).

Atypical mycobacteriosis may manifest itself as a single cutaneous nodule on the hand or finger or may produce a regional granulomatous lymphadenitis of the lymphatics near the original nodule. Occasional local osteomyelitis and arthritis may also occur

### ***Pseudomonas fluorescens***

Causes pseudomonas septicemia mainly in general pond fish, seldom in salmonids

normally a secondary invader, hard to distinguish from Aeromonas septicemia, not a huge concern in fish

Agent: ubiquitous bacterium of soil, water, spoilage-vulnerable foods; G- rod motile via polar flagellum; grows @ 18-25 C; cytox positive, catalase positive, strict aerobe

culture: std media, round glistening colonies w/undulating edge, radial striations, easily seen green pigment under UV light (pseudomonas F agar).

### **Diagnosis:**

Isolation from kidney on TSA or BHI; confirmation via serology tests

**Control:** remove stressor, drug therapy as with other G-(oxytet @50-75 mg/kg/f/day for 10 days); no vaccine yet.

## **Therapy of Fish Diseases**

Therapy can be applied in two ways: external treatments or treatment via diet.

### **External treatments**

There are two methods of application of external treatments.

#### ***Immersion in chemical solution***

The most common method of administering therapeutic agents to fish is immersion in water soluble compounds. These are baths in lower concentration of chemicals ranging from short to prolonged periods and dips where the fish are dipped into a chemical solution of high concentration for a very short period ranging from a few seconds to 5 minutes.

## **Treatment via diet**

This method is usually applied for treating the systemic bacterial diseases or gut parasites by incorporation of the drug into the feed. Loss of appetite is one of the first signs of a disease and hence in such cases the use of drugs in proper doses through supplementary feeding becomes difficult. Leeching of drug is another problem. If some of the water-soluble drugs are properly mixed with vegetable oil prior to its final mixing with the feed, such losses may be minimized.

## **Classification of disease diagnostic methods**

The disease diagnostic methods can be classified in to following types :-

- Microscopic diagnosis
- Histological diagnosis
- Microbiological diagnosis
- Immunological diagnosis
- Molecular diagnosis

## **Importance of case history**

Case history information is very vital for proper disease diagnosis and for taking proper steps. During a disease outbreak, careful scrutiny of the case history information will help to pinpoint the circumstances under which the disease has developed.