



BACTERIAL DISEASES IN FISHES



Dr . G. B. CHAND

Associate Professor

Department of Zoology

Aquatic Toxicology laboratory

Patna University, Patna

Email : gbchand@rediffmail.com



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BACTERIAL DISEASES / Diseases Caused by Bacteria

Bacterial diseases are frequently encountered in the eggs, fry and fingerlings of fish and prawn causing large scale mortality. Bacteria may act as primary pathogen or secondary invaders in stress or injured fish. Regarding causation of bacterial diseases - either the bacterial strain must be pathogenic to the host and be virulent or the total bacterial load should cross a critical concentration in the milieu.

Classification of some important groups of bacterial pathogens causing specific diseases in fish recorded in India are summarized in the following table.

Table - Important Bacterial Pathogen recorded from fish in India.

Type & Family	Genus	Species	Disease caused
1. Aerobes	A. Gram +ve bacteria		
Enterobacteriaceae	Citrobacter	C. freundii	Enteric ^{Septicemia} specimen of Channel Cat fish
	Edwardsiella	E. ictaluri	Edward ^{Septicemia} (Hemorrhagic septicemia)
	Yersinia	Y. ruckeri	Enteric ^{Septicemia} mouth disease
Neisseriaceae	Acinetobacter	Acinetobacter	
Pseudomonadaceae	Pseudomonas	P. fluorescens	Haemorrhagic septicemia, dropsy, skin lesion
	Aeromonas	A. hydrophila	

Type & family	Genus	Species	Disease caused	
		A. sobria		
		A. liquefaciens		
		A. salmonicida	Furunculosis	
		A. salmonicida	a typical strain carp erythrodermatitis	
	Vibrio	V. cholerae	} <u>Vibriosis</u>	
		V. alginolyticus		
		V. vulnificus		
		V. parahaemolyticus		
2) Myrobacteria	Cytophagaceae	Flexibacter	F. columnaris	Columnaris disease

(B) Gram +ve Bacteria

1. Aerobes			
Micrococccae	Micrococcus	Micrococcus sp.	Granulomatous lesion
	Staphylococcus	S. epidermis	
		S. aureus	Eye disease
	Streptococcus	Streptococcus sp.	
Nocardioforms	Nocardia	CAN	Granulomatous lesion
2. Anaerobes			
	Clostridium	Clostridium sp.	Botulism
		botulinum	

A detailed account of some of important bacterial diseases can be summarized as

1) Bacterial Haemorrhagic Septicemia or Infectious Abdominal Dropsy or Myo-entero-hepatic

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B) Acute ascitic form (easy to diagnose) -

- Exophthalmus / swollen eye
- Anus - inflamed & prolapsed, foul smelling, yellowish or bloody watery fluid in the abdominal cavity
- or a gelatinous mass formed by the clotting of ascitic fluid.
- Skin - ulceration may occur due to secondary bacterial infection i.e. terminal septicemia.
- Intestine - may be inflamed, hyperemic as then as a papilla
- Liver - yellow, dark yellow, pea green
- Kidney - soft pasty consistency
- Spleen - swollen, scale detached.

C) Latent form - (not easy to diagnose with certainty)

a) Sub acute form -

- A small quantity of fluid in the visceral cavity.
- Liver is deep green / yellow with small ascitic fluid is present.

Dry

b) Acute form -

- Complete absence of fluid in visceral cavity but strongly perceptible ascitic odour.

Etiology / Course of the disease -

Epidermis - A/C to Blunder (1953) the blood vessels break after initial capillary hyperemia, the erythrocytes are released into surrounding connective tissue & the serous fluid liberated in this process into the interstitial tissues & skin accumulation of fluid may take place near or under the epidermis which gives rise to the formation of boils or pustules. Histologically they are typical in the dermal connective tissues. The fluid contains serous components and isolated erythrocytes. The rupture of one of these bladders

Synonyme :-

Pathogen - Aeromonas liquefaciens forma ascitica, an aquatic bacterium, a gram -ve, asporogenous & monotrichous and measuring $0.4 - 0.5 \times 0.9 \mu$. It is a facultative anaerobe.

• Aeromonas liquefaciens forma typica, much less pathogenic, also reported in open water (Zimmermann).



Fig. Aeromonas liquefaciens!

Species affected - C. calla, C. mpingla & less in V. rohita

Organs affected - Eye, liver, kidney, spleen, intestine and fins.

The disease is typical of the cyprinids. The losses among one year old carp (C) are 20-40%. Droopy is rather exceptional among tropical aquarium fish. Amlachar (1959) has distinguished three forms of infectious abdominal droopy which are characterized as follows -

A) Chronic ulcerative form (easy to diagnose) -

- Colour of ulcer from the outside inward is black, white & red, losses of scales & fins and infrequently skeletal deformities.
 - Reddish fluid accumulation, lethargy, exophthalmos, swirling movement, muscular degeneration and petachial haemorrhagic epidermis.
- This form may pass to sub acute and acute forms.



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like boils produces an open cutaneous wounds and consequently, an ulcer where the skin is totally destroyed. Melanophores become distributed throughout the dermis in the vicinity of the necrotized area and produce a superficial black ring followed by white one in the affected connective tissues of distended dermis and muscles.

Intestine - it shows destruction of mucosa, caudative inflammation of propoia, sub-mucosa & muscularis mucosa. edema leads to a transparent paper like appearance of intestine.

Liver - hepatic vessels appear to be intact. The veins are generally empty & almost all of blood capillaries are hyperemic marked cellular necrosis characterized by fatty dissolution of cell wall & isolated histiocytes are found in liver tissues.

Prophylaxis

Preventive treatment is accomplished by the use of chloromycetin or streptomycin (Schaperclaus, 1955). When dropy makes its appearance, any dead fish should be collected, counted and buried. After the removal of fish, any foci of infection are carefully disinfected with quick lime or calcium cyanamide & are left dry throughout winter period.

Therapy - The susceptibility of a fish to bacterial haemorrhagic septicemia & infectious diseases depends upon 3 factors:

- i) resistance
 - ii) immunity
 - iii) hygiene (feeding, water quality etc.)
- The joint action of three factors decides the course of infection. The fishes acquire an immunity against the causative agent of bacterial septicemia specially they are

inoculated by light infection at the end of winter.

2) Simple Dropsy :-

Pathogen - It is caused by virulent strains of *A. hydrophila* (Gopal Krishnan, 1961). Besides a myxozoon *Neothelohanellus Catlae* also infects and causes damage to the kidney of *C. catla* affected by dropsy along with bacterial pathogen (Das & Haldar, 1968).

Species affected - juveniles & adults of *C. catla*, *L. rohita* & *C. mrigala*.

Etiology -

Scale - Accumulation of water in the body cavity or in scale, present pockets thereby making the scales loose.

Abdomen - The abdomen of fish gets distended. Mild ulceration may occur due to secondary infection. Very often due to secondary infection, scales fall off & ulcerations become deep with necrosis.

Therapy -

Prophylactic - The water body is treated with 5mg/l $KMnO_4$.

Therapeutic - Application of $KMnO_4$ @ 5mg/l. (Gopal Krishnan, 1963)

3) Vibriosis / Pike pest :-

The term 'vibriosis' is used to refer to all types of infection caused by bacteria of genus *Vibrio* including bacterial shell disease & black gill (Chandrasekhar et al 1990).

Causative agent - *Vibrio anguillarum* Bergman.

Course of disease - Slow, long and almost invariably asymptomatic.



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Symptoms -

- Small red spots or petechiae on the throat, under the opercula, & in the ventral & caudal region & just anterior to the pelvic fins
- loss of skin, muscles may be exposed.
- Cephalic ulcers.
- Hyperemia of intestine & liver, redening of rectum.
- Haemorrhages & necrosis of liver, small necrotic patches on kidney.

Therapy / Prophylaxis -

- Any dead eels should immediately buried.
- Chlamydomycin therapy.

WMA
A)

Furunculosis -

(Mc. Caw 1952, Herman, 1968) ✓

It is one of the best known bacterial disease of salmonids. Reddy et al (1994) reported mass mortality of common carp & tilapia in Kalyani reservoir, A.P. from prescute lepticemia and bacteriosis caused by *A. salmonicida*.

Pathogen - *Aeromonas salmonicida* measuring 0.8 x 0.5 μ , non-flagellated, non-motile gram -ve. bacterium. It grows at an optimum temp of 20-30°C.

Species affected - Common carp & Tilapia.

Symptoms -

- Appearance of boils/ulcers in isolated or groups chiefly in dorsal region. These ulcers are tinged with blood & dark reddish abscess (pus).
- Autopsy shows intestinal inflammatory changes in spongy & oily mass in Tilapia in buccopharyngeal cavity, gills, kidney, intestine and hepatopancreas.

(8)

- Hyperemic swim bladder.
 - Liver - small spot & haemorrhages are found.
 - Similar haemorrhages at the inner side of opercula, eyes or fins.
 - Petechiae on lateral surface of abdomen, swollen belly, exophthalmos.
- Several forms of furunculosis have been identified as ulcerative form, asymptomatic form & intestinal form.

Prophylaxis -

- Removal & destruction of dead & gravely infected fish.

- Disinfection with $KMnO_4$ @ 1gm/50 l.

Therapeutic treatment -

- Sulfonamide (Sulfamerazine, sulfaguanidine, sulfadiazin, sulfamethazine, sulfisoxazole) should be given orally with food @ 10gm/100 pounds of fish/day.
- Chloramphenicol & oxytetracyclin @ 2.5 - 3.5 gm/100 pounds of fish/day.
- Besides oral vaccines based on saline soluble leucocytolytic extract of *A. salmonicida* have given good results.

5) Columnaris Disease / Cotton wool disease / Mouth fungus -

Causative agent - *A. Myxobacterium Flexibacter columnaris* causes the disease in fishes subjected to environmental or physical stress in the pond (Kumar et al 1986).

Species affected - *C. catla*, *L. rohita*, *C. mrigala*, *Ctenopharyngodon idella* and *Hypophthalmichthys molitrix* (All six major carps).

Organ affected - Skin & gills.

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Etiology-

Columnaris is a common & very wide-spread disease of F.W. fish & gives rise to characteristic symptoms which in aquarium fish are known as 'cotton wool disease' or mouth fungus. Typically, the affected fish show the presence of grey white spots over head and dorsal sides of body giving very often a saddle back like appearance.

The bacterium penetrates the epidermis by means of small abrasion on the skin. The dermal capillary become ~~swollen~~ swollen, rupture & fills the interstitial areas with blood. The bacteria then begin to attack muscle fibres and forms red ulceration in musculature.

The gill lamellae very often erode & fringes of gill filament are lost due to necrosis.

Therapy-

Cotton wool disease in aquarium fish may be treated by dipping them in 1:2000 CuSO₄ solution for 1-2 min.

- 5-10 ppm of chloramycetin
- Treatment of oxytetracycline @ 75 mg/kg fish/day has been reported very effective.
- Dipping the affected fishes in 500 mg/l KMnO₄.
- Treating pond water (3-5 mg/l KMnO₄)

6) Bacterial Gill Disease :-

Causative agent - It is caused by myxobacterium (5-10 μ m x 0.5 μ m) on the gill gill epithelium. Serological tests have shown that a variety of types of bacteria are responsible for outbreak of disease.

Organ affected - gill.

Etiology-

- The first indication of the disease is loss of appetite.
- Fish tend to ride high in water & orient themselves into flow of water. They appear pale & lethargic. 5% or more of the fish may be dead in 24-48 hrs.

It causes hyperplasia of respiratory epithelium at the base of lamellae which is further assisted by due to the deficiency of pantothenic acid.

Prophylaxis-

- Maintenance of water quality & over crowding.
- Water sources with high turbidity or wild fish are dangerous.

Therapy-

Organic mercurial compounds have been most effective chemicals for controlling bacterial gill disease.

Quaternary ammonium compounds are most widely used chemicals for control of bacterial gill disease (@ 1-2 ppm bath for 1 hr.).

Dignat, a herbicide bath @ 2-4 ppm for 1 hr. is very much effective in controlling bacterial gill disease.

7) Eye Diseases of C. catla :-

Causative agent - A variant of bacterium *Aeromonas liquefaciens*.
(Gopal Krishna 1960).

Species affected - Advanced fingerlings and adult of C. catla.

Organ affected - eye.

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Symptoms -

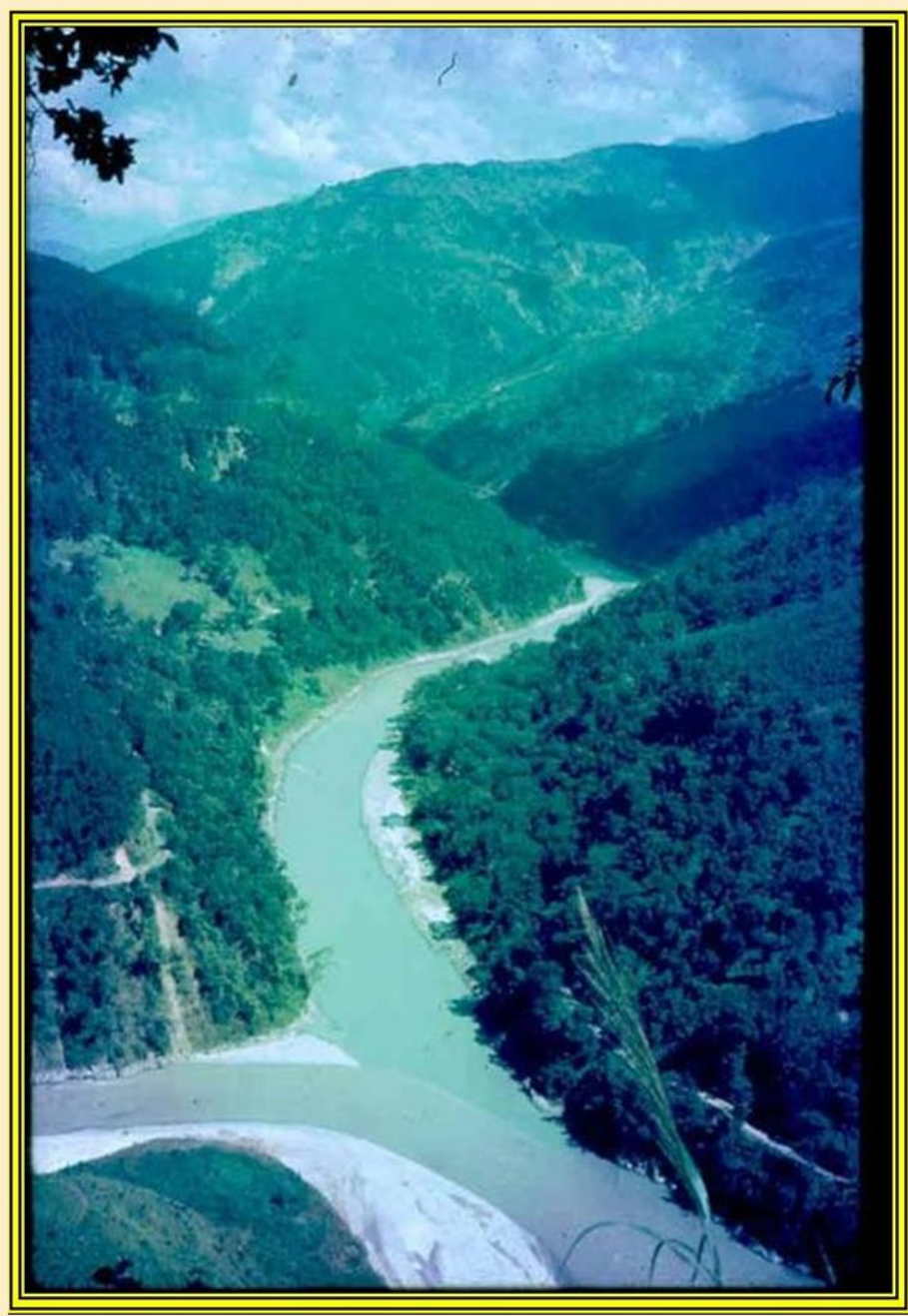
Initially the infected eye becomes vascularized & subsequently turns milky white & later turns opaque. The eyeball may either wither off or the contents become lysed & fall out from the eye. Bacteria may spread to brain, leading to death. (Gopal Krishnan 1960)

Besides eye disease of silver carp & air breathing fish Channa marulius have also been elucidated by different corners & causative agents have been considered as Staphylococcus aureus.

Therapy -

Prophylactic treatment with $KMnO_4$ @ 1mg/l and maintaining high dissolved O_2 content in the medium are helpful in checking the spread of disease.

Conclusion :-



THANK YOU