

FISH DISEASES AND THEIR CONTROL

Lecture

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ADVANCES IN FISH DISEASES

FIS 710


(3 Units) Core Course

Outline

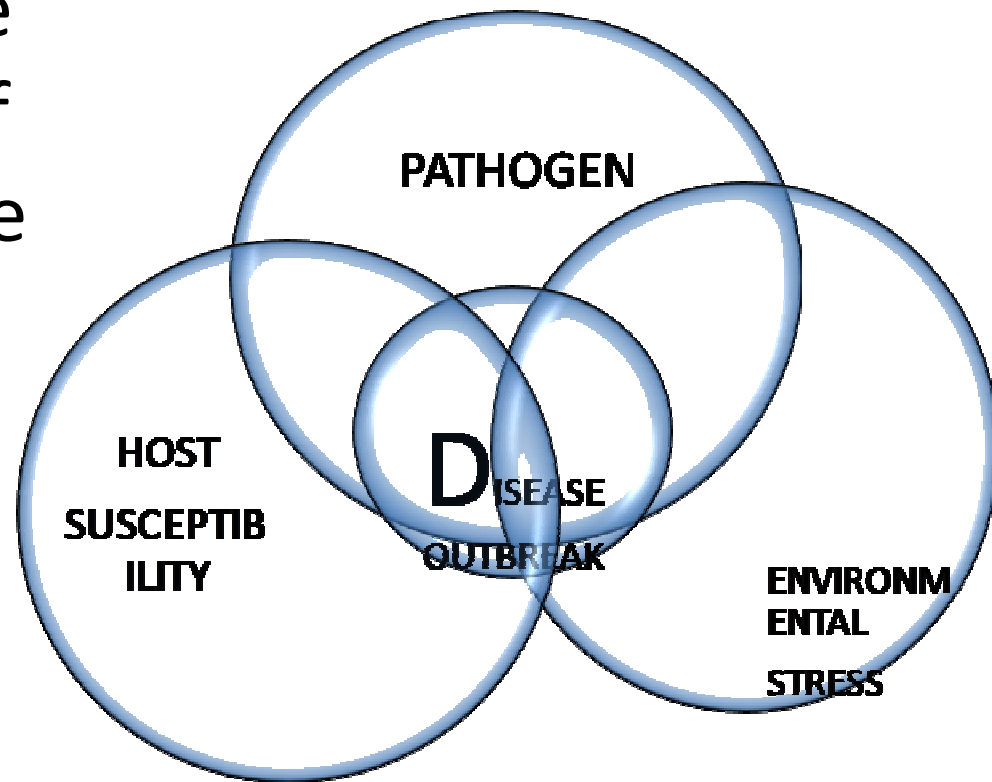
- Types of fish diseases, (parasitic, bacterial, fungal, nutritional etc.)
- Laboratory methods for fish disease diagnosis,
- Prevention, control and therapy of fish disease

Introduction

- Higher stocking densities call for the introduction of large quantities of concentrated feeds and mineral fertilizers.
- This affects the environmental factors in the aquatic environment
- environmental changes are stressful and lower body resistance of fish to disease

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- Infections and other diseases therefore sets in
 - Such unfavourable conditions include
 - crowding,
 - temperature fluctuations,
 - inadequate dissolved oxygen,
 - excessive or rough handling,
 - sublethal levels of toxic materials.

- Fish diseases are the end result of interactive of the etiologic agent, the susceptible the fish and the environmental condition




Physiological And Biochemical Changes

- These are non-specific physiological and biochemical changes which take place in three phases:
 - The alarm reaction
 - The stage of resistance during adaptation to achieve homeostasis under the changed circumstances taking place.
 - The stage of exhaustion when adaptation has ceased to be adequate and homeostasis is not achieved.

Classification of diseases

- Generally, diseases are classified as
 - infections,
 - parasitic,
 - non-communicable and
 - diseases of unknown etiology.

- **Infections diseases** are caused by viruses, bacteria, fungi and less frequently algae.
- **Parasitic diseases** are caused by protozoa, helminthes and parasitic crustacean.
- **Non-communicable disease** include
 - nutritional fish diseases (e.g goiter or hyper plasia of the thyroid gland)
 - diseases associated with physical or physicochemical abnormalities of water e.g gas bubble disease
 - low temperature disease, water borne irritants

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- **Diseases of unknown aetiology** are diseases for which the causative agents have not been identified.
 - It includes proliferative kidney disease

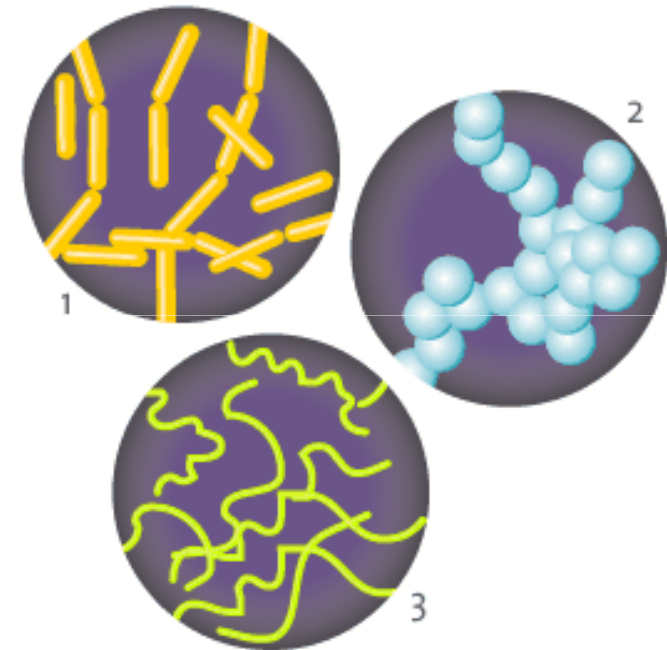
BACTERIA DISEASES

- Bacterial diseases are responsible for heavy mortality in both wild and cultured fish. The actual role of these micro-organisms may vary or differ from that of a primary pathogen to that of an opportunist invader of a host rendered moribund by some other disease process.

Microscopic examination

- Can provide information on the size and shape of the bacteria
 - Rods (1)
 - Cocci (2)
 - Spiral (3)
- It cannot provide enough information to enable bacteria to be identified

Bacteria



Taxonomy

- The taxonomic position of the currently recognized bacterial pathogens of teleosts includes the following families and genera

Cytophagaceae


- The cytophagaceae are single or filamentous rods which are characteristically motile by a sliding movement.
- They are gram-ve with orange, yellow or red colonies.
- They are usually associated with mucus of normal or diseased fish.
- They measure about 0.5um wide by 12um long.
- e.g *F. columuans*, *flexibacter* (cytophge)
Phychrophile
- Causes skin infections which may affect lateral line, fin edges, gill lesions,etc

Pseudomonadacea

- They are gram-ve non-sporing rods that may be straight or curved, motile by ptafeaeells, oxidaline chemo-organotroph
- They are strict aerobes.
- They may produce a fluorescent pigment.
- They commonly occur in soil and water. The rods measure about 3um x 0.5um
- e.g *P. fluorescens*.
- They with aeromones cause a disease known as Bacterial haemorrhagic septicemia e.g fin-rot,

Enterobacteriaceae

- This include various genera of small, gram-ve non-sporing rods that germent dexterose to produce acid or acid of gas and one oxidase negative may species are motile by peritrichons flagella.
- They measure $-0.75\mu\text{m} \times 2.5\mu\text{m}$ e.g *E. tanda* which cause confere of external lesions to the head of affected fish e.g rainbow front.

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- There may be erosion of lower jaw resulting in a need haemorrhagic ulcer and necrosis of the intestinal mucosa but the urtnal confinement of external lesions to the head of affected fish is a clinical feature for RM bacterium (Enteric red month).

Vibrionaceae

- These are gram-ve, non-sporing, straight or curved rods
- usually motile by polar oxidase +ve, catalase positive.
- They are usually found in both fresh or salt water.
- Some species are pathogenic to man, some to fish while others are of economic interest in the food industries.
- They cause a disease known as vibriosis which is the most significant disease of cultured and wild marine fish

- *V. arguillanum* which includes strain of *V. piscium* and *V. Ichthyodernis* have been isolated from diseased fish in both sea or river waters and are pathogenic for fish.
- First signs of infection are anorexia, darkening of sudden death.
- Acutely affected fish show swollen, dark skin lesions which ulcerate to release blood coloured exudates. Gills are pale

Streptococaceae

- These are gram +ve spherical or ovoid cells arranged in pairs or chains.
- They are usually less than 1.0um in diameter and non-motile.
- They are facultative anaerobic
- some species that infect fish include *S.taecalis*,
ad S. boris.
- They cause general septicemia.

Streptococciosis

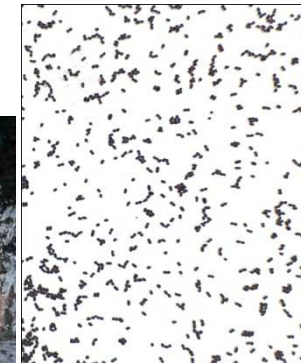
A. Characteristics of *Streptococcus iniae*

- a. Gram positive cocci in pairs or short chains.
Non-motile
- b. grown on TSA, BHIA and Blood agar
- c. On rabbit-blood agar most isolates are mostly β -haemolytic
- d. Facultative anaerobes



B. Hosts : olive flounder, seawater fishes

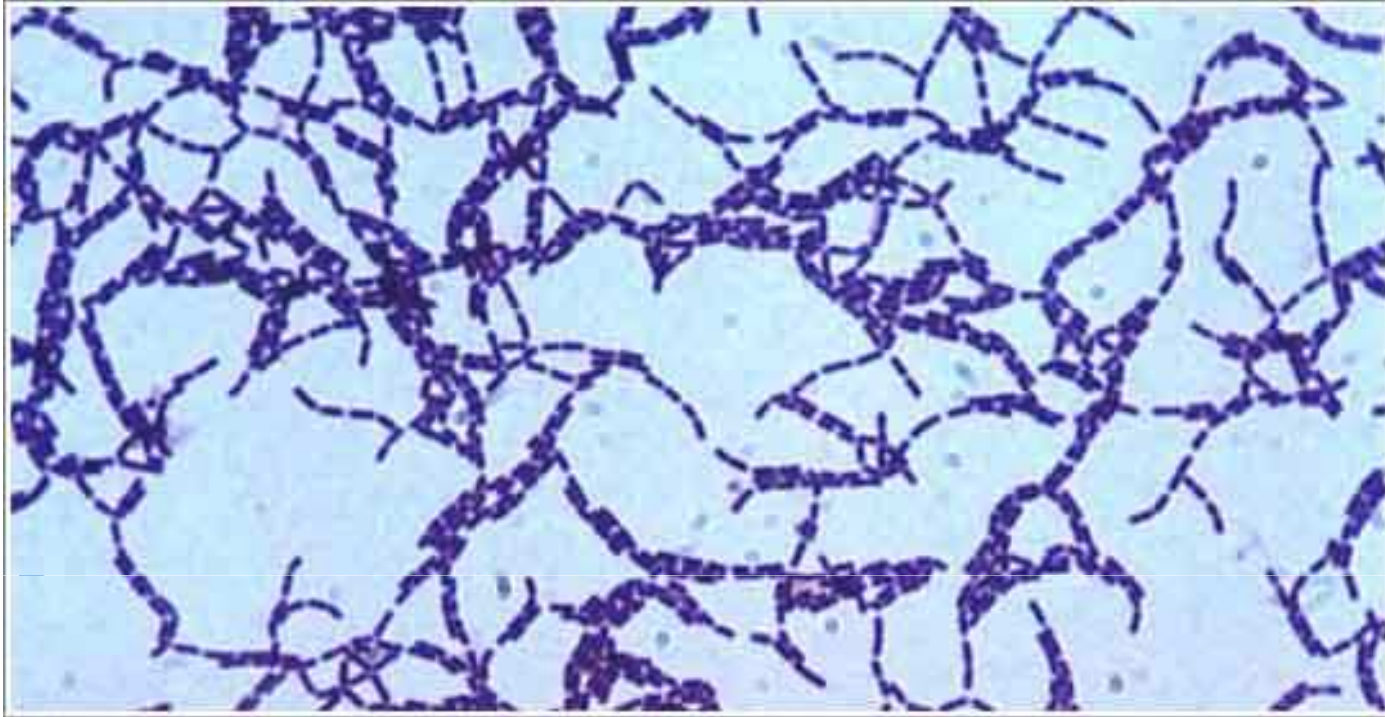
- C. Signs:**
- 1) Darkening of the skin
 - 2) exophthalmia, hemorrhaging in the eye, opaque eye
 - 3) bloody spot inside of the opercula and peritoneum



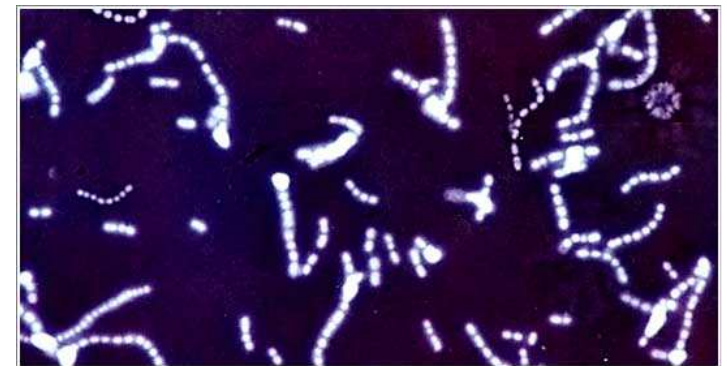
Bacillaceae

- These are gram +ve endospore-forming bacilli.
- They are non-acid-fast and measure up to 6µg (*C. botulinum*) and 1.7-3.5µg long (*C. tertrum*),
- *Bacillus coagulans*, *B. subtilis*. *B. coagulans* is Gram +ve, but gram –ve in old cultures while *B. subtilis* is Gram +ve.
- Both are motile clost.
- Botilium leads to nervous inbalance with infected fish swimming up of down in water and twitching.

Microscopic views of stained bacteria



Lactobacillus spp.



Lactococcus spp.

Corynebacteriaceae

- Are gram +ve non-motile, non-spore forming rods with characteristic “splitting morphology, with club-shaped swellings and arranged in palisades.
- Affected fish are usually darker in colour with occasional exophthalmos and small haemorrhages at the bases of the pectoral fins.
- At necropsy, lesions are usually found in the kidney, they are whitish with red hyperaemia.
- Organisms may be found in spleen and liver.

Mycobacteriaceae

- The mycobacteriaceae are slightly curved or straight bacilli measuring 1-10µm.
- They may occasionally have filamentous or branching forms.
- They are Gram positive but are acid-fast positive.
- They are non-motile, acerbic
- species include *M. Marium*, *M. fortunitum*, *M. chelonei*.
- Symptoms include darker colour, swelling of abdomen.
- They cause, skin infection and or hypersensitivity especially in aquanists.


Bacterial diseases of eggs


- Bacteria can completely destroy an egg mass in a very short time.
- First indication of a bacterial infection is an opaque or whitish appearance in small areas of the egg mass.
- *Flavobacterium* and *Acinetobacter* have been isolated from diseased eggs and are considered to be pathogens of catfish eggs.
- Aeromonas, a common fish pathogen, has also been isolated several times

Control of therapy

- Sooner or later, the fish culturist arrives at a situation where he must treat his fish for one disease condition or another.
- The treatment of fish is always a dangerous undertaking and every possible precaution must be taken to avoid disastrous results.
- the hatchery man must treat his fish enmasses
- The problem is complicated because the environment in which fish live plays such an important role in determining the type and effectiveness of the treatment.
- Prevention, rather than treatment, should be the goal of every fish culturist

- Some disease preventive measures are;
 - Use of water that is free of wild fish e.g well or spring water.
 - Good quality water with no harmful substances.
 - sand-gravel filters can be installed to prevent the introduction of wild fish and most parasites from stream or river water.
 - Avoid introduction of fish from other hatcheries but if this is not possible, obtain fish from hatchery without history of serious disease problems. Treatment for especially ectoparasites prior to stocking is advisable.

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- Avoid crowding of fish at any time especially during hot weather.
 - Maintain good environmental conditions in order not to include stress.

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- The general methods of treatment that are commonly adopted.
 - Introduction of chemical or drug directly into the pond water is external treatment.
 - Incorporation of medicine in feed of fish i.e systemic treatment via diet.
 - Parenteral treatment i.e injection of drugs.

External treatment

- Various methods of treatment and drug application have been used in the control of disease.
- They include
 - dip,
 - flush and
 - bath (short and prolonged).

Dip Method

- The dip method involves using a strong solution of a chemical for a relatively short period of time.
- The difference between an effective dose and a lethal one can be very narrow.
- Fish are usually placed in a net and dipped into a strong solution of the chemical for 15-45 seconds depending on the type of chemical.
- This is most effective while treating small number of fish.

Flush Method

- The flush method is fairly simple and consists of adding a stock solution of a chemical to the upper end of the unit to be treated and allow it to flush through the unit.
- This is a popular method in trout and salmon hatcheries but is rarely used in catfish hatcheries.
- It is only applicable with raceways, tanks or egg incubators.
- Adequate water flow must be available in order to completely flush the chemical through the unit or system within a predetermined period of time.

Bath Method

- The bath method is of two types, namely
 - a short term bath and
 - indefinite prolonged treatment;
- Bath method involves adding chemical directly to the unit or system and left for a specified period of time after which it is then quickly flushed with freshwater.
- Although a treatment of 1hour may be recommended, the fish should always be observed throughout the treatment period for any fish of distress e.g gasping at the surface.
- When noticed, freshwater should be added quickly

- Bath treatment often lead to reduced Water concentration and aerators should be used to ensure adequate oxygen supply to fish
- **Prolonged bath**
- Is used in treating ponds where a low concentration of a chemical is applied to dissipate naturally.
- This is generally one of the safest methods of treatment, but the large quantities of chemicals regard may be expensive if not prohibitive.

Other forms of treatments


- Systemic treatment via diet or oral application
- Parenteral treatment (i.e injection of drugs)
- Drugs and chemicals introduced directly into the water

- Some drugs and chemicals used in control of infectious diseases include;
 - Pyridylmercuric acetate (PMA): (i.e Phenyl mercuric acetate)
 - Formalin
 - Malachite Green
 - Potassium permanganate (KMNO_4)
 - Oxytetracycline
 - Copper sulphate
 - Salt (sodium chloride)
 - Furacin and Nitrofurazone

- Drugs added to the feed
 - Sulfamethazine-Commonly called sulmet
 - Terranyain
 - Furox-50 i.e a product containing 11% furazolidone
 - Erythromycin thiocynate: (in form of Gallimycin 50) contains 50gms erythomyin thiocynate /1lb
 - Vit. B1 (Thiamine hydrochloride)
 - Furacin and Nitrofurazone

VIRAL DISEASES

- The majority of fish virus diseases occurs in cultured species with high economic value.
- In most instances these virus diseases are acute, with high mortality
- Viral diseases of fish are impossible to control with chemotherapeutics, since no drug or chemical has any effect on the course of the viral disease of fish because of this prevention instead of treatment is a sine qua non.


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- Some viral diseases include;
 - Channel catfish virus disease (CCUD)
 - IHN-infections hematopoietic necrosis
 - IPN- infections pancreatic necrosis
 - VHS-viral hemorrhagic septicemia

FUNGAL DISEASE

- Fungal species of the genera saprolegmia and Achylya are usually implicated in fungus infections of cultured catfish with saprolegnia being more common.
- Aphanomyces pythium and leptomitius lactenus individual saprolegna is generally considered to be a secondary invader, taking advantage of a lesion or abrasion in order to establish itself and may cause mortalities to fish but to injection is possible.

PROTOZOAN PARASITES

- Nearly all losses of fish due to parasites are caused by protozoans.
- While many protozoans are obligate parasites requiring fish loss, some are facultative and constitute a problem as a result of poor water quality or poor nutrition.

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- The most important parasitic protozoans of fish include the following
 - Costia (ichthyobodi)
 - Trichodina
 - Ichtyophthrins nultifihs (ICH)
 - Spistylis perifrighous i.e hair-like cilia



THANK YOU