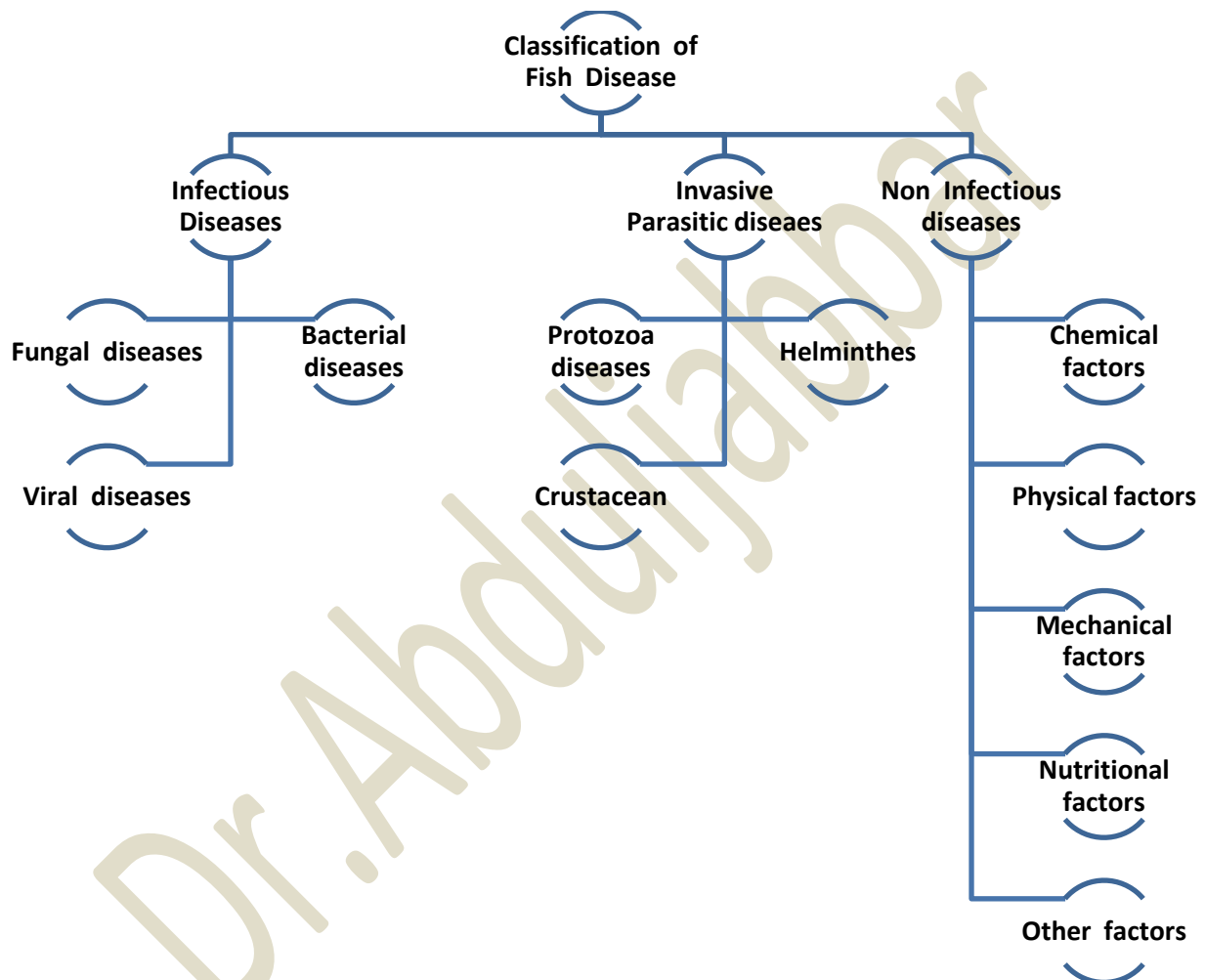


Ichthyology

Is the branch of zoology devoted to the study of fish . this includes skeletal fish (Osteichthyes), Cartilaginous fish (Chondrichthyes), and Jawless fish (Agnatha). The people who study ichthyology are called **ichthyologists**.



The main culturing fishes or farm fishes

1-Barbus fish:-

This family represents the most types of Iraqi fishes which include the following:-

- 1- *Barbus sharpeyi*
- 2- *B. luteus*
- 3- *B. grypus*
- 4- *B. esocinus*

2- Carp fish:-

1-Cyprinus carpio (common carp):-

The origin from China, this type of fishes is selected for cultivation for many reasons which include the following:-

- 1-Huge and fast production in the cultivated farms (3kg feed – 1kg meat).
- 2-It can rapidly adapt to most of the environmental conditions
- 3-Good quality of meat
- 4-High resistance to the fish's diseases
- 5-It can live with the lowest level of O₂
- 6-High fertility

Found three types of cyprinus carpio

- 1- Common carp
- 2- Mirror carp
- 3- Skin carp

The 1 & 2 entered Iraq in 1955, people called it the republic or the Indonesian.

The carp characterized by:-

- 1- Small head
- 2- Long dorsal fin
- 3- Silver scales
- 4- Protruded eyes
- 5- Superior position of the mouth
- 6- Long nozzle
- 7- Carp production is naturally in the artificial farms at a year February – April and Jun- September.

2- Big head carp (Aristichthys nobilis)

It can grow 3-5 kg at year, also may reach to the 47 kg in 10 years. This fish doesn't reproduce naturally in the artificial farms, the head for this fish equal to 1/3 of the body, it has large rounded bell with small scales and feeding on the zooplankton & phytoplankton

3-Grass carp (White amour) (Ctenopharyngodon idella)

Its lived on the grass, herbs and other vegetation in the water live in warmer water ,its grow rapidly can reach 32 kg in three years ,but it's not reproduce naturally in artificial farms, It's have good quality of meat. This fish in early life feed on the zooplankton then gradually become herbivorous, have large scales & short fin the reproduction time is at beginning of April to Jun.

4-Silver carp (Hypophthalmichthys molitrix)

Its feeding on the phytoplankton , the weight can reach to 16kg at 10th years of the age .but not reproduce naturally in artificial farms ,the maturation age is 3-4 years can jump 2 meters directly to noise sound.

Fish enemies

- 1-Hydra
- 2-Copepoda
- 3-Water tiger
- 4-Mollusea like (North Atlantic cuttlefish)
- 5-Starfishes
- 6-Fish
- 7-Reptiles
- 8-Birds
- 9-Mammalians

Characterization of good healthy fishes

- 1-perfect body (no ulcer , wounds, deformities , small head, brilliant appearance)
- 2-Bright appearance
- 3-Good fat index (fat fish color is yellow or green opposite emaciated fish color is gray or silver)
- 4-High body weight

Factors affecting fish production

- 1-Bad sources of fry and fingerlings
- 2-Bad management of the artificial farms (Ponds & aquariums)
- 3-Raising different ages
- 4- Vet. Quarantine violation
- 5- The intensity of cultivation
- 6- Type of supplementary food

Principles of cultivation (Prevention & control)

- 1-Good supply of high quality & quantity of water
- 2-Good level of dissolved oxygen & nutrients in the providing water.
- 3-Dryness of the ponds with spreading the quick lime 2.5 ton /hectare & mix with 15-30 cm water for 15 days then removed & replaced with clear water after marketing.
- 4-The foreign fishes must be prevented from introducing the ponds, because it considered as feed , O₂ consumers & diseases transmitters.
- 5- Fingerlings transportation is under control condition.
- 6-Choosing a proper season for cultivation.
- 7-External parasites must be eliminated with proper method.
- 8-The cultivation intensity ranging (4000-5000 fry / hectare) common carp plus 10- 15 % other carp species (grass, silver carp)
- 9-Water entrance guard by wire net barrier with tiny opening also to the opposite side (exit).This opening had important role to keep water at high quality ,normal level of O₂ 5-7mg / liter , good temperature between 20-30 C°, PH with acceptable range 6.5- 8.5 , minimum level of pollutants , prevents the increasing of the Ammonia at high levels in the ponds because it affects the gills tissue or act as predisposing factor to bacterial infection of the gills, partially ammonia oxidation can produce nitrate roots which cause rapid , high mortality of cultivated fishes.
- 10-High quality of food (protein 28-30%).
- 11-Examination & inspection the fishes in the ponds periodically.
- 12-Avoiding contaminated food with mycotoxins.
- 13-Get rid of wild birds
- 14-Controlling the transmission of the diseases from parents to progeny like 'Lernea & Dactylogyrus.
- 15-Sanitation of water.

Diseases transmission

- 1-Direct contact with infected fish.
- 2-Contaminated water.
- 3-Contaminated the soil of the bottom of the pond.
- 4-Contaminated food
- 5- Contaminated tools, workers, etc.

Diagnosis the fish diseases :-

Examination of gill and skin tissue Live, and Microscopic examination should commence immediately following euthanasia (severing of spinal cord immediately behind head or pithing brain) Using anaesthetics for euthanasia is not recommended as some ecto-parasites may be killed or detach rapidly from the fish and will therefore be unseen during the examination.

Fungal diseases in fish (Mycotic diseases)

Fungi belong to lower plants , but they don't have chlorophyll . Mycotic cells appear as elongated threads called Hyphae, its length 100 micron or more and width 0.5-40 micron. Hyphae of most fungi affecting fish are non-septets ,its cellular wall , nucleus, cytoplasm contain vacuoles and other structures. Mycotic diseases in fish could be systemic or non-systemic , fungi reproduces sexually reproduction occurs by male and female gametes formation .Asexually reproduction occurs by spores forming budding formation as well as by fragmentation.

1- Saprolegniasis (Water mold)

Non systemic disease, usually localized, a local chronic disease of fish characterized by dermal ulceration and necrosis of the muscles , the disease is also called *Dermatomycosis*.

Description of the fungus

The fungus reproduce sexually by male and female gametes contact and asexually by spoor-forming. The organism is water mold and live on decaying of organic material (saprophytic mold)

Epizootiology

Saprolegnia affects all species of farm fishes especially aged ones as well as their eggs in fish – hatcheries , and also aquarium fish. Lesion are

commonly seen after handling and overcrowding conditions and after other systemic bacterial or viral diseases. The diseases occurs mostly at 10-18°C.

Clinical and pathological lesions

1-The fungal agents appear as cotton wool like tufts or layers on the skin, fin, and the gills, there are the branched non-septic Hyphae with white grayish or brownish cotton like masses distributed on the skin, seen only when the fishes swimming in the water.

2-The area which undergo from O₂ deficiency the necrosis may be present on the affected muscles and the scales lifted away from the body wall.

3-The internal organs can be affected due to skin laceration.

4-Mortality rate up to 50%.

Microscopic examination

Skin sections stained with (H & E) for showed mycelia masses covering the necrotic epithelium.

Diagnosis

- 1-Epizootiological condition
- 2-Clinical symptoms and lesions
- 3-Fungus culture on nutrient agar
- 4-Microscopic examination

Control the disease

- 1- Prevention of infection eggs requires a maximal percentage of fertilization.
- 2- Avoidance of injuries to the eggs during collection & mixing with sperm.
- 3- The water entering the incubators should be free of suspensions which may injury the membrane of the eggs (embryo),
- 4- Increase the current of water in the farm, this cause washing off angels & increase the acieration of farms (O₂ contained), quick lime must be used together with general productic measures.

Treatment

- 1- Water bath of Sodium chloride 5% minutes, or 2.5% for 10 minutes at 12-15 °C with O₂ supply.
- 2- Diluted copper sulfate CuSO₄ 1gm / 200L. for 60 minutes, or 1gm / 100 L. for 30 minutes.
- 3- Potassium permanganates 0.5 kg / 1 donem. for 30 minutes, or 1kg / 1 donem. for 15 minutes.

2-Branchiomycosis (Gill rot)

This disease is commonly referred to as (gill rot), due to massive necrosis of gills. It's an infectious disease of farm fish characterized by bronchial intravascular growth of the organism. *Branchiomyces sanguinis* with mortality rate up to 50% mature fishes 2-3 kg / B.W., are more susceptible to the disease especially in summer. *Branchiomyces spp.* Invades gill blood vessels either *B. sanguinis* (only in gill blood vessels); carp, goldfish, *B. demigrans* (grows from blood vessels to tissue).

Epizootiology

The fungus affects brackish & fresh water fish as well as aquarium fishes, especially mature ones. This disease appears in high temp. 20 – 22 C°, it occurs usually in farms containing high organic matter (high acidity) disturbance in hydro chemical regime, unbalanced diet, mortality may occur in two to four days, with an incidence high as 50%.

Clinical and pathological lesions

The 1st general symptoms may occur few days (3-5 days) before death.

- 1-The fish cease feeding
- 2-Gather in groups at the surfaces
- 3-When the disease develops the fish gather at the inlet & die
- 4-The fish don't react to the approach of man & can be caught by hand
- 5-The don't swallow air their head is under the water surface.

The pathological lesions can be divided in to two stages

a- Early stages which characterized by the following :-

- 1-Present focal areas of hemorrhage.
- 2-Peripheral whitened necrotic patches due to thrombosis & ischemia
- 3-Affected gill show narrow dark red stripes on the gill filaments due to the observation of the blood vessels by the Hyphae
- 4-The stripes become muddily gray pale pink & dark brown (dirty – dark grayish) stripes, this is so characteristic for Branchiomyces on the gills.

5-Marbling appearance of the gills due to pale anemic patches in contacts with red congested one due to disturbance of circulation in gills.

b- later stages

1-Necrosis of the gills

2- The appearance as if its battened

3- The gills of recovering fish have a characteristic appearance, it looks as if pieces had been cut off them.

Microscopic examination

1- Lamellar of the proliferation

2- Fusion in gill lamellae

3- Necrotic changes in lamellar epithelium

4- Hyphae & spores can be seen

Diagnosis

1- Clinical symptoms

2- Epizootiology of the disease

3- Macroscopic & Microscopic examination

Control

1- Water of the affected ponds should be thoroughly drained

2- Maximum water level

3- Checking the organic content

4- Feeding & fertilized must be stopped

5- When 1st symptoms of disease appear increase water flow to decrease the water temp., dead fish must be removed immediately & not use for human consumption.

Treatment

-Use CaO +CuSo₄

Add CaO 40 – 50 kg / donem every 14 days + CuSo₄ 0.5 – 1 kg / donem every month during the high temp. (June , July , August and September).

3-Ichthyosporidiosis (Zygomycotina)

This disease is systemic granulomatous disease which can be affected on the fresh water & aquarium fish. The fungus which responsible for this disease is called *Ichthyosporidium hoferi*.

The fungus having three stages of development:-

-Spore or resting stage :- This is development from in life cycle from 10 – 250 micron with double wall & granulated cytoplasm.

-Germinating stages :- Flask shaped, the neck of the structure constituting of the formal Hyphae.

-Hyphae stage:- Less frequently elongated Hyphae non-septets vary in length to 2mm.& irregular width varying from 5-40 micron.

Epizootiology

All species of fresh, marine, aquarium & salmon fishes susceptible for this disease. The disease appears under two temp. (3-20°C), its transmitted through swallowing of the contaminating material with spores which undergo germination & penetrate the internal wall circulate in the blood stream & can be localized in different organs of the body. The spores reach new host after release by ulceration or death decay of original host. Also from intestinal treat, spores may remain viable & infectious in sac water under laboratory conditions for 6 months.

Gross lesion

- 1-Exophthalmoses and bristling of the scales
- 2-The infected fish undergo from cease feeding & emaciated
- 3-The skin is rough in feature described as the (sand paper effect) usually occurs on the lateroventral tail region. This lesion occurs 30 days after experimental feeding of the fungus.
- 4-Present the ulcer or abscesses varying size appear on the skin
- 5-The infected fish undergo from ascites.

6- Convulsion movement & rest on side because present the brain lesions

7- The sick fishes lies on the bottom of the bond because occurs the damage of the swim bladder.

Post Mortem lesion

1-Inflammation of liver & kidney & accumulation of the exudates in the body cavity.

2-Present the causative agent in the subcutaneous layer & muscles

3-Present numerous nodules (1-3 mm.) similar to granulomatous of Tuberculosis grayish white in color are observed in the visceral organs spleen, liver, heart, kidney & mesentery.

Microscopic pathology

1-Spores reported in bronchial blood vessels & can be seen by Giemsa stained blood smears.

2-Inflammatory cells in closed development germinating spores, surrounding the cell wall in the form of layers (1 – 4 layers).

3-Giant cell may rarely be present, together with thin layer of fibrous tissue.

4-The granulomatous lesion is clearly seen in the muscle layer of the intestine as well as red pulp of the spleen.

Diagnosis

1- Clinical signs

2- Histopathological sections

3- Culturing the fungus on Saborouds dextrose agar (SDA) slants with 1% bovine serum at 3 – 20 °C optimum temp. 10 °C. Growth is abundant at 7-10 days, after 3-4 days budding of the fungus occurs. We can take the specimens of the affected organ squeezed between glass slide & cover slide & examined under microscope immediately. Spores or germinal stage of the fungus can be demonstrate.

Control of the disease

- 1-Infected fish should be isolated
- 2-Severely infected one must be condemned or bunked.
- 3-Ponds should be disinfected with quick lime.
- 4-The fish must be examined before transporting at least 15 specimens of each batch.

Treatment

Antifungal drugs may have some effect in the early stage of the disease especially for aquarium fish but it is so expensive.

4-Aspergillosis

This disease occurs by *Aspergillus flavus* which cause granulomatous disease in farm fishes. But the aflatoxins which produced from this fungus induce hematoma (tumor in the liver).

Description of the fungus

Aspergillus flavus grows on ordinary sabaurouds agar media colonies grow rapidly & the fungus form conidiophores. Conidial head carries one row of spores which contains the conidia. Conidia & conidial head in early stages having yellowish coloration by time taken dark-yellow greenish coloration.

Epizootiology

The fungus affects farm fish, when the fish are exhausted or in a bad condition as a result of bad environment increase alkalinity or acidity of water, increase amount of organic matters, together with changes of salinity of water & high temperature. Aflatoxins contaminate the food of fish especially when the food is storage under high humidity. After eating of contaminated food the conidia or Hyphae of the fungus penetrate the intestinal wall, circulate in blood to other organs or tissue, causing degeneration & necrosis.

Clinical & pathological lesions

- 1-Affected fish show signs of disturbance in respiration
- 2-Swim at the surface of water, try to inhale air
- 3-Fish gather near the water inlet
- 4-Loose their equilibrium & lie to the back & dia
- 5-Fish cease to feed, its vitality lowered affected fish don't responded to the stimulus & even it can be caught by hand
- 6-In some cases ascites may be seen together with reddish patches distributed all over the color , gill cavity filled with excessive amount of mucous.
- 7-Necrosis of the gill lamella may be seen changes & extend towards the gill arches & even necrosis may involve gill arches & gill rankers.
- 8-Hemorrhagic areas distributed all over the skin with ulceration .
Ulceration of the skin appears reddish in ulceration with inflammatory zone separated it form healthy tissue , liver appear enlarged in size & hyperemic.

Microscopic pathology

- 1-Reaction of the gill against mycotic invasion is very sever.
- 2-Excessive dilation of blood vessels & lamella
- 3-Massive infiltration of affected tissue with lymphocytes & histiocytes
- 4-Necrotic changes of gills lamellae start from based area near to the gill arch towards the free portion of the lamellae.
- 5-Zinkers necrosis of the muscle bundles with massive invasion of lymphocytes between muscle faculae.
- 6-The Hyphae & conidia are seen between necrotic gill tissue

Diagnosis

- 1-Epizootiological studies
- 2-Clinical symptoms
- 3-P.M. examination



4-Histopathological changes

5-Isolation of the fungus

Control

-Never feed fish with contaminated food

-Prophylaxis measures against mycotic disease

-Performance of optimal sanitary conditions for fish culture

-Avoid stress factors

Dr. Abduljabbar