Saevan S. Al-Mahmood, *BVMS, MSc, PhD Veterinary Pathology*
Assistant Professor, Department of Pathology and Poultry Diseases
College of Veterinary Medicine, University of Mosul, Mosul, Iraq
https://orcid.org/0000-0002-9693-0354
https://www.researchgate.net/profile/Saevan_Al-Mahmood

Introduction to Ichthyology and Fish Diseases

Lecture Highlights:

1- Introduction to Subject [Fish Diseases]
2- Introduction to Ichthyology
3- Fish Culturing and Diseases Terminology
4- Fish Non-Infectious (Chemical) Diseases
- *a- Anoxia*
- *b- Gas Bubble Diseases*
- *c- Acidosis & Alkalosis*
- *d- Ammonia Toxicity*
- *e- Chlorine toxicity*
- *f- Heavy Metal Toxicity*

5- Fish Non-Infectious (Physical) Diseases
- *a- Temperature Shock*
- *b- Mechanical Diseases*

SUBJECT CREDITS

Theoretical	**2** Hours	**2** Units
Practical	**2** Hours	**1** Units
TOTAL	**4** Hours	**3** Units

MARK DETAILS

	Course Exam Marks	Final Exam Marks
Theoretical	27	40
Practical	13	20
TOTAL	40	60

Fish Non-Infectious (Chemical) Diseases

1-: Anoxia (Asphyxia)

Dissolved oxygen (DO_2) refers to oxygen gas that is dissolved in water. Fish "breathe" oxygen just as land animals do. However, fish are able to absorb oxygen directly from the water into their bloodstream using gills, whereas land animals use lungs to absorb oxygen from the atmosphere.

There are three main sources of oxygen in the aquatic environment:

1) direct diffusion from the atmosphere;

2) wind and wave action; and

3) photosynthesis. Of these, photosynthesis by aquatic plants and phytoplankton is the most important, so DO_2 increase in day light.

Oxygen depletion refers to low levels of DO_2 and may result in fish mortality. A concentration of 5 mg/L DO_2 is recommended for optimum fish health. Sensitivity to low levels of dissolved oxygen is species specific, however, most species of fish are distressed when DO_2 falls to 4 mg/L and mortality usually occurs at concentrations less than 2 mg/L.

Anoxia define as critical decrease in dissolved oxygen in pond's water that will cause serious condition in fish. The causative agent is decrease in O_2 level in the water. There are many factors which can affect O_2 concentration in water:

1- Temperature.
2- Overcrowding.
3- Drainage and water quality.
4- Plants in pond.

Clinical Signs:

1- Increase in operculum movement, to compensates decrease in DO_2.
2- Gasping at the surface of water, in attempt by fish to absorb the oxygen from air.
3- Loss of appetite.
4- The gill filaments are pale in color.

2: Gas Bubble Diseases:

This problem is occurred in the water is supersaturated with gas (usually nitrogen or oxygen), this condition occur in special climate condition in which low temperature or high atmospheric pressures can cause increase of gases concentration in water above than critical concentration hold by water. This condition occurs in natural and artificial causes:

1- Natural causes: waterfalls and spring wells, heavy aquatic plant growth.
2- Artificial causes: when the water is pumping through long pipe line that will cause dissolve high concentrations of gases in water.

Clinical Signs:

The fish swim at water surface or appear floating over the water surface or swim on one side or swim upside down.

PM Lesions:

When the gill and fin are examined under light microscope gas bubble observe in blood vessels, causing obstruction then rupture of affect vasculature and hemorrhage in gill giving it dark red in color, later this will lead to asphyxia then death.

Treatment:

Remove the causes.

3: Acidosis & Alkalosis

Each fish species has an optimum range of water's pH levels. In carp it's should be ranged in 7 to 8. The importance of this condition is related to gills damages. Rapid changes in pH will appear directly and cause high mortality with obvious lesions, the most important one is the slow changes in pH that not appeared directly on fish this will lead to retardation of growth that lead to decreased in weight gain. Many factors play a role in the level of pH on pond's water:

1- Number of fishes in pond.
2- Amount of aquatic vegetation and presence of algae.
3- Water drainage and water temperature.
4- Chemical materials and food residues.

The degree of **4** pH is critical at pond and can caused acidosis, while **9** pH considered critical also and cause alkalosis.

Clinical Signs:

1- Abnormal increase activity of fish.
2- Fish jumping from the water.
3- Increase in operculum movement.
4- Abnormal swimming of fish (fish swim around itself).

PM Lesions:

1- Fin and gills are damaged.
2- Necrosis and hemorrhage of gills lamella.
3- Milky bluish membrane on the fish body.

Diagnosis:

1- pH measurement.
2- Skin scraping for differential diagnosis of the cause from protozoan disease.

Treatment:

1- Increase drainage at first step, stoppage of food and fertilization.
2- Use of quick lime (CaO) at dose **25- 30** kg/2500m^3 in case of acidosis.

3- Use ammonium sulphate $(NH_4)_2\ SO_4$ **0.5** kg/2500m^3 with measuring the pH in case of alkalosis.
4- Remove of plant and algae in the pond.

4: Ammonia Toxicity:

Ammonia is a toxic bio-product of fish, which must be controlled, overcrowding and high feeding rates increase ammonia production. An ammonia concentration of zero is optimum level up to **1** PPM, a higher level can cause death. Ammonia is more toxic when both pH and temperature are elevated.

Signs of Toxicity:

1- At high concentration of ammonia, this will cause CNS stimulation lead to convulsion and tremor, later fish will jump from the water, then RBC will lyses associated with high mortality.
2- At low concentration of ammonia, this will cause loss of color of the fin (appear transparent and white in color), the edge will damage and look like cooked meat.
3- Ammonia salts will cause increase in mucus secretion which accumulate at gill filaments lead to increase operculum movement result in gasping then asphyxia.

Treatment:

Treatment is drainage the water.

5: Chlorine toxicity:

Chlorine an important cause of death in aquarium. A concentration of **0.1** PPM will kill fish in 7 – 8 hours.

Signs of Toxicity and Pathological lesions:

The first signs are exiting and waving of fish, then they calm and stay in bottom of the aquarium with decrease in respiration then death. The pathological lesions are damaged of gill filaments with white color appearance in tip of affect filament and skin appears white in color.

Treatment:

Chlorine can be removed from water with aeration.

6: Heavy Metal Toxicity:

Many metals are toxic for fish and each one is different in their toxic effect according to its concentration and the metal itself. The general toxic signs are decrease in respiration and damage of the epithelial cell of the gill then death within short period after appearance of clinical sign.

Fish Non-Infectious (Physical) Diseases

1: Temperature Shock:

Fish can resist variant degree of temperature range between **10 – 12** c^o if these changes are occur gradually, while in sudden onset of change in temperature it will lead to death especially in the aquarium fish, e.g. sudden change of temperature from **11** c^o to **4** c^o will cause lyses of RBC and death occur after three days, while change from **11** c^o to **25** c^o will appear as gill white in color and completely covered with slime. The large fish are not affected with heat or temperature variation.

2: Mechanical Diseases:

In ponds, fish handling can cause skin trauma specially when associated with overcrowded and improper mesh netting cause these skin lesion specially when fish try to escape. Such lesions appear as hemorrhage and ulceration to depth of muscle. Secondary infection (bacterial, fungal and viral infection) will occur causing high ratio mortalities and even when healing takes place bizarre malformation will result. The best way to avoid this condition by:

1- Keep the number of fishes in pond with in normal range.
2- Using proper net for handling.
3- Removing affected fish immediately from pond to prevent secondary infection that could extend to other fishes.

Reference

1- Roberts RJ. Fish Pathology. 4th edition. New York: Blackwell; 2012. 1-62.