Introduction

Disease is a condition in living organisms in which normal physiological functions are being impaired due to alteration in the body systems and typically manifested by distinguishing signs and symptoms. However, healthy fish have adequate resistance against diseases, they can adapt to reasonable environmental changes and in turn resist diseases.

Diseases occur in fish when the following pathologically factors are found:

- Presence of pathogens.
- Low resistance of the fish.
- Un favorable water environment.

Development of disease in fish results from the effect of the association among these factors. In a pond, when the pathogen load increases due to external factors (environmental problems), these factors also may cause drastic changes in water quality and lower fish resistance, when these happen, fish become susceptible to diseases, even the risks of fish kill is heightened.

Types of fish diseases

There are two broad categories of disease that affect fish:

A- Infectious diseases:

Infectious diseases are caused by living factors or pathogenic organisms (viruses, bacteria, fungi and parasites) present in the aquatic environment or carried by other fish. Fish become vulnerable to pathogenic infections when there are stressors (environmental abnormalities, water quality deterioration, unbalanced nutrition, or bodily injuries) which weaken natural resistance of fish (immune system). The Infections can occur internally and externally affecting tissues or parts of fish body. They are mostly contagious diseases and some types of treatments may be necessary to control the disease outbreaks.

B- Non-infectious diseases:

Non-infectious diseases are caused by non-living factor, these diseases are either congenital (genetic abnormalities) or iatrogenic (induced by external conditions such as environmental or nutritional problems). They are not contagious and medications are generally not indicated for them.

The role of stress

Fish diseased organisms are constantly present in most aquatic environments and farm. Under optimum conditions, healthy fish are able to fight off most forms of infectious diseases. Conversely, fish subjected to stress are often unable to maintain their natural defenses against infectious diseases such as bacteria, viruses, fungi or protozoan parasites.

Stress may result from a variety of conditions, including overcrowding, handling stress, poor water quality, inadequate nutrition and weather-related environmental stress. These forms of stress may kill fish outright, in which case they can be considered non-infectious diseases or lead to outbreaks of infectious diseases.

In summary, three factors are involved in fish disease outbreaks; infectious pathogens (viruses, bacteria, fungi or protozoan parasites) must be present and capable of attacking the fish, the fish must already be in a susceptible state, and certain environmental conditions, such as specific temperatures or poor water quality must be present. Three main practices can minimize the possibility of disease outbreaks. These are maintenance of good water quality, proper nutrition and elimination of contact with wild fish whenever possible. A sound fertilization program can contribute to the first two objectives. The third

can be achieved through proper pond design and water management, as well as prevention of fish introductions outside of the established stocking plan.

Non-Infectious Diseases

1- Environmental diseases

Brown Blood Disease (Nitrite Poisoning)

This disease affects a number of fish species cultured, it caused by high nitrite concentrations in the pond water. The source of the nitrite is the metabolic wastes produced by fish when they metabolize the protein in their diet. Nitrite, a product of the breakdown of ammonia by bacteria, is a compound that can enter the circulatory system of fish through the gills. The primary nitrogenous waste product of fish is ammonia this causing ammonia poisoning in water, this ammonia oxidized by the *Nitrosomonas* bacteria to form nitrite (NO2) that lead to nitrite Poisoning, later The nitrite is oxidized by the *Nitrobacter* bacteria to form nitrate (NO3) is a compound that is not toxic to fish at concentrations typically found in ponds, the *Nitrobacter* bacteria that convert nitrite (NO2) to nitrate (NO3) require time to become active, therefore, If fish are heavily fed and/or if the *Nitrobacter* do not efficiently oxidize the nitrite to nitrate, the nitrite concentration can increase to problematic levels. Nitrite can become toxic to fish at concentrations as low as 0.5 mg/L (= ppm).

The presence of high levels of nitrite can cause that the fish blood takes a dark brownish color, thus the name **"brown blood"**. Chemically, nitrite can oxidize hemoglobin in the fish and convert it into another compound called **methemoglobin**. Methemoglobin does not transport oxygen as is the function of normal hemoglobin and, as a result, affected fish show signs of low oxygen stress even in the presence of saturated levels of dissolved oxygen.

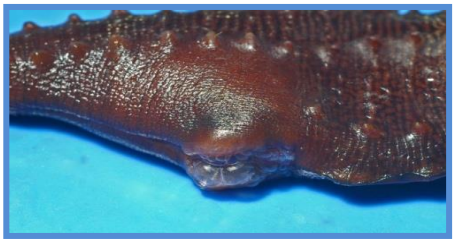
Clinical signs are damaging the nervous system, liver, spleen, and kidneys of the fish. Nitrite is actively transported across the gills where it enters the blood stream and oxidizes hemoglobin (red) to methemoglobin (brown), Behavioral changes associated with nitrite poisoning are including lethargy, gasp at the water surface or crowded near the water inlets.

To prevent and control this disease by using salt (NaCl) to water, the chloride is the fraction of salt and Combines with nitrite, that lead to inhibit nitrite uptake across the gills of fish, increase aeration to maximum, Addition of nitrifying bacteria (*Nitrobacter*), Decrease stocking density of fish, Reduce the feeding rate.

Gas Bubble Disease (GBD)

It is a very common disease, all fish species are susceptible of it, caused by an increase in the dissolved gas pressure (nitrogen or oxygen) above the ambient air pressure (super saturation), this occur when water pumping, heating water or mixing cold with warm water **(sudden** temperature gradients), Heavy algal blooms that producing more oxygen than can diffuse into the water which supersaturates the pond. When fish breathe supersaturated water, the excess gas can form emboli in various tissues. The disease may occur in a chronic form or in an acute form, with the chronic form, the fish die slowly without symptoms. Affected fish (Clinical Signs) show bubbles in the abdominal cavity, eyes, skin, gills, fins, mouth, swim bladder, subcutaneous emphysema, Brain damage, embolism, exophthalmos mostly only on one side, swimming near the water surface with darkened skin, hemorrhages and high mortality. The clinical signs of gas bubble disease should not be confused with Swim bladder stress syndrome because the bubbles in the latter can be seen only in the swim bladder.

To prevent and control must be Monitor dissolved oxygen (DO), avoid algal blooms, maintain efficient operation of waterlines and pumps.


Swim bladder stress syndrome (SBSS)

This disease affected fish larvae, is associated with malfunction of the swim bladder and is also associated with a combination of handling, high temperature, high ambient illumination, dense algal bloom that presumably cause oxygen depletion at night and super saturation during the day.

The clinical signs show large bubble of gas in the region antero-dorsal to outside the swim bladder**.**

Seabass larva / with Swim bladder stress syndrome compared with normal larva (top)