

Protozoal Diseases



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External Protozoal Diseases

● **Ichthyophthirius multifiliis ("Ich" or White Spot Disease)**

A) The largest protozoan parasite of fish. The trophozoite are up to 100 microns diameter, ciliated and contain an oval horseshoe shaped nucleus.

B) This is a disease of aquarium and hatchery reared fish.

C) Clinically fish become hyperactive with fish flashing and cutting against rocks or sides of aquariums. As the trophozoites enlarge they cause hyperplasia of the epidermis with white spots forming on the skin and gills. Severely infected fish may have respiratory problems and die. Histologically there is epidermal hyperplasia with the encysted trophozoite present in the epidermis.

D) The life cycle is direct. Encysted trophozoites (trophont) leave the fish and settle to the bottom of the tank. The trophozoites (tomonts) divide into numerous tomites (theronts) which are released to infect the skin of the fish. The life cycle takes approximately 4 days to complete. However, it can be sped up by increasing the water temperature.

E) The only way to treat the disease is by interrupting the life cycle of the parasite. Removal of fish from the infected water for 3 days (25°C) will usually interrupt the life cycle (Tomites live only 48 hours at 26°C). One must treat the water to kill the tomites to prevent spread of the disease (Malachite green, formalin, methylene blue, or KMnO₄). Remember, these treatments only kill the tomites and not the trophozoites that are encysted in the fish.

● Ichthyobodo necatrix (Costiasis)

A) Piriform shaped protozoa 6-12 microns long with two short and two long flagella. These are stalked protozoa which attach to the skin or gills.

B) This disease is observed in most aquariums and hatchery raised fish. This disease occurs primarily in cold waters (10°C) and affects very young fish when they are just beginning to eat food.

C) Clinically the fish may flash, produce abundant mucus over the skin (blue slime disease) and/or show respiratory distress (flaring of gills). Histologically the parasites are attached to the epithelial surface of the skin or gills.

D) Transmission of the parasite is by direct contact with the protozoa. This protozoa is a free swimmer so it can swim and then attach to the host where it undergoes binary fusion for reproduction.

● Trichodina sp. (Trichodiniasis)

A) This disease is caused by a group of peritrichal ciliated protozoans. The organisms are saucer-shaped, 50 microns diameter, with rows of cilia at either end and a macro and micro nucleus. When viewed dorsoventrally the parasite appears as an ornate disk with a characteristic ring of interlocking denticles forming a circle in the middle of the organism.

B) These are observed on most fresh and saltwater fish. This protozoa is relatively common on many fish and is not always associated with disease.

C) Clinically fish usually exhibit flashing and become lethargic. There is an increase in mucus production causing a white to bluish haze on the skin. The skin may develop ulcers and the fins may fray. If the gills are involved the fish may have severe respiratory distress. Histologically masses of organisms are attached by

adhesive discs and denticles of exoskeleton to the epidermis. The underlying epithelial cells undergo necrosis. There is secondary hyperplasia and hypertrophy of the gill epithelium.

D) Transmission is by direct contact with infected fish and or contaminated water.

● Tetrahymena corlissi

A) Normally a free-living oval ciliated 50-70 micron long protozoa.

B) The organism has been known to affect the fry of various cultured fish (Guppy and Northern pike).

C) Clinically, one may observe necrosis and hemorrhage of the skin. In severe cases the fish have rupture of the body walls and the fish eviscerate. Histologically one observes massive invasion of the musculature by this organism. (The ventral abdominal wall is severely affected.)

D) This is a free-living protozoan that only becomes a problem at times of overcrowding and poor water quality.(water having a high organic matter content)

● Dinoflagellates (Velvet disease, Coral fish disease)

A) Dinoflagellate 100 microns diameter containing chromatophores and a single eccentric nucleus. When free swimming they are 20 microns diameter contain a transverse flagellum in the transverse furrow and a longitudinal flagellum in the longitudinal sulcus. Several species of dinoflagellate are involved:

- 1) Oodinium - Velvet disease**
- 2) Amyloodinium - Coral fish disease**

B) Problem in aquarium and cultured fish.

C) Clinically, fish flash in the water and become depressed with lateral opercular movement. A shimmering heavy yellow colored mucus secretion over the skin and gills is observed. Histologically large oval organism (80 microns diameter) with multiple chromatophores and a single eccentric nucleus are attached to epithelial cells by a pseudopodia.

D) Transmission is by direct contact with infected fish, and contaminated water.

● **Epistylis (Red sore disease)**

A. Branched stalked ciliated protozoan (Heteropolaria sp.).

B. Found primarily in wild populations of scaled fish.

C. Clinically one observes ulcers or cotton-like growth on the skin, scales and spine resulting in a red-colored lesion. In catfish the lesion involves the spines and bones which underlie the skin of the head and pectoral girdle. This protozoan parasite has also been observed on eggs.

D. This ciliated protozoan is primarily a free living protozoan that lives on aquatic plants and is believed to be an opportunist. Outbreaks have occurred in catfish and salmon that have been maintained in water high in organic content.

● **Glossatella**

A) This disease is caused by the ciliated protozoan Apiosoma which has a barrel-shaped body with cilia at the distal end and a large rounded macronucleus.

B) This organism usually is not a problem but can affect many species of fish.

C) The organism can appear on the gills or skin causing increased mucus production and hyperplasia. Severe infections of the gills will cause respiratory problems.

D) This disease is a problem when fish are exposed to poor water quality.

Internal Protozoal Diseases

● **Heneguya (Proliferative gill disease, Hamburger gill disease)**

A) Myxosporidean parasite with two polar capsules and a long tail like extension of the spore shell.

- B) Problem in many cultured freshwater fish involves primarily new ponds.**
- C) Clinically fish are presented with numerous white cysts on the skin and gills. Cysts observed on the gills (both intralamellar and interlamellar) can cause extensive granulomatous inflammation and hyperplasia of the gill surface leading to serious respiratory problems. Cyst have been detected in other organs (brain, spleen, liver, and kidney).**
- D) The life cycle is unknown. Some feel it is a direct life cycle, others feel that an intermediate host (a mud worm) is involved.**
- E) Currently there is confusion as to what is the true cause of proliferative gill disease. *Henneguya exilis* kudo was once believed the myxosporidean agent responsible. Recent evidence suggests that the interlamellar form which evokes the inflammatory response may be due to other sporozoan parasites. One group suggests (MacMillin 1989 and Hedrick, 1990) that this may represent the extrasporogenic stage of the myxozoan *Sphaerospora ictaluri*. Another group (Burtle) suggests that this lesion is due to the triactinomyxid myxozoan of an unidentified species of *Aurantiactinomyxo*.**

● Myxobolus cerebralis (Myxosoma cerebralis or Whirling Disease)

- A) Myxosporidean parasite with a 10 micron oval spore with 2 piriform polar capsules.**
- B) Parasite affects primarily young salmonids (rainbow trout most susceptible).**
- C) Clinically fish become deformed about the head and spine with the fish swimming erratically (whirling). Histologically there is necrosis of the cartilage with numerous spores present in the area of inflammation. The necrosis of the cartilage is the cause of the deformation.**
- D) Transmission is believed to be by ingestion of spores. The life cycle of this organism is not completely known,(believed to be indirect since myxobolus spores do not directly infect the fish) however, there appears to be a tubificid oligochaetes (tubiflex mud worm) as an important intermediate or transport host. It is believed that the parasite undergoes sporulation in the tubiflex worm were the organism takes on the form of a Triactinomyxon sp. It is believed that this parasite is then released from the tubiflex worm and infects the trout. (injection of infected tubiflex worms may also cause the fish to become infected)**

● **Microsporidians (Glugea, Pleistophora)**

A) **Microsporidian parasites from cysts in various organs. The cysts are filled with small 1 to 2 micron spores. Parasitic cyst may induce hypertrophy of the infected cell (Glugea, Spraguea, and Ichthyosporidium) or does not cause hypertrophy of infected cells (Pleistophora).**

B) **Microsporidian parasites are found in numerous fresh and saltwater fish.**

C) **Clinically microsporidian present themselves as individual or multiple cyst which can become quite large and may give the appearance of neoplasms (xenomas). These cysts are filled with numerous refractile spores.**

1) **Glugea: Infect macrophages and other mesenchymal tissues which then undergo massive hypertrophy causing deformity of visceral organs (liver, gut, ovaries) as well as infections in the muscle and subcutis.**

2) **Pleistophora hypessobryconis (Neon tetra disease): This microsporidian infect the sarcoplasm of muscle fibers causing these fibers to be filled with these organism. There is no inflammatory reaction around the cyst.**

D) **Transmission of the disease is most likely direct.**

● **Coccidiosis**

A) **Primarily of the genus Eimeria. Various species of Eimeria are observed in the different fish.**

B) **Affects both fresh and saltwater fish. The coccidia not only infects the epithelium but also many other organs including the gonads. This is a very important problem in the carp and goldfish culture.**

C) 1) **Eimeria subepithelialis; carp: Nodular white raised areas in the middle and anterior gut.**

2) **Eimeria carpelli; carp: Ulcerative, hemorrhagic enteritis.**

3) *Eimeria sardinae*; marine fish: **Granulomatous reaction in the liver and testicles.**

● **Hexamita salmonis**

A) **Binucleated piriform protozoan with 6 anterior and 2 posterior flagella.**

B) **Infects young salmonids.**

C) **Clinically the young fish have anorexia, and become debilitated with reduced growth. The fish develop an acute enteritis with numerous organisms present in the feces.**

D) **Transmission is by ingestion of infective cyst.**