



PART 1: TOP 10 INFECTIOUS AQUATIC DISEASES



Some **11.5 million households** in the U.S. own pet fish (that's more than own birds or horses!)



Yet, **aquatic veterinarians** make up only around **0.2%** of the total veterinarians in the U.S.

5 OF THE TOP 10 INFECTIOUS AQUATICS DISEASES TO KNOW FOR BOARDS SUCCESS

1. Columnaris disease

o Classic case:

- "Saddleback" lesions are patches of pale discoloration of skin +/- red edges located dorsally (at the base of and around the dorsal fin)
- Gills may have patchy white or tan discolored areas (i.e., "necrosis")
- These and other affected areas of fish may have increased mucus/slimy exudate
- Fin deterioration
- Anorexia, oral mucosal erosion and/or ulceration

o Dx: Etiology: *Flavobacterium columnare* is a gram-negative, rod-shaped, long and motile filamentous bacterium

- Dx: see "waving haystacks" of bacteria on wet mount slides of lesions from skin, fin, or gills
 - Although this is considered "classic," these are not always evident on wet mount evaluation

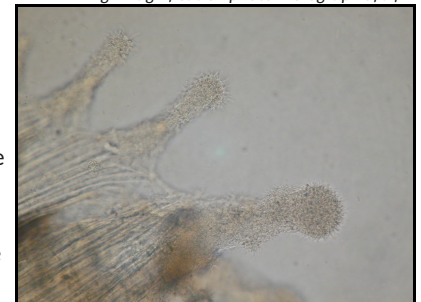
o Rx:

- Early infection/bath treatment: add potassium permanganate, hydrogen peroxide, or diquat to the water
- Chronic disease: bath treatment as above but may also need to treat with medicated feed containing **florfenicol** or **oxytetracycline**
- Prevent: minimize traumatic injuries, reduce organic debris in the tank, including uneaten feed

o Pearls:

- Environmental or handling factors often compromise skin/mucus and predispose to columnaris infection
- Can spread rapidly
- Uneaten food may serve as a reservoir
- There is a **columnaris vaccine** in the U.S. for largemouth bass and channel catfish

High magnification photomicrograph of a fin



biopsy showing a clump of *Flavobacterium columnare* bacteria - note the commonly seen "haystack" formations on the edges of fin rays

2. Motile aeromonad septicemia

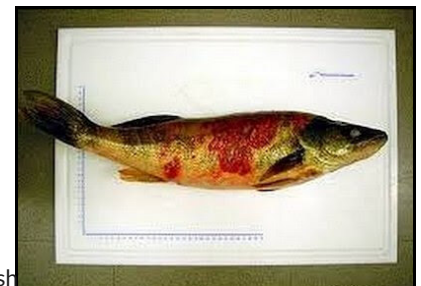
o Classic case:

- Variable morbidity and mortality rates (depend on water quality, dissolved oxygen level, stress level)
- External hemorrhages, petechiae, and/or erythema; can have ulceration
- Hemorrhages/petechiae in the viscera, body wall, and peritoneum
- Other non-specific signs may be present, including ascites

o Dx:

- Etiology: most often caused by motile *Aeromonas* spp. infection in freshwater fish (*Vibrio* spp. are a more common cause of a similar hemorrhagic septicemia in marine fish)
 - Often "secondary" to poor management or husbandry issues
 - Dx: bacterial culture of kidney, brain, other affected organs

o Rx:



Motile aeromonad septicemia in a fish

- Correct underlying stressors including environmental or other management issues
- Antibiotics, based on culture and susceptibility

○ Pearls:

- Risk factors include poor water quality (including low dissolved oxygen levels, elevated ammonia), trauma, and handling stress
- “Red sore disease” is a common manifestation of this seen in wild game fish
 - Combination of motile *Aeromonas* sp. infection and protist parasite infection (often *Epistylis* or *Heteropolaria*, both sessile ciliates)

3. “Ich” (freshwater) or “white spot disease” (freshwater or marine)

Ich in a freshwater fish; note the white spots all over the surface

○ Classic case:

- Small white spots all over fish (body, gills, fins)
- Extreme lethargy, inappetance, mortality

○ Dx:

- Freshwater etiology: *Ichthyophthirius multifiliis* (“Ich”) is a ciliated obligate parasitic protozoa that can reproduce exponentially (hundreds to a thousand offspring in one life cycle)
- Marine etiology: *Cryptocaryon irritans* has a similar “explosive” numbers-type life cycle
- Dx: microscopic evaluation of skin, fin, and/or gill scrape or biopsy -- make a slide to see characteristic ciliated protozoa with gray/granular interior that rotates slowly or moves like an amoeba
 - This life stage, known as the feeding stage or “trophont,” is often embedded under skin or mucus (when seen in tissue biopsies)
 - For mature freshwater *Ichthyophthirius* stages, horseshoe-shaped macronucleus is more apparent
 - For marine *Cryptocaryon*, internal structures are not easily seen in any stages

○ Rx: only free-swimming, infective stages (“theronts”) in the water for both freshwater *Ichthyophthirius* and marine *Cryptocaryon* are susceptible to treatment!

- Pet fish: multiple treatments of formalin or malachite green (the latter cannot be dispensed by vet but may be available over-the-counter)
 - Alternatively, for many freshwater species, 4-5 g/L salt for an extended period of time, depending on temperature
- Copper therapy
- Refractory to treatment: parasites encysted in the environment and those on the fish

○ Pearls:

- Life cycle varies depending on temperature - at “warmer” temperatures (78–80°F [25.5–26.6°C]), freshwater *Ichthyophthirius* treatment period may last a week or more
- For *Cryptocaryon* in marine tropical fish, treatment duration may be 4–6 weeks because the life cycle of *Cryptocaryon* is significantly longer than that of freshwater *Ichthyophthirius*
- Recovered fish can be silent shedders (carriers) in the future and will have some degree of immunity
- The classic white spot of “Ich” seen grossly is actually the encysted parasite surrounded by tissue reaction by the fish
- In younger stages of freshwater *Ichthyophthirius*, the “U” or “C” shaped macronucleus may not be apparent

4. Velvet disease (freshwater and marine)

○ Classic case:

- Swimming against objects or substrate (flashing), lethargy, gathering near the surface more than usual
- Affected fish have a dusty, velvet appearance, but this may not be readily apparent in lighter colored fish or in predominantly gill infestations

○ Dx:

- Etiology: *Amyloodinium ocellatum* is a parasitic dinoflagellate that attaches to, and invades, the skin of brackish to marine fish (salinity of 3–45 ppt)
- Etiology: *Piscinoodinium pillulare* (and several others) are freshwater counterparts to *Amyloodinium*, and are very similar in appearance microscopically



Velvet disease in a freshwater fish

- Both marine and freshwater parasites can have explosive population growth in one life cycle - i.e., one adult may lead to hundreds of organisms in one generation
- Dx: wet mount preparation of gill tissue shows many small pale brown/golden organisms (trophonts)
 - Microscopic exam: round, ovoid, or pear-shaped, brown/golden trophonts (feeding stages) are evident anchored to the gill epithelium, fins, and skin

○ Rx:

- Rx for pet fish can include use of a chloroquine extended bath
- ExtendedTx of copper sulfate is one of the few legal options for food animals, but can also be used in marine pet fish and in freshwater (in many instances)
- A pH-adjusted freshwater dip (0 ppt, for 3–5 minutes) will help remove significant portions of the brackish to marine *Amyloodinium* “feeding” or trophont stage
 - Some euryhaline species (those that have a wide salinity tolerance) can handle extended freshwater exposure for 2–3 weeks
- A saltwater dip (30 ppt for 3–5 minutes) will help remove the freshwater parasite in freshwater species
- Note: extended treatments which include the environment are required due to more resistant environment life stages found off the fish in both freshwater and marine infections

○ Pearls:

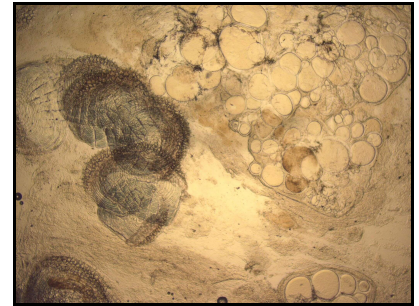
- The feeding stage (trophont) of *Amyloodinium* is non-flagellated, nonmotile, and pigmented while the infective stage (dinospore) is motile
- Tomonts (the reproductive stage found off the fish and in the environment) are more resistant to treatment

5. Lymphocystis

- **Classic case:**
 - Papillomatous or pebble-like masses (or “warts”) on the fins, gills, or skin
- **Dx:**
 - Etiology: infection with an iridovirus known as *Lymphocystivirus* or Lymphocystis disease virus (LCDV), a member of the family Iridoviridae
 - Dx: microscopic evaluation of the masses reveals enlarged fibroblasts (they become “virus-making factories”) which look like “balloons”
- **Rx:**
 - None, self-limiting in days to weeks if infection is not too severe (up to 6 weeks)
 - Isolation of grossly/visibly infected specimens may help reduce viral loading and spread in the system
 - Supportive care (e.g., increased or decreased salinity to aid in osmoregulation, antibiotics if secondary infections seen) may be warranted if severe infection
- **Pearls:**
 - Mainly of aesthetic concern in “light cases”
 - If significant portions of the skin or gills are affected (i.e., in moderate to more severe cases), mortalities may result from impaired osmoregulation, secondary bacterial infections, and other opportunistic diseases
 - Because fibroblasts are a common cell type found in multiple organ systems, internal organs may also be affected with lesions only apparent at necropsy
 - Does not affect cyprinids (e.g., koi and goldfish), catfish, or salmonids
 - Contagious, but more likely if there are skin wounds/trauma or other significant stressors



A clownfish with severe lymphocystis disease caused by *Lymphocystivirus*; note nodules/wart-like lesions on fins, head, and body and the erosion and ulceration on the body



Photomicrograph of skin scrape (wet mount) from a clownfish with lymphocystis disease; note round to ovoid/balloon-shaped structures to the right of the scales - these are greatly enlarged fibroblasts filled with viral particles

6. Bonus! Head and lateral line erosion (HLE) disease/syndrome

- **Classic case:** a.k.a. “Hole in the head disease”
 - Seen in freshwater (especially in cichlids) and ornamental marine species (especially in surgeonfishes, tangs, and angelfishes)
 - Erosions around eyes/on the head and along the lateral line
- **Dx:**
 - Etiology: considered to be a syndrome, use of activated carbon has been proven as one cause in published marine studies
 - Other etiologies and/or predisposing factors that are suspected but as yet unproven include nutrition, water quality, high oxidation/reduction potential (ORP), and/or infectious agents (e.g., internal parasites such as flagellates)
 - Dx is based on clinical signs
- **Rx:**
 - Improve water quality, remove activated carbon filters, address any stray voltage near tank, enhance diet/ micronutrients (including vitamins and antioxidants)
 - Metronidazole if flagellate infestation is suspected or diagnosed: administer in feed or add to water
- **Pearls:** common!
 - Underlying causes are as yet to be determined; marine and freshwater etiologies may differ
 - The lateral line is part of the nervous system and helps fish navigate: helps to detect movement, vibration, and pressure differences in the water
 - Click here to see a [diagram of the lateral line](#) sensory organ with neuromasts
 - Fish with advanced HLE may have irreparable scarring of skin tissue



Head and lateral line erosion in a Pacific blue tang

Images courtesy of [Liz WinfreyV](#) (fish tank), Roy Yanong (clownfish, columnaris, head and lateral line disease, lymphocystis, HLE), [Sneha srivatsa](#) (hemorrhagic septicemia), [djpalm](#) (ich), [mydigitallife](#) (velvet infection), [Nick Hobgood](#) (lymphocystis).