Chapter 7 Fish Health

Prevention is better than a cure

7.0 Overview

Offering fish a healthy environment is key to their survival. Fish are constantly exposed to opportunistic parasites and bacteria but are normally able to ward off infection if they are healthy. Environmental stress weakens the fish's immune system making them more susceptible to disease. Most often when a problem occurs it is due to a poor environment or the introduction of sick fish to a closed fish system. A fish system is a limited cosmos parasites and bacteria have a much a better chance of finding a fish than they would in the wild. Therefore certain measures are required in large fish colonies to prevent epidemic diseases.

Measures include

- ✓ *Maintaining a healthy unstressful environment*

Regular water testing on a daily and weekly basis are used to hold water quality parameters to with in optimal conditions. The most important parameters are tested once or even twice a day. From the pH, temperature, and conductivity that are tested daily other water chemistry parameters can be estimated such as high pH will lead to higher levels of toxic ammonia. Weekly testing of ammonia NH_3, nitrite NO_2, nitrate NO_3, alkalinity $CaCO_3$, dissolved oxygen O_2, and water hardness $CaCO_3$ are performed see Chapter 5 Environmental for more details. When adjusting water parameters it is extremely important to avoid drastic fluctuations in water parameters. Generally avoid large water exchanges on any fish system. Smaller more frequent water exchanges are preferred. In general, avoid any stressful drastic changes to any environmental parameter including ambient temperature, lighting, and sound levels. Safe husbandry practices are important see Chapter 3 Spawning, and adequate tank stocking levels see Chapter 6 Fish Systems.

- ✓ *Closed fish colony*

Fish are not brought in from the outside in to the fish colony rather they are quarantined in a separate laboratory and only after certain conditions have been meant can there disinfected progeny be brought in to the facility see Chapter 9 Quarantine Laboratory.

- ✓ *Limiting transfer and contact between fish in separate tanks*

Use a clean fish net for each fish tank do not transfer a net from one tank to the next. Place dirty nets in the Net Soak disinfectant after every use. Do not continually move your fish from one fish system to the next. Although fish facility work hard at keeping water quality parameters the same on all fish systems there is always fluctuations that can weaken fish.

- ✓ *Disinfecting or sterilizing equipment that comes in to contact with the fish*

Fish tanks and dishes are bleach disinfected. Spawning traps are autoclaved after every use. Dirty nets are disinfected in net soak. Additionally fish tank lids, shelves and counter tops need to be disinfected with 70% isopropyl and floors with sodium hypochlorite.

- ✓ *Sterilizing recirculated water by ultraviolet radiation*

Check and maintain fish system UV filters.

- ✓ *A healthy well balanced diet*

Proper nutrition will aid fish in fighting off infection. Feed fish regularly.

- ✓ *The removal of sick, old, and dead fish on a daily basis*

Inspect regularly and remove any dead or sick fish immediately upon discovery. Sick and dead fish can harbor disease. Remove fish from the system that are 3 years or older. These fish have diminished immune systems and are reaching the end of their productive reproductive life.

7.1 Fish Diseases & Inspections

This section covers some of the more common fish diseases that can be encountered in the fish facility. Every fish tank is inspected daily during the week by the laboratory technician, and the same tanks are reviewed weekly by the laboratory manager. Successful health inspections requires one to be able to differentiate between diseases caused by the fish itself or its environment such as hereditary diseases, deformities, injuries, and improper diet and those diseases caused by pathogens, which are far more common in a aquaculture setting. It is recommended to always have one or two fish disease reference books on hand. Alert laboratory manager who will consult with Veterinary Services there contact information is located as a header on laboratory checklists if a disease is suspected that is not due to heredity or the more common preexisting conditions exhibited in the fish facility such as pinheads see wasting disease below.

When performing health inspections carefully look in to every tank, sometimes a flashlight is useful and make sure your view is unobstructed, first look for mortalities on the bottom of the tank, floating on the surface, or near the drainage of the tank. Next look to see if any of the fish are exhibiting abnormal behavior such as swimming irregularly, rubbing, heavy or rapid respiration, fish clustered together in the corner of tank or at the surface or bottom. Then look at the physical appearance of the fish are they emaciated, bloated, spine curvature, lethargic, irregular color including red streaks that is often a sign of bacterial infection, raised scales and generally anything out of the ordinary. Look for pinheads these fish exhibit pale coloration often gray in color, emaciation, lethargic and are often distorted by a curved spine. See sick fish protocol below.

7.2 Hereditary and Environmental Diseases

Net and Fight Damage/Wounds

Characteristics of fish net damage including efforts fish undertake to avoid nets, such as recklessly darting around the tank, include skin abrasions, cuts, fin base erythema (inflammation but also a sign of infection), and puncture wounds. These symptoms can also be caused by fighting or aggressively spawning fish, another sign of this is frayed fins, which can also be a sign of inadequate quantities of feed also check to see if

stocking densities are adequate. If the damage is not too extensive these fish can be observed to see if they will recover once the problem is fixed.

Malformations and Deformations
Malformations and deformations are not unusual in fish that are extensively breed from relatively small stocks of fish often with known genetic abnormalities. An s-curved caudal peduncle or stunted body length can be due to heredity, especially if it is seen only in a particular line of fish. Spontaneous mutations with in a generation of a fish stock are not uncommon. Hereditary diseases do not pose a direct threat to other fish, but indirectly if complications make the fish more susceptible to disease for example that can not eat properly putting down the line may be necessary. If malformations and deformations are widespread spanning many different fish families, especially if fin deformations are involved, then chemical or nutritional factors may be involved.

Nutritional Problems
Nutritional deficiencies can lead to operculum deformities, gastrointestinal inflammation, degeneration of internal organs, symptoms of wasiting disease, other external malformations and deformations and is even suspected in hole in the head disease exhibited by cichlids. Since all of the fish are feed the same diet if a nutritional problem was suspected it should be widespread, but with in this realm a small infrequent number of fish may be predisposed to a deficiency problem.

Oxygen Deficiency
This can be due to overfeeding, poor maintenance, overstocking tanks, and inadequate aeration. Symptoms include heavy and/or rapid respiration and gasping for air just under the surface of the water. Check DO levels and if need be address the overlying cause(s).

Acidosis and Alkalosis
Zebrafish are adapted to a pH 7 (range 6.75-7.5) anything outside this range or frequent changes in pH can lead to acidosis or alkalosis. Acidosis symptoms include darting fish and heavy respiration. Signs of alkalosis include frayed fins, white or corroded skin. To fix this problem slowly adjust the pH to the correct range. Never adjust pH by more than 0.2 in one hour or 0.5 in a day.

Gas Bubble Disease
A sudden reduction in gas pressure can lead to the formation of gas bubbles in the skin, fins and in severe cases in the blood (gas embolus-fatal). Gas pressure can be reduced by lowering the temperature and by performing large water exchanges. Gas bubble disease is unlikely to occur in well-aerated tanks.

Bloated Females
Females that appear to be extremely bloated are believed to be overfed leading to blockage of eggs in the belly. This symptom is similar to abdominal dropsy (below) but with out any of the other symptoms. Females can be anesthetized and squeezed to relieve the blockage.

7.3 Diseases Caused by Pathogens

Abdominal Dropsy (pinecone disease)
Abdominal dropsy is the abnormal accumulation of fluid within the abdominal cavity often due to kidney failure. It is a condition with a wide range of causes. It may be bacterial in origin from *Aeromonas* or *Mycobacterium*, viral (but unlikely in Zebrafish), water quality problems, nutritional deficiencies, and abdominal tumors or related to parasites, as from *Costia*.

Symptoms include markedly swollen abdomen, scales sticking out and away from the body giving it the appearance of a "pinecone", lethargy, extruding eyes and rapid gill breathing. All of the symptoms can appear separately or simultaneously.

Bacterial Fin Rot
This disease generally affects younger fish and is due to poor water quality. Symptoms include tattering of the fin margins that eventually turn white, tissue between the fin rays break apart, and the base of the fins become inflamed and red. Generally, correcting the water quality parameters reduces these symptoms.

Mycobacteriosis (fish tuberculosis)
This is a chronic bacterial infection caused several species of bacteria in the *Mycobacterium* genus. The results from the disease ranges from chronic with low-level fish mortality to acute massive high-level mortality. It theorized that the differences seen in mortality levels is due virulence of the infecting species of bacteria, or the difference is due to the level immunocompromised fish. Cautionary note this disease has been known to spread to humans with immuno-deficiencies typically showing up as a rash on the extremities. Always wash your hands after handling fish.

Symptoms of Mycobacteriosis include lethargy, emaciation, spinal curvature, pigment change (pale color), skin ulcers, and white nodules in internal organs. This disease does not respond well to antibiotics. This is one of the most dangerous fish diseases. See also wasting disease.

Oodinium (velvet disease)
Oodinium pillularis is a yellowish parasitic dinoflagellate that attaches itself to the fish near the fins and gills with filaments. During this stage Oodinium are barely visible to the negative eye, but can be observed under a microscope. They are approximately 100 µM in length. After these dinoflagellates receive sufficient nutrients from the fish they fall off to the bottom of the tank and reproduce numerous flagellated cells. These cells then seek out hosts, attach, and loose their pair of flagella.

Symptoms include heavy breathing if in infection is in the gills, lethargic, clamped fins, rubbing behavior and in severe cases fish appear to have a velvety texture and pieces of skin fall off. Although this disease is contagious it is treatable.

Wasting Disease
There are several etiological agents that are believed to cause this disease. One of which is *Mycobacterium* see above and fish have the same symptoms. Another cause of these symptoms is the nematode *Capillaria.* This is distinguishable from *Mycobacterium* by the presence of oval eggs in fecal matter samples or worms in the intestines of affected fish. Fish can generally tolerate mild infestations of *Capillaria* with no ill effects and there are effective treatments for them.

7.4 Sick Fish Protocol

If a disease is suspected that is not due to heredity or the more common preexisting conditions exhibited in the fish facility such as pinheads see wasting disease below and irregularly swimming fish. Alert laboratory manager who will consult with Veterinary Services their contact information is located as a header on laboratory checklists.

Otherwise remove the fish from the tank with a clean fish net, and place it in a labeled "euthanize" spawning trap filled with system water see euthanizing fish below. Rinse off the net with RO water and place it in the net soak. Obtain the mortality log, there is a separate log for each laboratory and record the date, stock number, family, description of the fish and your initials. Keep track of all fish removed from the tanks for euthanasia see Mortality Log Appendix C. This is also the same method for fish that are found dead. Promptly remove sick or dead fish. Contact facility manager if a fish to be euthanized is the last fish (or last male or female) in the tank.

7.5 Euthanizing Fish

There are only two acceptable methods for euthanasia of fish in the facility. First is "icing" fill the solid section of a spawning trap halfway full of ice then add system water. Let the ice bath stand for one minute then insert the inset (screened section) of the spawning trap in to the ice bath. Place the fish to be euthanized in the inset section of the spawning trap. The fish should not come in to direct contact with the ice. The second method is with the overdose of MS-222 (tricaine methanesulfonate). To do this add 50 mg tricaine to 1.0 liter of system water and adjust the pH 7 with sodium bicarbonate. Add the fish to be euthanized directly to this solution. For both methods icing and tricaine overdose wait 10 minutes after the last observed gill movement before removing the fish. Place the fish in a plastic bag and temporarily store them in the freezer with in the laboratory.

7.6 Dead Animal Storage

To dispose of dead fish take them to the 6th floor of Comparative Medicine D607 freezer. Do not dispose of dead fish in any other manner. Special requirements are needed to access 6th Comparative Medicine.