

Aquatic Diseases

Objectives

1. To recognize the relationship between disease, stress, nutrition and water quality.
2. To identify common aquatic diseases.
3. To recognize symptoms and determine treatment options of common aquatic diseases.

Diseases

- Are abnormal conditions of organisms that impair bodily functions with specific symptoms and signs
- Result from the following:
 - genetic or developmental error
 - illness or sickness
 - infection
 - poisons
 - nutritional deficiency or imbalance



Robert Koch

- First demonstrated the disease process in 1876 while studying anthrax
- Identified the anthrax epidemic in domesticated animals and sought a solution
- Determined a bacterium caused the illness by establishing a method of research



Koch's Method

- Consisted of the following steps:
 - find which organisms are common to all infected animals yet absent in healthy ones
 - isolate the organism
 - reproduce the disease under controlled conditions
 - re-isolate the same organism from the experimentally infected animals



Disease

- Occurs from the following three factors:
 - susceptible host
 - pathogenic agent
 - environment which is unfavorable to the host yet favorable to the agent

Stress

- Is defined as a stimulus which disrupts *homeostasis* in an animal
- Causes animals to use more energy to maintain homeostasis rather than fight diseases
- Is different among aquatic animals because they are always immersed in their environment and cannot escape it
 - some pathogens are always found in water



Homeostasis – an organism's ability to maintain internal equilibrium

Diseases

- May be broken into the following four categories:
 - infectious
 - non-infectious
 - treatable
 - non-treatable

Infectious Disease

- Develops from an infection
- Potential relies on the following:
 - number of organisms
 - infectivity: ability to get into host
 - virulence: ability to cause disease
 - host susceptibility



Degrees of Infection

- Are categorized by the following:
 - acute: high mortality rates in short amount of time
 - chronic: deaths occur on a gradual level
 - latent: host shows no signs and there are few or no deaths despite agent being present

Host/Agent Relationships

- Include the following:
 - symbiosis: a relationship between two organisms which may result in mutual benefit or dependence
 - commensalism: symbiotic relationship in which two organisms live together where one benefits and the other is unaffected
 - parasitism: symbiotic relationship in which the parasite metabolically depends on the host

Disease Transmission

- Can fall into one of the following categories:
 - direct
 - indirect



Direct Transmission

- Transfers infections from one host directly to another
- May be either:
 - vertical: parent to offspring
 - horizontal: one member of a population or species to another

Indirect Transmission

- Transfers infections from the following:
 - inanimate vehicle: handling equipment, feed
 - intermediate host: a host in which the agent undergoes development but does not reach sexual maturity

Non-Infectious Diseases

- Form from non-living agents
- Include the following:
 - nutritional diseases
 - neoplastic diseases



Nutritional Diseases

- Are common in domestic fish because their diet is predetermined
- Can be associated with nutritional deficiencies or toxicities
- May be avoided by practicing proper nutrition



Nutritional Diseases in Fish

- Are often chronic
- Develop slowly over an extended amount of time
- Possess faint disease symptoms and may be hard to interpret
 - only moderate nutrient deficiencies or excesses are often present
 - secondary pathogens can cover signs of the disease

Neoplasia

- Produces tumors caused by cell growth and proliferation occurring at an uncontrolled rate
- Is thought to be caused by the following factors:
 - heredity
 - carcinogen presence
 - chlorination of water
 - age

Neoplastic Tumors

- May be either of the following:
 - benign: describes a mild or non-progressive disease; non-cancerous
 - malignant: describes a severe or progressively worsening disease; cancerous

Viral Agents

- Cause the following diseases in fish:
 - Infectious Pancreatic Necrosis (IPN)
 - Viral Hemorrhagic Septicemia (VHS)
 - Infectious Hematopoietic Necrosis (IHN)
 - Channel Catfish Virus Disease (CCVD)



Infectious Pancreatic Necrosis

- Is an acute infection which especially affects trout and char
- Causes high death rates in fry and is rare in adult fish
- Eradicated Oregon of brook trout from 1971-73
- Allows the virus to be present in the blood while specifically targeting the pancreas and the tissue of the kidneys and spleen

Infectious Pancreatic Necrosis

- Is chemically resistant
- Can be resistant to freezing
- Enters fish through the gills and digestive tract
- Stays with a fish for life; once a carrier, always a carrier
- Mortality rate is reduced in cooler temperatures



Infectious Pancreatic Necrosis

- Causes the following:
 - sudden death in fry
 - hemorrhaging at base of fins
 - lethargy
 - pale liver and spleen
 - no food present in digestive tract

Treating Infectious Pancreatic Necrosis

- Involves the following:
 - isolating infected fish and water
 - removing infected water
 - destroying infected fish
 - vaccine possible in the near future



Viral Hemorrhagic Septicemia

- Was first recognized in Denmark in 1949
- Is resistant to freeze drying
- Is sensitive to ether, acid, chloroform and heat
- Can mainly be found in Washington
- Spreads very quickly among farms

Viral Hemorrhagic Septicemia

- Causes the following:
 - general tissue and organ damage
 - concentrated death of liver tissue
 - spleen and kidney damage
 - lethargy
 - swimming in circles
 - pale gills
 - dark discoloration

Preventing Viral Hemorrhagic Septicemia

- Involves the following:
 - maintain clean *broodstock*
 - keep water clean
 - routine slaughter of a few fish to inspect organs
 - isolate new fish
 - keep distance from surrounding farms
 - vaccine under development which will be available in near future

Broodstock – group of sexually mature individuals of a cultured species in aquaculture which are kept separate for breeding purposes

Infectious Hematopoietic Necrosis

- Prevails in salmon and trout
- Caused 100 million fish deaths in the years between 1970–1980
- Is slowed when exposed to temperatures below 10 degrees Celsius
- Often causes death due to kidney failure

Infectious Hematopoietic Necrosis

- Causes the following:
 - lethargy
 - hemorrhaging of muscles and fins
 - paleness in liver, kidney and spleen
 - milky fluid fills stomach and intestines
 - widespread *necrosis* of kidney and spleen hematopoietic tissue

Necrosis – death of cells or tissue in a localized area of the body

Preventing Infectious Hematopoietic Necrosis

- Involves the following:
 - avoid infected fish or water
 - isolate infected fish
 - disinfect water with *ozone*
 - disinfect eggs
 - vaccines under development

Ozone – fresh, pure air which acts as a powerful oxidizing agent

Channel Catfish Virus Disease

- Is a contagious herpes virus which only affects channel catfish under four months of age
- Predominately occurs in the southeastern United States, California and Honduras
- Is easy to kill as it is sensitive to freezing and thawing, acid and ether



Channel Catfish Virus Disease

- Causes the following:
 - swimming in spiral motion
 - floating with head at surface
 - hemorrhaging fins, abdomen, gills, liver, kidney and gut
 - necrosis of organs
 - degeneration of the brain

Preventing Channel Catfish Virus Disease

- Involves the following:
 - avoid potential carriers
 - avoid infected fry
 - maintain water below 27 degrees Celsius
 - vaccines are under development



Bacterial Agents

- Cause the following diseases among fish:
 - Bacterial Coldwater Disease (BCWD)
 - Columnaris Disease
 - Bacterial Gill Disease (BGD)



Bacterial Coldwater Disease (BCWD)

- Predominately infect salmon, though have been known to infect catfish in Louisiana
- Create yellow colonies which give off a fried egg appearance
- Is prevalent in lower temperatures



Bacterial Coldwater Disease (BCWD)

- Causes the following:
 - external lesions on fins, skin and muscle
 - darkening of color
 - spinal deformities



Preventing Bacterial Coldwater Disease

- Involves the following:
 - avoidance of infected fish is the only prevention
 - no vaccines are available
 - may be treated with preventative drugs such as formalin



Treating Bacterial Coldwater Disease

- Includes using the following medications:
 - oxytetracycline (external or internal)
 - quarternary ammonium (external)

Columnaris Disease

- Affects 36 different species of fish, though salmon and catfish are most likely to be exposed
- May be either acute or chronic
- Severity increases with temperature, higher pH and crowding

Columnaris Disease

- Causes the following:
 - lesions on head, back and gills
 - erosion of skin which then exposes muscle
 - rapid death due to respiratory issues with lesions on gills

Columnaris Disease Prevention

- Involves the following:
 - cooler water temperatures
 - stress reduction
 - decreased crowding of fish
 - increased oxygenation



Columnaris Disease Treatment

- May be accomplished through using the following medications:
 - oxytet (internal)
 - sulfonamides (internal)
 - nifurpirinol (internal)
 - Roccal (external)
 - Hyamine (external)

Bacterial Gill Disease (BGD)

- Affects a wide array of hosts and can be found in both cold and warm water fish, though not caused by the same bacteria
- Specifically infects salmon reared in hatcheries
- Can be caused by muddy, silt containing water
- Is mainly a problem in the United States

Bacterial Gill Disease

- Causes the following:
 - loss of appetite
 - higher respiratory rate
 - swollen gills
 - large amounts of mucous present

Bacterial Gill Disease Prevention

- Involves the following:
 - no crowding
 - water free of mud and silt
 - strict hygiene



Bacterial Gill Disease Treatment

- Is dependant upon severity of the disease as over-treatment may result in death
- May be accomplished through using the following:
 - quarternary ammonium compounds
 - chloramine T
 - oxytetracycline
 - one to five percent salt for one to two minutes

Mycotic Diseases

- Are caused by molds and fungi
- Include the following:
 - saprolegniasis
 - branchiomycosis



Saprolegniasis

- Is typically external
- May infect any species of fish
- Affects the skin, gills and sometimes eggs
- Forms an adult mass of filaments (hyphae) known as mycelium
 - mycelium looks like a wad of cotton in the water
- Lives on both dead and living fish

Saprolegniasis

- Only affect fish which have been compromised in some way
 - suppressed immune system
 - skin injury or trauma
 - spawning or unusually advanced in sexual maturity

Saprolegniasis

- Causes the following:
 - gray-white lesions along the skin
 - occasional damage to internal organs
 - hyphae may only penetrate unfertilized eggs

Saprolegniasis Prevention

- Involves the following:
 - good management techniques
 - avoid predisposing factors such as injury, water quality and temperature



Branchiomycosis

- Is also known as “gill rot” due to large amounts of necrosis of gills
- Found most often in waters above 20°C
- Occurs due to high amounts of organic matter, such as algae
- Treatment is ineffective due to quick onset of the disease

Branchiomycosis

- Causes the following:
 - sudden death often occurring before any signs are present
 - loss of appetite
 - schools swimming near surface
 - large amounts of necrosis, especially on gills

Branchiomycosis Prevention

- Is accomplished through the following
 - do not over feed, fertilize or crowd
 - remove any dead fish
 - maintain proper hygiene and water quality

Parasitic Diseases

- Include the following:
 - anchor worms
 - black spot
 - costia
 - ich



Anchor Worms

- Obtain their name because they attach themselves to fish by using hooks or “anchors”
- Bore into the skin by burrowing under the scales
- Appear only as little strips of cotton as all you can see is the tail
- Increase the chances of a fish to acquire secondary diseases

Anchor Worms

- Cause the following:
 - fish scratch themselves with anything found in the tank
 - leave open wounds which are susceptible to infection
 - loss of energy
 - lower levels of blood

Treating Anchor Worms

- May be accomplished through the following:
 - introducing potassium permanganate into the tank to treat the entire colony
 - isolate the infected fish and apply a potassium permanganate solution

Black Spot

- Is often found in sources with an earthen bottom
- Is caused by a parasite burrowing into a fish, which then creates a cyst
- Causes relatively little damage to adult fish

Black Spot

- Causes the following in juvenile fish:
 - excessive blood loss
 - stress
 - blindness
 - eventual death

Costia

- Can be recognized by the skin of a fish becoming cloudy and pale
- Is caused by *protozoa*
- Is relatively easy to cure

Protozoa – one-celled organisms which are larger than bacteria and may cause disease

Costia Prevention

- Involves the following:
 - maintain a clean aquarium
 - administer healthy feeding habits
 - take proper measures against the introduction of parasites and diseases

Costia Treatment

- May be accomplished through the following:
 - raise temperatures of aquarium for a few days
 - add copper to water (over administering copper may poison the fish and cause sudden death)
 - add acriflavine to water (over administering acriflavine may lead to fish sterility)

Ich

- Is one of the most common diseases found in aquaculture
- Is also known as the White Spot Disease
- Is caused by a parasite of the genus *Ichthyophthirius*
- Occurs when a parasite attaches to a fish, buries under the skin and forms a protective outer layer which appears white in color

Ich

- Causes the following:
 - blood loss
 - formation of white cysts all over the fish's body
 - lethargy



Ich Prevention

- Involves the following:
 - avoid over-crowding
 - perform routine water changes
 - quarantine new fish before introducing them to the tank

Ich Treatment

- Must be performed on the free-moving parasites as those protected by cysts are nearly impossible to get to
- May be accomplished through the following:
 - raise water temperatures to 85-88°F
 - increase aeration to improve the levels of oxygen
 - change water and clean gravel frequently

Assessment

1. What causes mycotic diseases?
2. What is necrosis?
3. Which three factors produce a disease?
4. What is a protozoan?

Assessment

5. Anchor worms appear as little strips of cotton.
 - a. true
 - b. false
6. Bacterial Coldwater Disease creates yellow colonies on fish which look like fried eggs.
 - a. true
 - b. false

Assessment

7. Acute deaths occur on a gradual level.
 - a. true
 - b. false
8. An example of a source of indirect transmission is handling equipment.
 - a. true
 - b. false

Assessment

9. Diseases spread from parent to offspring are known as:
- horizontal
 - vertical
 - parallel
 - perpendicular
10. Which of the following is often found in sources with earthen bottoms:
- ich
 - costia
 - anchor worms
 - black spot

Resources

- Fish Diseases

www.aquaticcommunity.com

- Parasites and Methods of Controlling Them

www.koicarp.net

- Black Spot

www.michigan.gov

- Fish Disease

www.hccfl.edu

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