VIRAL DISEASES OF FISHES

PRINCIPAL VIRAL DISEASES OF FISHES

- Diseases caused by viruses and the economic losses are becoming increasingly important in the aquaculture.
- As is known, antibiotics and chemotherapeutic drugs are not effective against viruses (although they are used to prevent secondary infections).
- Therefore, PROTECTION is the most important in viral infections.

VIRAL DISEASES IN FISH

A) Acute and subacute diseases, which are characterized by epidemic outbreaks and high mortality.

B) Chronic and showing tumor formation diseases, which are characterized by sporadic and mortality is low.

Access roads for disease transmission

1. Orally: *Ceratomyxa, IPN, Bacterial kidney disease, Myxobolus cerebralis*
2. Gill lamellar: *Schizamoeba salmonis, Ichthyobodo necatur, Lymphocystis, IPN*
3. Lesions: *Bacteria (Vibrio sp.), Fungi (Saprolegnia sp.)*
4. Active perforating/drilling: Some metazoas, *dinoflagellata*

Transmission of Infection

1-Direct transmission and 2-Indirect transmission

1-Direct transmission: from a host to another

a) vertical or **b)** horizontal

- a) Vertical infection: from parents to offspring
- by way of/via male fish (*Gyrodactylus*)
- By way of female fish (IHN)

- b) Horizontal infection: from one individual to the other
- Contact: usually water-borne (e.g. from fish to fish)
- By taking the agent or infected aquatic living creature

Transmission of Infection-2

2-Indirect transmission:

Lifeless instrument-equipment

Vector or intermadiate host

- **Tool-equipment:** Transport equipment (net, fishing line, etc.) or fish-feed (aflatoxin)

- **Vector or intermediate host:**
- **Mechanical vector:** The vector is not necessary for the parasite's life cycle
- **Biological vector:** The parasite that passes part of the life cycle in the vector

- **VIRAL DISEASES WITHOUT TUMOR FORMATION**

- VIRAL HAEMORRHAGIC SEPTICAEMIA(VHS)
- INFECTIOUS PANCREATIC NECROSIS(IPN)
- INFECTIOUS HEMATOPOIETIC NECROSIS(IHN)
- INFECTIOUS HYDROPS COMPLEX
  - 1)ERYTHRODERMATITIS OF CARP
  - 2)SPRING VIREMIA OF CARP
  - 3)VIRAL SWIM BLADDER INFLAMATIONS
- ULCERATIVE DERMAL NECROSIS (UDN)
- RED ILLNESS OF THE PIKE/Turna balığı
- VIRAL DISEASE OF THE CATFISH/Yayın balığı

- **VIRAL DISEASES SHOWING TUMOR FORMATION**

- CAULIFLOWER DISEASES OF FISH
- SMALLPOX
- LYMPHOCYSTIC DISEASE (LCDV)

ACUTE AND SUBACUTE INFECTIONS

VIRAL HAEMORRHAGIC SEPTICAEMIA (VHS)

- It was first observed epidemically in a trout management in Denmark.
- Today this disease is a problem in many countries in Europe.
- **Agent:** *Rhabdovirus*
- Thermolabile (It is observed that the water temperature falls below 14°C).
- The virus is not resistant to acid-medium (pH 3.5 is inactivated).
- It is not resistant to ether-chloroform and glycerine.

  - It is a notifiable disease. It is very common and infectious.
  - Especially, this infection is important in trout (rainbow, brown trout) in Europe.
  - It is also seen in pike(turna fish) and turbot (kalkan fish).
  - Visible below the water temperature (below 14 °C).

Epizootiology:

- The disease is frequently seen in trout and salmon.
- Although it is seen in all ages, it affects mostly on serving size fish.
- The loss caused by the disease ranges from 45% to 100% (mortality).

- **Transmission/In the outbreak and spread of the disease:**
- Unsuitable environmental conditions,
- suboptimal care and nutrition and stress factors have a role.

- **Infection/transmission of the disease;**
- Transmission is caused by feces and urine of latent infected fish that virus go everywhere with feces and urine.
- In addition, contaminated water, fish-feed and equpments with virus
- Some ectoparasites and endoparasites in fish have a role for infection.
- No vertical transmission with egg.

SYMPTOM AND LESIONS:

- Swimming in diseased fish is disturbed
- (Rotating swimming, horizontal swimming is observed).
- The skin is darker in color.
- Petechial hemorrhagies at the base of the pectoral fin.
- Exophthalmos is seen.

In NECROPSY:

- The liver and kidney are hyperemic, with bleeding on them.
- Liver and kidney are hyperplasiac.
- Petechia is seen in skeletal muscles,

in fat tissue and in swim bladder.

- Yellow or mucus liquid is seen in stomach.

gastric pH increased from 1-4 to 6-7.

- The intestines may empty, slightly enterit improved.

On the blood table:

- Hemoglobin is reduced by 1;3 (one of third).
- There is an increase of 3 - 18% in lymphocytes.
- The erythrocytes are much reduced in relation to the anemia.

-paleness in the abdominal area
-petechial haemorrhagic areas in the fatty/adipose tissue
-paleness in gills

-haemorrhagie in internal organs

VIRAL HEMORRHAGE SEPTİSEMİ (VHS)

Swelling in abdomen the rainbow trout, pop eye

Small hemorrhagic bleeding foci in internal organs

Swelling in the eyes

Hemorrhagic bleedings in the skin

VIRAL HEMORRHAGE SEPTİSEMİ (VHS)

DIAGNOSIS:

- **Clinical diagnosis;** is difficult because it is confused with many diseases.

- **In Necropsy,** findings (macroscopic and histopathological) may give an idea.
- Disorders in the liver and kidney are especially important.

Histopathological examination:

- Edema and epithelial atrophy occur in the kidneys.
- Necrotic changes occur at the advanced stage of the diseas.
- There are also necrobiotic changes in the liver.
- In the liver, fat degeneration is also occasionally seen.

- **In laboratory diagnosis;**
- İsolation in cell culture, neutralization, serological methods (such as ELISA, IFAT, immunperoxidase), PCR

PROTECTION, CONTROL, TREATMENT

- **PROTECTİON:**
- General hygienic rules must be applied.
- Pathogenic spread is observed below <15 ° C. If possible, the temperature is raised.
- Disinfection applications, (Eggs 50-200 mg iodine / 1 lt / 10-15 min. bathroom)
- Do not use transfered waters in the pools (each pool has to be separate outgoings)
- Transfer of freshly picked fish to the main pools after a certain period of retention in the quarantine pool
- Bathing against parasites in fish
- Good care and feeding
- Finding an infection source and removing it - removal of patients and portraits

  - **CONTROL:**
  - Materials, 3% formalin, 100 ppm iodine with minimum 5 min, 2% sodium hydroxide with 10 min, 540 mg / l chlorine 20 min. it must be disinfected.
  - Pools disinfected with quicklime (1kg / m^2)
  - Extraction of water temperature above 15 °C for at least 4 weeks is effective for re-stocking of uninfected fish.
  - No treatment, because of this reason protection is important, eggs from infected sources, avoidance of taking fish, certified sources, strict hygiene measures must be applied

- **TREATMENT:**
- Antibiotics and chemotherapeutic drugs are not effective against the virus.
- However, secondary infection can be used to prevent infections.
- Vitamin additions to foods (Vitamins A, B and E)
- Bath applications can be done for skin lesions.

INFECTIOUS PANCREATIC NECROS (IPN)

- In fish, the pancreas is characterized by necrosis.
- Mortality is a high disease.
- It is a notifiable disease.
- It is very common in salmon fish, especially in trout.

- **Agent:** *Birnavirus*

- Heat resistant - thermoresistive (50% inactivity at 5 minutes and 70°C).
- It is not resistant to alkaline environments.
- It is not resistant to low heat.

Epizootiology:

- The disease is most common in Salmonidae.
- It is visible at all ages, but young fishes are more sensitive, It is more common in fish smaller than 10 cm.
- The death rate in fish is 80-95%.

- **Infection/transmission:**
- Adult fish are important as carriers and spreaders of the disease.
- The virus spreads with feces, urine, semen and eggs of diseased fish.
- Virus is easily transported by dishwashing material.
- Water birds, various invertebrates in the water (e.g. water slugs) play an important role in the spread of the virus.

- **In the outbreak and spread of infection:**
- Bad environmental conditions,
- Bad care and nutrition,
- The effect of stress factors is great.

SYMPTOM AND LESIONS:

- The incubation period is 1 to 2 weeks for natural infections.
- Sudden increases in the mortality rate are observed, particularly in those with large appearances in juveniles.
- Sick fish have stagnation and anorexia.
- They swim around their own axis or spin.
- In general, the color is darkened.
- Exophthalmos is observed.
- Hemorrhages occur in the ventral part of the body and in the fins.

- **In NECROPSY:**
- The liver, spleen and kidney are buff-colored (lose colour).
- Hemorrhages are seen in the body interior wall and organs.
- Severe haemorrhages occur in the caecum and pancreas.
- The stomach and intestines are usually empty or have whitish-yellowish mucoid content in the anterior parts.

- **Histopathologic examination:**
- The pancreas has extensive necrosis and cytoplasmic inclusions.
- Hyaline degeneration in skeletal muscle.
- Degeneration occurs in kidney haemopoietic tissues.

Dark color towards the back of the body,
a little bump in the head

Above: normal trout
Bottom: patient trout

Typical swelling in the rainbow trout's abdomen,
exophthalmos

INFECTIOUS PANCREATIC NECROSIS(IPN)

skin thickening, swelling in the stomach, bleeding points in internal organs

INFECTIOUS PANCREATIC NECROSIS(IPN)

Distension and swelling in the abdominal area

- **DIAGNOSIS:**
- **Clinical diagnosis:** It may be confused with other diseases. Symptoms are not specific.
- **Necropsy Findings:** Degenerative, necrotic changes and occlusion of the cytoplasmic inclusions may be helpful, especially when the pancreas is examined.
- **Laboratory diagnosis:**
- Electronmicroscopy
- İsolation in cell culture, neutralization, serological methods (such as ELISA, IFAT, immunperoxidase), PCR

- **PROTECTION AND CONTROL:**
- Good maintenance and feeding conditions
- Removal of stress factors
- Enhanced of environmental conditions
- Fish, eggs and sperm samples should be frequently examined in terms of viruses and porters should be identified.
- Patient fish should be removed from the pool.
- The pool and all materials must be disinfected.
  - During the epidemic the water temperature is reduced to 10°C.
  - IPN vaccine is available. It can be considered for fish in the endemic region.
  - No treatment, protection is important, eggs from infected sources, avoidance of taking fish, certified sources, strict hygiene measures must be applied.

INFECTIOUS HAEMATOPOIETIC NECROSIS (IHN)

- **Agent:** *Rhabdovirus*
- It is a notifiable disease.
- In fish, haematopoietic tissues are a disease characterized by necrosis.
- Salmonidae are more common.
- Virus is easily produced in cell culture.
- It is sensitive to ether and chloroform.
- It is inactivated at 60°C in 10 minutes.

Epizootiyology;

- It is seen in Salmonidae.
- High mortality in young fish.
- Rainbow trout and somona are more visible.
- In young people (less than 2 months) mortality can reach 90%.
- The disease starts when the water temperature drops/fall down to 8-10°C.
- Infection is caused by infected water, food and direct contact.
- It is pointed out that ovaries can play a role in virus transfer.

SYMPTOM AND LESIONS:

- High mortality in young people
- Rainbow trout and somona are more visible
- The fish; lethargic or hyperactive (weak in water, swimming sluggish, stop in different positions)
- Darkening of skin color (increase of pigmentation)
- Swelling in the abdomen, ascites, yellowish mucus-like fluid in the digestive tract.
- Long and dull feces/stool are usually removed from the anus.
- Exophthalmus, and an elongated form of stool on anus.
- Hemorrhagic areas in the fins, lateral line, back and head region
- pale in the gills and anemia
- Hemorrhagic areas in liver, swimmer, kidney and other internal organs
- Scoliosis can be seen when the disease is overcome (vertebral deformities)

Mass death in fish
Abdominal swelling in fish
Hemorrhagic gills

Darkness in the skin, hemorrhage in the abdomen and around the pupilla

Hemorrhages in the vitelline sac

INFECTIOUS HEMATOPOIETIC NECROSIS (IHN)

Petechial hemorrhages in the muscle

Liquid accumulation in abdominal cavity(ascites)
Small haemorrhagic hemorrhages ın the muscle and internal organs

Tail region darkened in salmon
Swollen stomach
Hemorrhage at the base of the fins

Above trout healthy
The trout below is sickly, the color is darkened
Exophthalmus (pop eye).

INFECTIOUS HEMATOPOIETIC NECROSIS (IHN)

Usually, long and dull feces/stool are removed from the anus

INFECTIOUS HEMATOPOIETIC NECROSIS (IHN)

In NECROPSY:

- Ascites (The collected liquid is generally clear)
- Hemorrhages occur in the peritoneum, spleen, kidney, liver, pylorus, and swim bladder.
- In general, liver and kidney are faded/solgun.
- The stomach and intestines have mucoid content.
- Sometimes hemorrhagic enteritis can be observed.
- **Histopathology:**
- Degenerative necrotic changes in the liver, spleen, kidney hemopoietic tissue and pancreas,
- Hemorrhages are seen in the skeletal muscle, the base of the fin and around the eye.

- **CONTROL;**
  - Fertilized eggs should not be infected. Eggs, fish pups have to be grown in completely virus-free water, certified products should be used
  - Fish eggs with iodophor compounds 100 mg / 1lt / 10 min
  - Equpments may be disinfected with 150-200mg / ll / 1.5-2 hours the chlorine
  - Water temperature should be above 15°C
  - Regular disinfection of the management
  - No treatment, protection is important, eggs from infected sources, avoidance of taking fish, certified sources, strict hygiene measures must be applied

- **DİAGNOSİS;** isolation in cell culture, neutralization, serological methods (such as ELISA, IFAT, immunperoxidase), PCR

TREATMENT: There isn't treatment, protection is important.

- Eggs from infected sources, avoidance of taking fish, certified sources, strict hygiene measures must be applie

INFECTIOUS HYDROPS COMPLEX

– It is composed of 3 independent diseases which are seen in carp fish.

This complex;

- **Carp Erythrodermatitis (CE)**
- **Spring Viremia of Carps (SVC)**
- **Swim Bladder Inflamation (SBI)**

1)ERYTHRODERMATITIS OF CARP

- It is a subacute or chronic disease characterized by inflammation of skin, ulcers and necrosis.
- **Agent:** *Rhabdovirus*

• EPIZOOTIOLOGY:

- The disease is seen in carp.
- Especially those who are one year old are more sensitive.
- Disease can occur at all seasons and at different temperatures.
- Infected fish and waters are important in spreading the disease.

– SYMPTOM AND LESIONS:

- Fluid-filled nodules are formed throughout the body. Later these nodules open in time and ulcers are formed in their places.
- Generalize edema is a problem.
- Exophthalmos is observed.

o In NECROPSY:

- There are no macroscopic disorders in internal organs.
- There is a small amount of exudate in the body cavity.
- Internal organs also have edema.
- The liver is greenish.
- Mild enteritis may be seen in the intestines.

❖ **Histopathology:** Edema is seen between the epithelium and the corium, and cellular infiltration, hyperemia, capillar hemorrhages and necrosis are observed.

Erythrodermatitis, on carp

2) SPRING VIRAEMIA OF CARP (SVC)

It is a notifiable disease.

It is characterized by enteritis, peritonitis, viscera edema and hemorrhage in fish.

➢ **Agent:** Rhabdovirus

EPIZOOTIOLOGY:

- The disease is usually seen in spring (it occurs at times when the water temperature is 12 - 22°C).
- Mortality rate is 30-70%.
- There are differences in susceptibility to infection among fish (2 older carp are more susceptible to disease).
- Environmental factors, bad care and nutrition, stress factors play a role in the outbreak and spread of the infection.
- It is contaminated by contaminated water and other materials.
- Several parasites (such as Argulus, leeches) have been reported to carry the agent of the disease.

SYMPTOM AND LESIONS:

- Slow breathing, swelling in the abdomen, standing thick and long stools
- Anterior inflammatory reaction and prolabsus
- Exophthalmos, anemic gills, petechial hemorrhages in skin and gills, change in skin pigmentation
- Blood fluid in abdominal cavity
- Hemorrhage, edema and necrotic areas in internal organs and muscles
- Petechial bleeds on skin and gills

- **In NECROPSY:**
- Peritonitis, severe enteritis in intestine (yellow mucus inside)
- Sero - purulent or bloody exudate in the body cavity
- Internal organs are edematous and hemorrhagic
- The liver is usually greenish.

✓ **DIAGNOSIS:** isolation in cell culture, neutralization, serological methods (such as ELISA, IFAT, immunperoxidase), PCR

- **CONTROL:**
- The greatest effort is in winter conditions (in the optimization of the available fish by reducing the density in the stock). New stocks are quarantined for at least 2 weeks without leaving the ponds.
- Infected fish are destroyed immediately. When the first epidemic begins, the affected fish are fully isolated (put in quarantine).
- No treatment, protection is important, eggs from infected sources, avoidance of taking fish, certified sources, strict hygiene measures must be applied

• **PROTECTION AND SAVING:** It is like it is in the others.

A

B

Healthy (**A**) and infected (**B**) carp. Abdominal distension and swelling.

Exophthalmos and petechial bleeding of the skin

Severe bilateral exophthalmus

3) SWIM BLADDER DISEASE (SBI)

It is mostly an acute disease that characterized by the swim bladder's inflammation.

➢ **Agent:** Rhabdovirus

- **EPIZOOTIOLOGY:**
- The disease is most common in June and July.
- Losses due to the disease can reach 100%.
- It is contaminated by water and equipment.
- It has not been reported that the disease was transmitted with eggs.

✓ **SYMPTOM AND LESIONS:**
✓ Swimming is disturbed (head is irregularly moved because the balance is also affected).

- **In NECROPSY:**
- The most characteristic findings are in the swim bladder.
- Petechiae or general blood sedimentation is seen.
- There's bloody mucus inside.
- Sometimes, necrosis may occurs.
- Enteritis is seen in the intestines. There is usually little mucus content.
- Peritonitis is seen.

DIAGNOSIS, PROTECTION AND SAVING: It is like it is in the others.

Swimming upside down

Enlargement of the caudal part of the air sac, and especially thickening of the cranial partition wall

ULCERATIVE DERMAL NECROSIS (UDN)

- It is a disease that characterized by the formation of white spots on the epithelium layer of the fish, especially in the head region, and subsequent necrosis.
- **Agent:** No virus isolation.
- Even if the virus isolation is not done, the experimental infections have succeeded.
- Although the presence of various bacteria and fungi in disease episodes suggests that they are responsible for the disease, according to recent studies these are the secondary actors.
- It is also noteworthy that the disease is observed together with "water pollution".

- **EPİZOOTİYOLOGY:**
- The disease is more common in Salmonidae (S. gairdneri is more resistant).
- The disease is most common during the cold months.
- Disease events are decreasing in the summer.
- The agent is inactive in warm and hot water.
- Immunological reactions are weaker in winter
- Contamination results in direct contact with the agents in the water.
- Mortality is low and morbidity is between 10-40% according to the region.

- **SYMPTOMS:**
- Especially at the head, sometimes white gray spots are formed in the other body parts without the scales.
- Initially 0.5 cm in diameter, the spots are in the form of a white bubble.
- Over time, lesions develop and grow and lateruUlcers and necrosis developed.
- Sometimes lesions are seen in the fins.
- In chronic events, the lesions are settled in fungi (entering the skin between layers of water, preparing the ground for mushrooms).

- **NECROPSY:**
- The internal/visceral organs are normal.
- In the case of secondary infections, degenerative disorders are also observed here.

- Histopathology:
- No major changes.
- Degenerations in epidermis cells, swellings, spills on top of the epidermis,
- Sometimes hypha are seen.

- **DIAGNOSIS, PROTECTION AND SAFETY:**
- Because of confuse for many diseases (clinical diagnosis) and agent is unkown (laboratory diagnosis) is difficult.
- It is particularly important to prevent fungal infections or other secondary infections.

Healing UDN lesions in the head area

RED ILLNESS OF THE PIKE/Turna balığı

- **Agent:** Rhabdovirus
- Disease seen in young fish.
- İt seen with hemorrhage.
- Red stains are formed bilaterally along the lateral line.
- Hemorrhages are also present in the muscle sections.
- Necrosis is observed in the kidney tubules.
- The loss rate is around 80-90%.

VIRAL DISEASE OF THE CATFISH/Yayın balığı

- The disease is characterized by oedema, intense internal and external bleeding, oedema and necrosis of the liver, oedema in the intestinal wall.
- The most affected organ is the kidneys.
- Virus is most commonly found in the kidneys.
- **Agent:** It's a virus that carries effective DNA.
- Due to the disease, the mortality rate for larvae and offspring is 80%.
- The disease is seen in months when water is hot (July, August, September).
- The incubation time varies according to the temperature. (2 - 3 days to 10 - 15 days)