

VIRAL DISEASES OF FISH (VHS, SVC & IHN)



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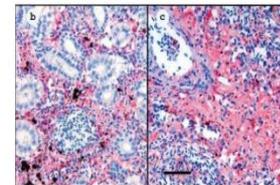
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Pale liver and anemic condition.



(b) Kidney, immunohistochemistry (IHC) showing virus labelling (red colour) of necrotic haematopoietic tissue in between intact kidney tubules.
(c) Spleen, immunohistochemistry showing virus labelling (red colour) of necrosis in spleen.

VIRAL DISEASES OF FISH

- The OIE lists viral diseases of fish as Notifiable:
 1. Viral hemorrhagic septicemia
 2. Spring viremia of carp
 3. Infectious hematopoietic necrosis.
 4. Koi Herpes Virus
 5. Infectious Salmon Anaemia.
 6. Red Sea Bream Irido Viral Disease
 7. Infectious Pancreatic Necrosis
 8. Noda Viral Infction

Viral Disease

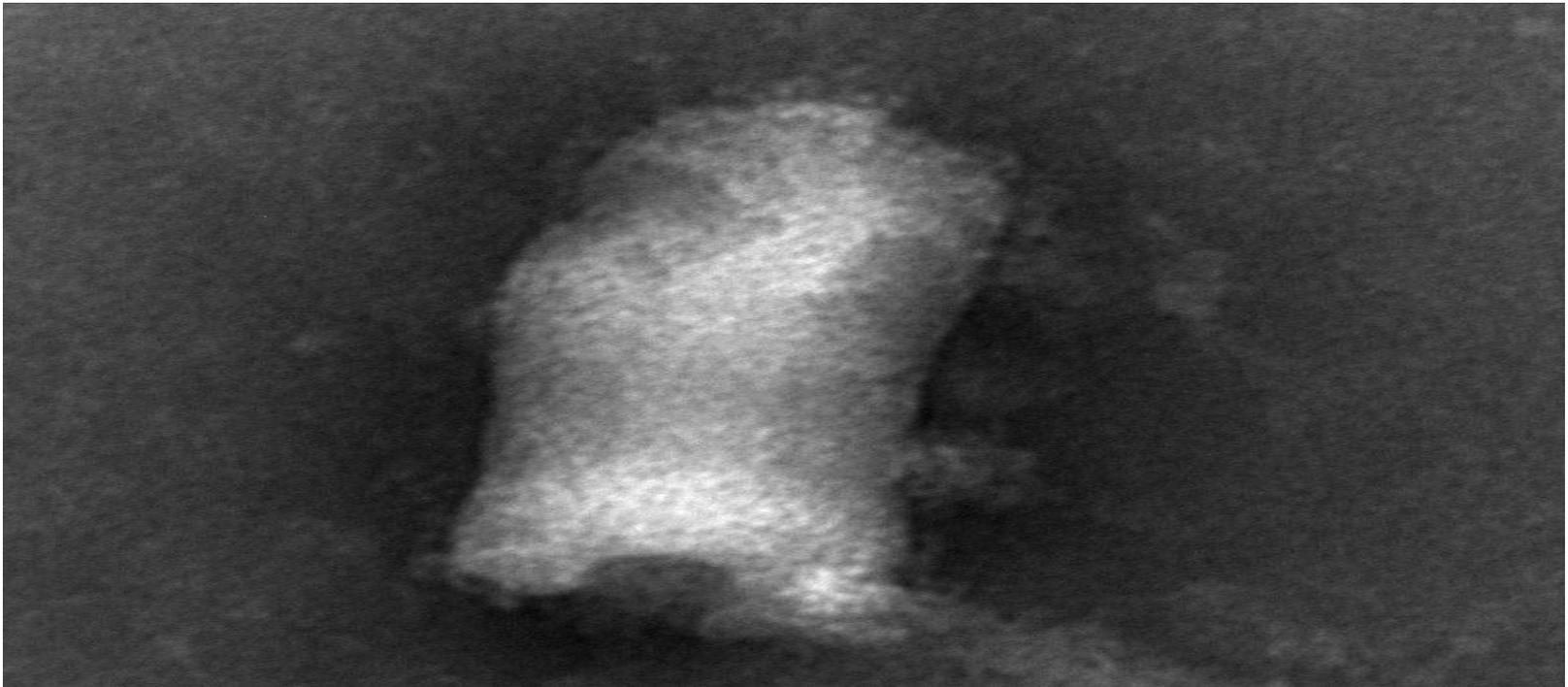
- Many produce high mortality in young fish and little or no losses in adults, which may become carriers.
- Vaccines are not yet commercially available for viral diseases of fish.
- Drugs are not effective, although antibiotics and other drugs may be used to control secondary bacterial infections that frequently follow viral diseases.
- Management techniques that minimize stress and crowding, biosecurity measures, and temperature manipulation hold the greatest promise for control of many types of viral diseases.

Viral Haemorrhagic Septicemia

- VHS is highly contagious disease caused by Rhabdo Virus, affecting both Salmonids in fresh and sea water when temperature become below 14o C.
- First recorded by Schaperclaus (1938) in rainbow trout.

VHS

- Etiology – Rhabdo virus, a RNA virus.



Transmission

- VHSV can be spread from fish to fish through water transfer, as well as through contaminated eggs, urine, sperm, and ovarian fluids etc.

VHS

- **Pathogenesis -**

The virus is Leucotropic in nature, affects mostly the circulating Leucocytes.



Affect the kidney melanomacrophages



Macrophages lyses & releases various active granules. Released granules causes early dysfunction of different stem cell precursor.



Pathogenesis of VHS



Simultaneously, hepatocytes become infected, necrosed & liver Sinusoids filled with haemorrhages.



In kidney hyaline cast is found in tubular lumen.



Muscular haemorrhages are prominent in cardiac ventricle.

Lesions

In acute form

- High mortality is common in first few days.
- Affected fish shows pale gills,
- Exophthalmus
- Darken body colour with erratic swimming movement.
- Congestion & haemorrhages found in skin, kidney, liver & intestine during post mortem.

VHS

- In chronic form
- Affected fish become lethargic with anaemic gills & distended abdominal body cavity.
- Splenomegaly
- Hepatomegaly & Swollen kidney are prominent

Lesions

- Nervous form
- Spiral swimming is prominent due to motor nerve disorder.
- Retracted abdomen with anemia is found in most cases with a history of sudden death.

VHS



VHS



VHS



Target organs and infected tissue

In septic stages of the disease, the virus is abundant in all tissues including skin and muscles.

Target organs are **kidney, heart and spleen** as these are the sites in which virus is most abundant.

In chronic stages, virus titres can become high in the brain



Swollen organs

Incubation time is dependent on temperature and dose; it is **5–12 days at higher temperatures.**

During and immediately following an outbreak, virus can be isolated readily in cell culture.

Kidney, heart and spleen tissues yield the highest viral titres



Viral haemorrhagic septicaemia in rainbow trout.

Note pale color of stomach region, pinpoint haemorrhages in fatty tissue, and pale gills



Hemorrhagic areas on skin – Gizzard Shad, Lake St Clair



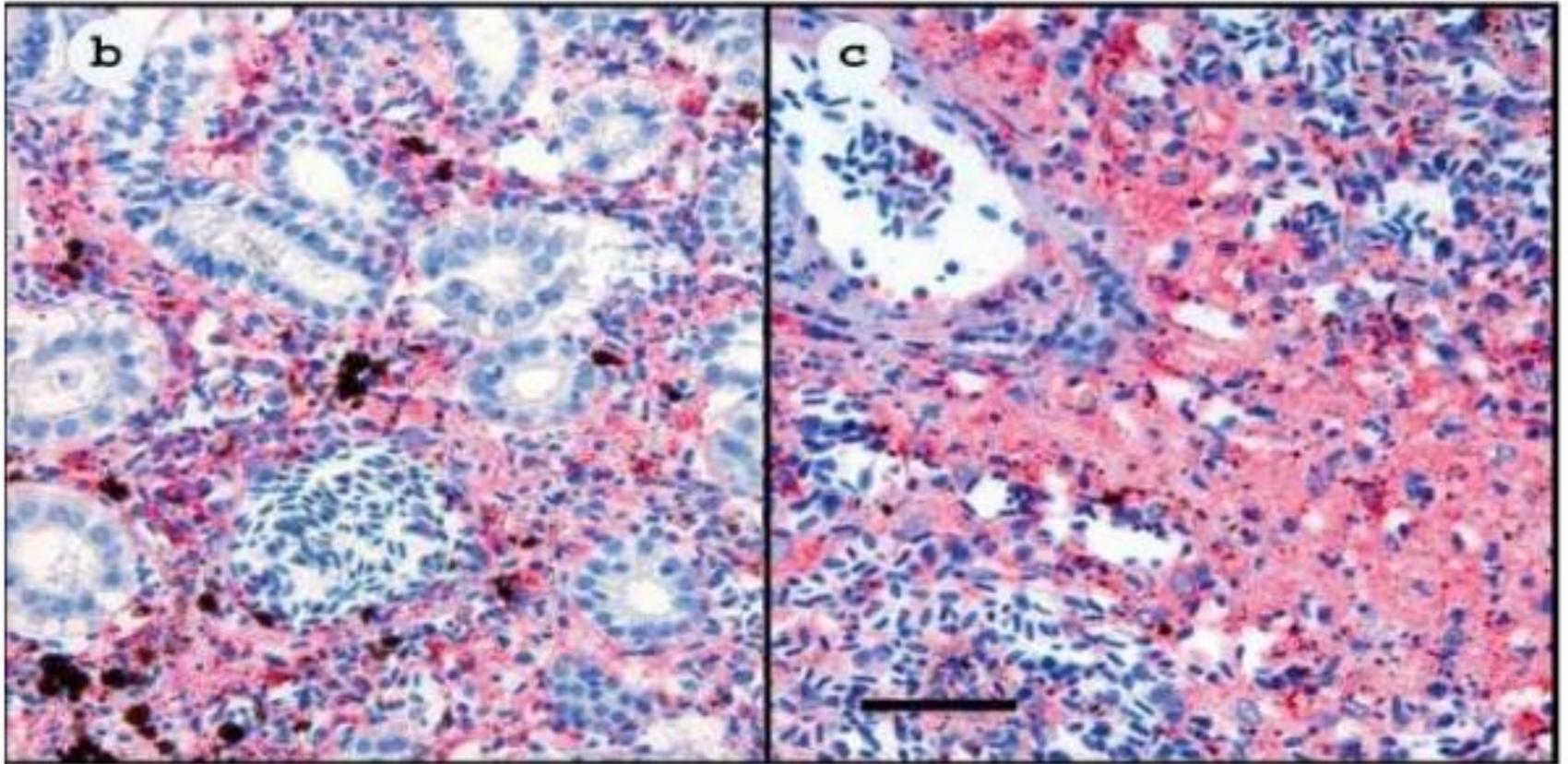
Hemorrhagic areas near eye – Yellow perch, Lake St. Clair



Swimbladder vesicles filled with fluids



External hemorrhages around the eye



(b) Kidney, immunohistochemistry (IHC) showing virus labelling (red colour) of necrotic haematopoietic tissue in between intact kidney tubules.

(c) Spleen, immunohistochemistry showing virus labelling (red colour) of necrosis in spleen.

SPRING VIRAEamia OF CARP (SVC)

- SVC is caused by Rhabdo virus, a RNA virus
- Affecting both carp and other cyprinids with generalized viraemia and haemorrhage in viscera and muscles.
- Extreme pin point haemorrhages found over the surface of swim bladder, resembling “Turkey egg appearance” & sometime termed as Swim bladder inflammation.

Classification of the Virus:

Domain: Virus

Group: "RNA viruses"

Order: Mononegavirales

Family: Rhabdoviridae

Genus: Vesiculovirus

Species: spring viremia of carp virus

Source: (Zhang, et al., 2009).

Fish types which affected by virus.

- 1.Common carp.**
- 2.Silver carp.**
- 3.Grass carp.**
- 4.Goldfish.**
- 5.Koi carp.**
- 6.Crucian carp.**
- 7.Bighead carp.**
- 8.Catfish.**
- 9.Orfe.**
- 10.Tench.**
- 11.Salmon.**

SVC

- The SVC occurs during higher spring temperature, just after low winter temperature, so called SVC.
- The disease was 1st reported by Fijan *et al*, (1971) in Yugoslavia.

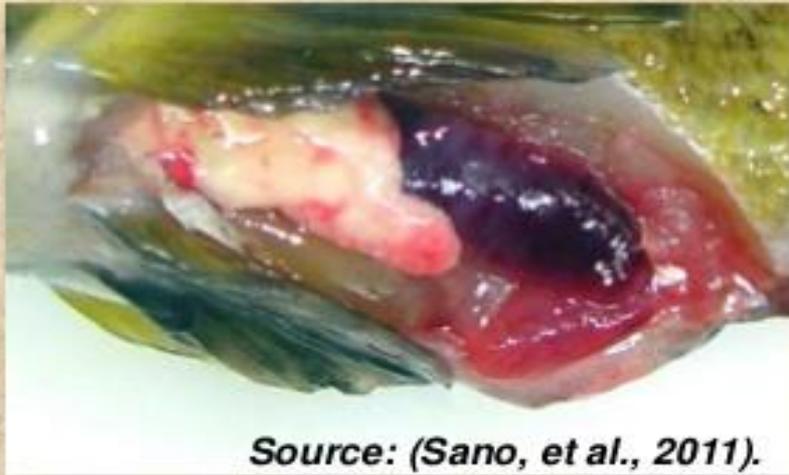
Pathogenesis

- The SVC virus enters through gills of fish, replicates in gill epithelium using highly vascularised area & ultimately spread to all vital organs.
- In swim bladder, the monolayer epithelium converts to multilayer.
- Necrosis of hepatocytes & cardiac muscle are prominent.
- In intestine, enterocytes become necrosed, inflammed, producing catarrhal enteritis. Ultimately villi become atrophied & FCR reduced.

Pathology

- Exophthalmus with pale gill
- Ascites
- Peritonitis are common
- Turkey egg appearance of swim bladder is pathognomonic in nature.
- Petechial haemorrhages are found in most vital organs like heart, liver, kidney, intestine & skeletal system.

2. HEMORRHAGES OF INTERNAL ORGANS



Source: (Sano, et al., 2011).

Figure (4)



Source: (Dixon, 2008).

Figure (5)

**3. EXOPHTHALMIA
(BULGING EYES)**



Source: (Basic, et al., 2009).

Figure (6)

**4. DISTENDED ABDOMEN
(BLOATED APPEARANCE)**



Source: (Zhang, et al., 2009).

Figure (7)

7. HEMORRHAGES IN MUSCLE



Source: (Dixon, 2008).

Figure (10)

8. HEMORRHAGES IN SWIM BLADDER



Source: (Sano, et al., 2011).

Figure (11)

9. SWOLLEN STOMACH



Source: (Basic, et al., 2009).

Figure (12)

10. HISTOPATHOLOGICAL SECTION OF GILL IN CARP INFECTED WITH SVC



Source: (Dixon, 2008).

Figure (13)

Conclusion:

1. Disease outbreaks in carp generally occur between 11-17 C.
2. Disease rarely occur below 10 C.
3. Small fish more affected than older fish.
4. Fish mortalities decline as the temperature exceeds 22 C.
5. In carp, the disease is often observed in springtime (hence the common name for the disease).
6. Rare in countries having cold winters.
7. It is believed that the poor condition of the overwintered fish may be a contributory factor in disease occurrence.
8. The disease can occur in fish in quarantine following the stress of transportation, even though there has been no evidence of virus in the fish prior to transportation.

Infectious Hematopoietic Necrosis (IHN)

- The disease is caused by Rhabdo virus, a RNA virus, affecting both rainbow trout and salmon with a mortality up to 100%.
- The name itself speaks that necrosis of haematopoietic organ (kidney) occurs in IHN.
- The disease occurs at the temp 10 oC & subsides above the temp at 150c
- IHN was first recorded by Wolf (1988).

Pathogenesis

- The virus enters through gill, passes into esophagus & reaches to stomach.
- Ultimately reach into blood circulation after viraemia.
- Target organ of the viruses are connective tissues of entire digestive system & kidney.
- In intestinal wall, severe necrosis of sub-mucosal eosinophilic granular cell, is the pathogenomic lesion.

Pathogenesis

- The anterior kidney shows intense necrosis with congestion in renal sinus.
- Sometimes, melanomacrophages present in kidney become necrosed.
- Hemorrhagic thrombi is also found in cardiac muscle

Pathology

- Affected fish shows pale gills
- Exophthalmia
- Darken body colour with increased pigmentation.
- Hemorrhage found on skin & viscera particularly at the base of fins, behind the skull & above lateral line
- Surviving fish may develop scoliosis

Target organs and infected tissue

Virus entry is thought to occur through

- ❖ the gills and
- ❖ at bases of fins



Salmon affected by IHN virus, ventral congestion and pale gill

while **kidney, spleen and other internal organs** are the sites in which virus is most abundant during the course of **overt infection**.



Salmon affected by IHN virus exhibiting **peritoneal and caecal fat haemorrhage**



Microscopic pathology

Histopathological findings reveal **degenerative necrosis in haematopoietic tissues, kidney, spleen, liver, pancreas, and digestive tract.**

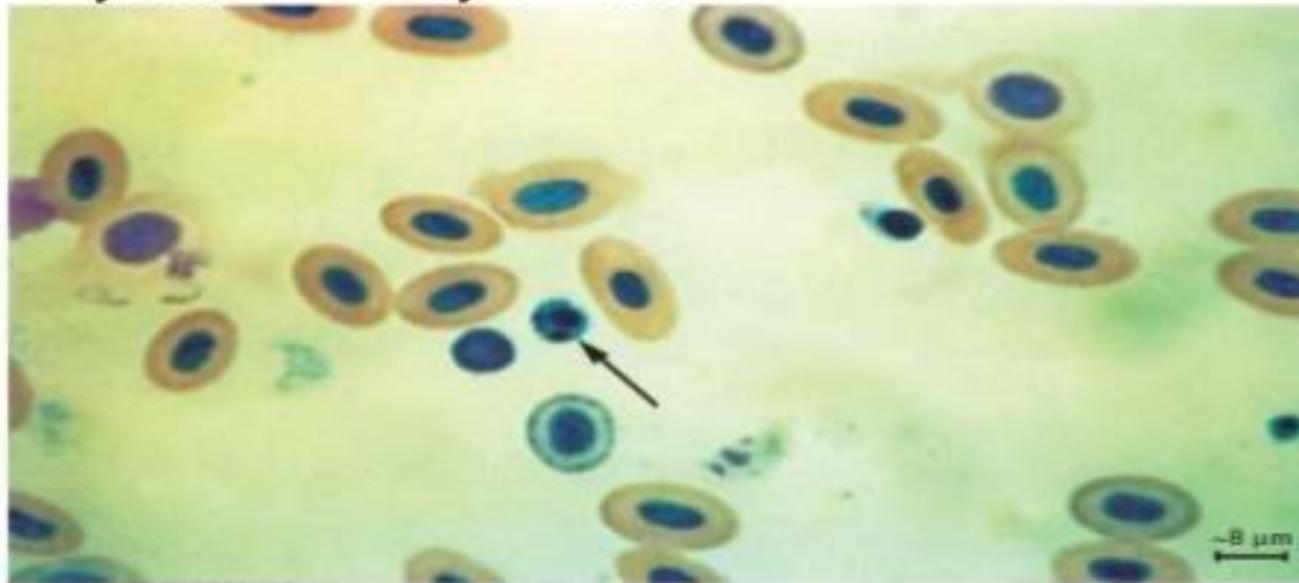
Necrosis of eosinophilic granular cells in the intestinal wall is pathognomonic of IHNV infection



CLINICAL PATHOLOGY

IHN causes profound changes in cellular and chemical blood constituents, primarily because of **renal damage**.

The most diagnostic change is the presence of remnants of necrotic cells (“**necrobiotic bodies**”), probably erythrocytes, in kidney smears.



- ❑ These cells are less frequent in peripheral blood.
- ❑ Fish are **anemic and leukopenic**, and there is evidence of osmotic imbalance (hypoosmolality).