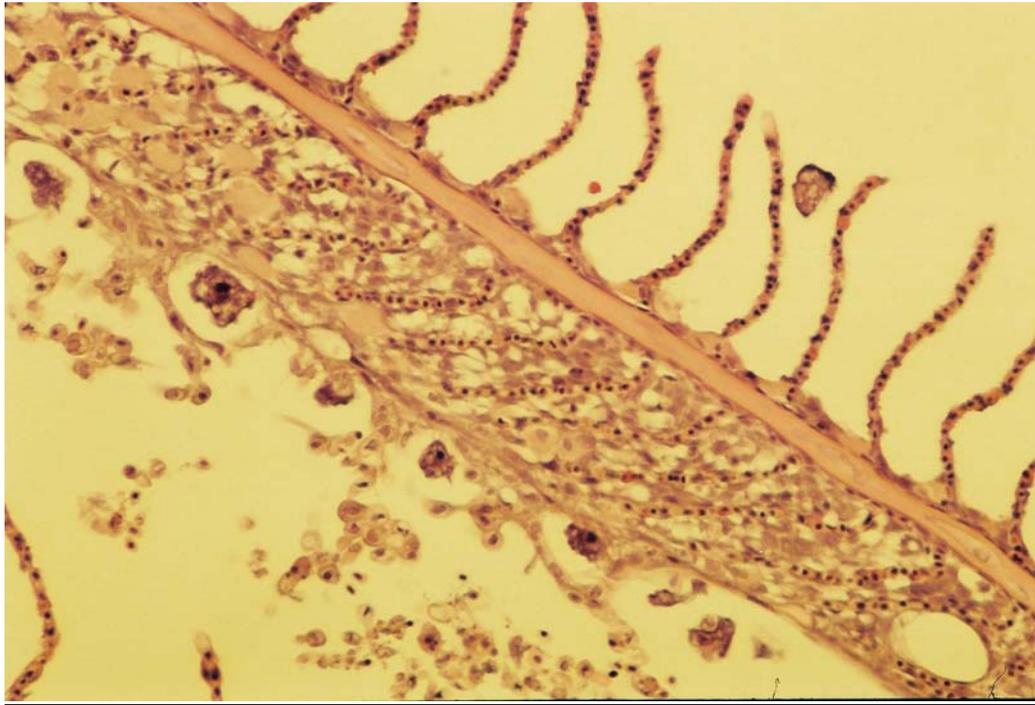


MODULE 12

FISH HISTOPATHOLOGY WORKSHOP



CASE NOTES

K.D.A. HUCHZERMEYER

Copyright reserved 2007

Normal tissues

S2656-97 – Rainbow trout

The spleen section illustrates the three major components of the fish spleen well.

- Ellipsoids carrying the central thick walled capillaries, surrounded by a sheath of reticular cells within a network of reticulin fibres. These in turn are surrounded by sinusoidal blood spaces, lined by endothelium, containing erythrocytes and phagocytic cells.
- The diffuse pulp made up of a network of phagocytic tissue in the form of sinusoids containing mainly lymphopoietic haemopoietic tissue and numerous erythrocytes.
- The melanomacrophage centres consisting of discrete cells within a capsule, usually close to blood vessels. The pigment appears darker in old and sick fish.

The gill section illustrates the fine structure of the primary and secondary lamellae.

Infectious Haematopoietic Necrosis (IHN)

337-96 Rainbow trout - Belgium

Focal areas of degeneration and necrosis of the inter-renal tissues are visible within the kidney section. The remaining inter-renal cells are abnormally large and evenly basophilic. Necrotic areas occur in distinct foci. The spleen appears severely congested. A large focus of dense basophilic cells is attached to the main blood vessels. Karyorhexis is present throughout the spleen. There are extensive deposits of melanin granules throughout the spleen. Well-demarcated large foci of sinusoidal congestion and distinct foci of haemorrhage are visible within the liver section. The condition is caused by a rhabdo-virus and although widespread in the USA and parts of Europe it does not occur in South Africa.

S104-98 – Rainbow trout

Extensive necrosis of the haematopoietic tissues of the renal interstitium. Karyolysis and karyorhexis is extensively visible within the necrotic areas. Renal tubular epithelium appears normal. Karyolysis and karyorhexis is evident within necrotic haematopoietic tissues in the spleen. Extensive necrosis and haemorrhage is evident throughout the spleen. Necrosis of the eosinophilic granular cells in the lamina propria, stratum compactum and stratum granulosum of the intestines is a distinguishing characteristic of IHN infection (no intestine on section).

Proliferative Kidney Disease (PKD)

S106-98 – Brown trout - Belgium

Clusters of monomorphic round cells can be seen interspersed in the renal interstitial tissues between tubules. An increase in fibrous tissue and fibroblasts and eosinophilic granular cells can be seen in areas of the kidney parenchyma. Large pale basophilic parasitic cells, termed PKX cells can be seen on the margins of the fibrous areas of the kidney section.

Bacterial Kidney Disease (BKD)

2504-95 B + C - Brown trout - Belgium

The interstitial tissue of the kidney shows a lack of red blood cells as well as a prominent macrophage response. The liver shows very distinct focally disseminate aggregates of macrophages scattered throughout the liver. In some but not all cases

the aggregates surround bile ducts and blood vessels. Some fibroplasia is evident around the bile ducts.

Focal aggregates of macrophages are also evident in the stratum spongiosum of the heart and on the pericardium. The macrophage aggregates can be considered pathognomic for BKD.

The condition was responsible for an ongoing low-grade mortality in trout fingerlings. Affected fish did not show the typically enlarged livers that are usually found with the condition. The causative agent, *Renibacterium salmoninarum*, is widespread in the USA and Europe but does not occur in South Africa.

Streptococcus D infection

788-93 Rainbow trout

A large focus of haemorrhage is present in one of the liver sections. Marked melanin deposition is present within the area of haemorrhage. A mild degree of vacuolar degeneration is evident in the hepatocytes of most of the other livers. A marked degree of interstitial oedema is present in all the kidney sections.

787-93

The area between the pyloric caecae shows a marked accumulation of mixed inflammatory cells. Peritoneal fat cells are virtually absent. Despite surrounding inflammatory cells the pancreatic acinar cells appear to be unaffected.

The second section shows foci of haemorrhage with melanin deposition in the livers. In all but one liver the hepatocytes are small and compact indicating a starvation status. A degree of round cell infiltration is evident around the blood vessels.

Aeromonas hydrophila septicaemia

2487-92 Rainbow trout

The liver shows a mild perivascular round-cell infiltration. Focal perivascular areas of degeneration and necrosis of hepatocytes are evident.

One area of the pancreas is surrounded by a roundcell inflammatory reaction. The acinar cells appear normal.

The spleens show increased melanomacrophage activity. One spleen is surrounded by a massive accumulation of roundcells and fibroblasts. Small chains of coccoid bacteria are visible within this area of inflammatory cells. The ovary is similarly infiltrated by a severe inflammatory cell reaction.

The kidney section shows an increase in melanin deposition within the melanomacrophage centres within the renal interstitium. Glomeruli and tubules appear intact and the haematopoietic tissue shows normal density

Tumours

5038- Rainbow trout

Renal tubular adenocarcinoma consisting of fairly poorly differentiated darkly basophilic tubular cells within a fibrous connective tissue matrix. Some normal renal tissue is visible around the edges of the tumour mass.

95160 - Rainbow trout

Renal tubular adenocarcinoma.

Plus minus 300 gram trout with large posterior abdominal swelling visible from the exterior. Post mortem examination revealed a large whitish lobulated tumour-like mass within the posterior kidney, attached to the abdominal wall on both sides.

Normal kidney tissue was present anterior and posterior to the lesion. The tumour weighed approximately 60 grams.

1-561 - Rainbow trout

Splenic tumour

The central area of the tumour appears to consist of red pulp tissue. This is surrounded by a distinct band of collagen fibres that separates the red pulp from a layer of white pulp that is in turn again surrounded by a connective tissue capsule covered by mesenterium. The golf ball size tumour was submitted by a farmer who had found it while slaughtering fish.

Hepatoma

1762 and 3221 – Rainbow trout

Liver tumour lesions vary from small areas of dark staining hepatocytes with melanin granule deposition and containing a rich vascular supply, distended blood channels and a fibrous connective tissue structure to highly undifferentiated tumour cell masses within a connective tissue matrix.

Thyroid adenoma

SF 1765-93 - Gelludichromis

This appears to be a thyroid adenoma, consisting of a well-differentiated mass of tubules each with an intact lumen. Other areas are less well differentiated with a loose fibrous tissue stroma and poorly defined tubules consisting of dense basophilic cells. Throughout the tumour mass karyorrhexis is visible within numerous of the tubular epithelial cells. Many tubules contain eosinophilic amorphous material.

A number of these fish developed a chronic condition with swollen abdomens and lethargy often lying still on the bottom of the aquarium. Post mortem examinations revealed ascites and a poorly differentiated gelatinous tissue mass in the thyroid region.

Sex reversed gonads

91630 – Rainbow trout

Seminiferous tubules as well as oocytes are visible within the same gonad. These gonads were derived from female trout that had been fed on a testosterone containing

diet for the first few weeks after hatching, a common practice in trout hatcheries in order to produce single sex all-female offspring the next generation.

Purpose: to produce only X chromosome containing sperm and hence guaranteed all female offspring.

Multivitamin deficiency

33454 – 33526 – Rainbow trout

Livers from various trout farms showing similar changes. Varying degrees of lipid liver degeneration are evident in all the livers. Section 33453A shows some interesting changes which appear to be associated with recovery of the livers. Focally disseminated well-demarcated areas of fat accumulation are interspersed amongst compact appearing hepatocytes in three of the liver sections. Some fibrosis around the blood vessels and bile ducts is evident. These fatty areas are most intense around the blood vessels. The liver section as a whole has a pock marked appearance.

Imported Danish trout ova were distributed to several farms. All of these farms except one started feeding a new feed available on the market. Mortalities commenced on all the farms (except the one which used a different feed) approximately 3 weeks after starting to use the new feed, despite initially attaining good growth rates. Fish presented with lemon yellow discoloration of the fins and ventral operculum. Mortalities slowed down as soon as feeding was discontinued. Feeding with a different brand of feed still caused mortalities to increase if given during the following 3 weeks. Low-grade mortalities continued for approximately 6 weeks and substantial losses occurred on all the affected farms. Two months after discontinuing feeding questionable feed most fish could again be fed normally. Analysis of the feed involved, indicated that the required vitamin premix had not been included.

Blood fluke (Sanguinicola) infection

S2902-98 - cultured Nile Tilapia broodfish, Zambia

Numerous parasite eggs visible in cross sections of gill capillaries. Longitudinal sections of adult worms visible blood vessels of the gill arch. Numerous Trichodina parasites are also visible on the gills as well as a few monogenean flukes lying between gill filaments.

S2901-98 - cultured Nile Tilapia broodfish, Zambia

Adult worms are visible within the larger renal blood vessels. Numerous fluke eggs can be seen blocking blood vessels within the kidney.

Epizootic Ulcerative Syndrome

07HD1325(2) Labeo species, Chobe River, Botswana

Numerous oomycete hyphae of *Aphanomyces invadans* can be seen within characteristic granulomas in the dermis and musculature associated with ulceration of the epidermis and dermis and necrosis of the underlying musculature. Hyphae can be observed within the blood vessels of the kidney. A strong fibroblast infiltration is present surrounding the invading hyphae.

Gill necrosis

2277 – Koi

An accumulation of necrotic epithelial cells between the secondary gill lamellae is evident. This would have been an acute condition arising from a severe gill irritant. There was no history available with this case.

790-93 – Koi

The condition indicates a chronic inflammatory condition of the gills with hyperplasia of the secondary lamellar epithelium, accumulation of cell debris between secondary lamellae and an increase in eosinophilic granular cells in the hyperplastic lamellar epithelium. Increased numbers of granular appearing mucus cells are usually clearly seen on wet mount preparations or such gills. The cause of this condition is usually multifactorial and includes chronic infestation with ectoparasites such as *Costia* and *Dactylogyrus*, as well as ammonia toxicity associated with high pH levels.

Gill parasites

Paramoeba

S1506 – Yellow tail

Parasites are visible lying between secondary lamellae of the gill. Infection is associated with sloughing of gill epithelial cells

Trichodina

5138 – Rainbow trout

Trichodina parasites visible on otherwise normal gills – incidental finding. Normal gills structure is well illustrated.

Costia

3221 – Yellow fish

The focal fusion of secondary lamellar epithelium is typical of infection with *Costia*. Numerous small comma-shaped parasites can be seen attached to the epithelial cells of the secondary lamellae.

Ichthyophthirius multifiliis

S151-97 – Koi

The typical holotricous ciliates are clearly visible embedded in the gill lamellar epithelium.

Ichthyophthirius

1587-93 - Goldfish

Several white-spot parasites are visible within the epithelium of the secondary lamellae of the gills.

Mixed gill parasites

2420-94 – Labeo spp

A mixed infection of the protozoan ciliate parasite, *Chilodonella*, and digenean fluke parasites are visible on the gill sections.

Pleistophora infection

328-94 - Angelfish

Spansporoblasts are visible in the abdominal musculature and peritoneal cavity with associated inflammatory reaction. This microsporidian parasite causes loss of colouration and abdominal swelling in affected fish.

Pleistophora hyphobryconis

1201-94 – Neon tetra, red eyed tetra

The typical pansporoblasts can be seen encapsulated in the vertebral body on the section of the neon tetra. The red-eyed tetra section shows pansporoblasts in the nervous tissue below the vertebra. Pleistophora is the cause of neon tetra disease.

Piscine Mycobacteriosis

139-93 – Moenkhausia tetra

Multiple, granulomas visible in the dermis causing scale protrusion, in the connective tissue, around the mouth, around the pseudobranch, in the liver, kidneys, gonad and peritoneum. Each granuloma consists of a necrotic centre containing numerous bacteria. The central area is surrounded by a distinct connective tissue capsule consisting mainly of densely packed fibroblasts. The granulomas are clearly demarcated and often occur in clusters surrounded by a joint connective tissue capsule. This represents a chronic case.

2015-93 - Guppy

The granulomas are larger and there are fewer than in the previous case. The granulomas are surrounded by a less extensive connective tissue capsule although demarcation is still clearly discernible. In some areas the central necrotic area of one or more granulomas is surrounded by a larger area of loose connective tissue containing large amounts of melanin. Granulomas in the liver are associated with fairly extensive areas of degeneration and necrosis. This appears to be a more acute case.

Hole in the head disease / mycobacteriosis

S1030-97 - Oscar

Multiple typical mycobacterial granulomas are visible primarily in the spleen but also within the melanomacrophage centres in the liver as well as in the stratum spongiosum of the heart. A cross section of a typical “hole in the head” lesion reveals extensive inflammatory response with multiple granuloma formation and melanin deposition.

This common condition has variously been attributed to infection with the parasite Hexamita, a dietary deficiency of Vitamin C and both. It appears however to be a manifestation of piscine mycobacteriosis, where small bite wounds to the head region, caused by intraspecies aggression and mating behaviour, become infected by mycobacteria.

Solar Dermatitis

2014-93 – Koi

The epidermis has taken on a convoluted appearance in areas. In some areas of the epidermis a distinct increase in inflammatory cells is visible. The condition occurs along the backs of red coloured fish kept in shallow ponds – The thickening and

convolution of the epidermis is visible to the naked eye and results in a loss of intensity of the red colour.

Carp Pox

2278-93 – Koi

The lesion consists of a mass of dense epidermal cells arranged in a whorl-like appearance. Macroscopically, the lesions appear as white epidermal plaques although they may be pedunculated in the mouth region. The condition is caused by a Herpes virus. Lesions regress spontaneously when the immune status of the fish improves.

634-93 - Koi

The transition of normal epidermis to the pox lesions is clearly visible. In contrast to the normal skin, the pox lesion is devoid of mucus cells

Lymphocystis

2276-93 – Glass fish

The severely enlarged fibroblasts are visible within the epidermis. There is minimal connective tissue reaction to the lesion. These lesions are visible to the naked eye. The causative agent is an Irido virus. Lesions seldom regress and unless they are very extensive exert little harmful effect on the fish.

Adenoviral hepatitis

S620.07 Nile crocodile

Extensive vacuolar degeneration as well as necrosis of hepatocytes in all of the liver sections. Large pale basophilic viral inclusion bodies can be observed in one liver section.