

## **Veterinary Clinical Pathology**

### **Australian Animal Pathology Standards Program (AAPSP) 2013 Roadshow.**

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- **Blood levels of acute phase proteins (APP)** are often altered in acute degenerative/inflammatory conditions, although some can be increased in other disease situations (they modulate immunity):
  - **Fibrinogen (FNG)** is implicated in coagulation and wounds healing. Higher concentration of FNG determines erythrocytes agglomeration, fast deposition, and increase of their sedimentation velocity. In inflammatory conditions in fish, it is possible to see increases by 1-10x.
  - **C-reactive protein (CRP)** is the most important APP. CRP is a  $\alpha$ -globulin characteristic to vertebrates, including teleost fishes.
  - **Haptoglobin (HGb)** inhibits bacterial development by binding iron, depriving bacteria of this element. Thus HGb increases in cases of bacterial inflammatory conditions.
  - **Serum amyloid A (SAA)** is useful in fishes and they can increase in inflammatory conditions.
- **Erythropoiesis** occurs normally in the kidney or spleen in fishes (not bone marrow), but “extramedullary” haematopoiesis can also occur in the liver and even intravascular in fish.
  - The **lifespan of erythrocytes** in fish as a group is highly variable, ranging from 80-500 days.
  - In regenerative anaemia, there may be:
    - Anisocytosis with the polychromatophilic (immature) cells being smaller than mature cells (i.e. have lower MCV and RDW).
- All **haemotropic protozoa** have an asexual phase of multiplication characterized by trophozoites (Greek for "animal that feeds"): this is the form that commonly causes most effect on the host (directly or indirectly)
  - Most are transmitted by biting/blood sucking invertebrates, many of which contribute to the sexual phase of the life cycle. Aquatic animals may have oral transmission.
  - An example of an haemotropic protozoa is the *Trypanoplasma* in fish and they possess two flagella.
  - Apicomplexa (syn. Sporozoa) → Coccidia → Adeleida (haemogregarines) → *Babesioma*.
  - Apicomplexa (syn. Sporozoa) → Hematozoa → Piroplasmida (Piroplasms) → *Mesnilium*.



- **Comparative leukocyte morphology** (lower Orders) – the **five cell ‘rule’ for identification in all species**
  - Heterophil (equivalent to neutrophil), eosinophil, basophil, lymphocyte and monocyte are the five main leukocytes BUT variations may exist
  - Similar reasons for leukocytosis and leukopaenia occur
  - Monocytes may contribute significantly (major phagocytic cell in the fish and important in many reptiles). Can you get a left shift for monocytes? Granulocytes commonly mononuclear but not always!
  - Fish – the main granulocyte is called neutrophil (nuclei are rarely lobed) and stress and inflammation can cause increases.
    - In instances where it is impossible to differentiate between heterophils and eosinophils, they may be called acidophils.
  - Thrombocytes may be confused with small lymphocytes in some species.
  - Toxic changes to heterophils is characterised by basophilia, vacuolation and loss of granules.
- **Leukaemias in fish**
  - Lymphosarcoma has been documented in pike.
    - This is an epizootic condition in northern pike and muskellunge in certain regions (i.e. Lake Ontario). The lesion develops as a purple ulcerative cutaneous mass on the head, mouth and flank with invasion into the adjacent muscle and metastasis to spleen, liver and kidney. A type-C Retrovirus is believed to be the cause of this disease.
  - Plasmacytoid leukemia (marine anaemia) of Chinook salmon
    - Plasmacytoid leukemia virus is observed in farmed raised Chinook salmon (Experimentally in Sockeye, Coho and Atlantic salmon). It is believed to be caused by a retrovirus (Salmon leukaemia virus). Affected fish become lethargic, have dark skin, pale gills (anaemia), and exophthalmus. The spleen, kidney, and retrobulbar tissues are enlarged and mottled. Petechial haemorrhage of the serosa is common. Infiltration of the liver, spleen, and kidneys with plasmablastic cells is noted. Plasmablast have a slightly lobulated nucleus with a central nucleoli.

