

## Life in the Red Zone - Haemolytic Anaemia in Animals

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### Introduction

Haemolytic anaemia is lysis of RBC either intravascular or extravascular space. Animals with these diseases think their own RBC as a threat and destroy them. This causes the drastic reduce in the RBC count. This condition deprives the levels of oxygen and will affect the overall health of animals. There are several causes of haemolytic anaemia among them the most common cause in dog is immune mediated haemolytic anaemia which contributes around 60% - 75%. Let's discuss in detail about the haemolytic anaemia.

### Etiology

- 1) **Congenital haemolytic anaemia:** RBC contains neither nucleus nor mitochondria but still require energy in the form of ATP for the maintenance of shape of cell, deformity etc. erythrocytes depend on glycolysis for the ATP. In such cases there is any deficiency in the enzymes involved in glycolysis can cause significant effect on RBC. On the other hand, a very rare inherited metabolic disorder where there is a deficient of enzyme uroporphyrinogen III synthase which causes the excessive accumulation of porphyrins in tooth, liver, bone marrow, skin etc. This porphyrin is photosensitive, and it causes the appearance of teeth as pink tooth and bone as osteohaemochromatosis.
- 2) **Acquired haemolytic anaemia.**
  - a) **Microangiopathic haemolysis:** It is an intravascular haemolysis occur due to excessive turbulence of blood in circulation which in turn causes damage to RBC. In animals it can be seen in heartworm disease, vascular tumours, disseminated intravascular coagulation, haemolytic uremic syndrome, equine infectious anaemia, African swine fever etc.
  - b) **Metabolic haemolytic anaemia:** Hypophosphatemia that is low phosphorus in blood causes post parturient haemoglobinuria in ruminants. It occurs during 1<sup>st</sup> month of parturition. This phosphorus deficiency causes the reduction of glucose

utilization that will decrease the ATP synthesis further causes the loss of integrity of RBC which further leads to breakdown of RBC.

**c) Toxins and drugs causing haemolytic anaemia:**

**Copper toxicity** – In RBC cupric ions interact with the sulphur group of glutathione which causes decreased concentration of glutathione simultaneously ferrous ions in RBC replaced by cupric ions which leads to formation of methaemoglobin that ultimately causes haemolysis.

**Phenothiazine toxicity** – Lysolecithin which is present normally in horse body will get activated by phenothiazine sulfoxide that ultimately results in haemolysis.

Other metals and non-metals such as arsenic, lead, bismuth etc, other drugs such as sulphonamide and aspirin cause haemolysis.

**d) Infectious haemolytic anaemia**

Many infectious diseases such as bacterial, viral, protozoal etc causing haemolysis in animals.

- **Bacterial** – Leptospira interrogans, Clostridium haemolyticum, Clostridium perfringes type a, haemolytic streptococcal and staphylococcal infection, Haemobartonella, myoplasma etc.
- **Viral** - Equine infectious anaemia virus, Feline leukaemia virus, equine infectious anaemia, infectious mononucleosis etc.
- **Protozoal** – Babesia, Theileria, anaplasma, ehrlichia, Trypanosoma, Sarcocystis cruzi, epyerthrozoones etc

**3) Immune mediated haemolytic anaemia (IMAH)**

It is one of the most common types of haemolytic anaemia in animals especially in dogs this can be occur under any special circumstance which cause the destruction of RBCs and results in decreased total amount of RBC. IMAH may be primary or secondary. Primary is idiopathic i.e the unknow cause of origin whereas the secondary is due to infectious causes, neoplasia, drugs, intrinsic RBC defects etc.

Normally lifespan of RBCs varies from species to species, aged RBCs will get destroyed by the mononuclear phagocyte system whereas in case of IMAH is a pathological process causing the destruction of premature RBC and this IMAH comes under type II hypersensitivity reaction. In case of domestic animals of the newborn animals are more prone

to iso immune haemolytic anaemia or neonatal isoerythrolysis this is caused by transfer of maternal iso antibodies to the newborn through colostrum.

### **Clinical findings**

- Pale mucous membranes
- Dull and depressed
- Exercise intolerance
- Lethargy
- Anorexia
- Tachypnoea
- tachycardia
- In later stages of life intensity of heart sound increased,
- systolic murmur
- laboured breathing etc
- Other signs may include jaundice, haemoglobinuria, haematuria, oedema etc.

### **Diagnosis**

- For evaluation of animals with haemolytic anaemia careful examination of blood is necessary, based on the morphological abnormalities we can be able to diagnose the particular cause of disease,
- The sample which is collected should be first checked for autoagglutination by placing the glass slide at 4 c by adding a drop of blood on it we can be able to appreciate the agglutination when immunoglobulins bind to the RBC this can be called as mother nature coombs test.
- As a simple test we can find the haemolytic anaemia by taking one drop of blood on a glass slide and one drop of normal saline there will be a marked agglutination noticed in haemolytic anaemia.
- Haemolytic anaemia not only associated with immune mediated destruction but also cause due to any other causes like drug, infectious agents, neoplasia etc. rule out the cause and treat appropriately.

### **Treatment**

The first line of medication is steroids that quickly suppress the attack of immune cells on the RBCs, rather than steroids other drugs can also suppress the immune system like cyclosporine.

Blood transfusion is one of the most important treatments for severe anaemia patients, patients who didn't exposed to transmission previously can have low risk of haemolysis. The most fatal complication in this disease is clump or thrombi formation this may cause the blockage of blood flow. It is difficult to remove but in recent trends new medications are being available such as enoxaparin sodium under the trade name of clexane.

