Anemia in cats

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Anemia is one of the most common clinical findings encountered in sick cats though rather be an underlying disease process than a primary disease itself.

By definition “anemia” implies a lower than normal of packed cell volume (PCV) or blood hemoglobin concentration resulted in a reduction in oxygen-carrying capacity of the blood to tissues.

Compare to dogs, cats are more sensitive to anemia. This is because of their lower blood volume of 40 - 67 ml per kg (90 ml per kg in dog) and the short life span of RBC of 70 days (120 days in dog). However, in many instances, anemia in cats is understated and can be subdued that cats can overcome with time until weakness is pronounced. The PCV at which clinical signs develop varies according to the causes and chronicity of anemia. Cats with chronic anemia can tolerate a low PCV much better than those with acute anemia.

Adult healthy cats will produce RBC of 2.5 billion per kg per day. Approximately 1.3 % of RBC are removed each day from circulation. Thus, any disease processes affecting onto bone marrow will cause rapid development of anemia. Cat with complete failure of bone marrow function would have a daily reduction of RBC count by approximately 0.12 million per µl or a decreased PCV of 0.5 %.

**Figure 1** Classification of severity of anemia in cat compared to dog

<table>
<thead>
<tr>
<th>Severity</th>
<th>Cat (PCV %)</th>
<th>Dog (PCV %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mild</td>
<td>20 - 26</td>
<td>30 - 37</td>
</tr>
<tr>
<td>moderate</td>
<td>14 - 19</td>
<td>20 - 29</td>
</tr>
<tr>
<td>severe</td>
<td>10 - 13</td>
<td>13 - 19</td>
</tr>
<tr>
<td>very severe</td>
<td>&lt; 10</td>
<td>&lt; 13</td>
</tr>
</tbody>
</table>

When anemia is detected whether or not the cats are with signs of weakness, lethargy, pallor and anorexia, peripheral blood smears should be well evaluated for non-regenerative or regenerative type of anemia also morphology of the red blood cells.
There are two forms of feline reticulocytes; punctate and aggregate forms. The punctate reticulocytes live 10-12 days, hence they can accumulate in large numbers in blood despite the bone marrow is not producing them as rapidly as their numbers suggest. Therefore, their presence in the blood does not indicate active bone marrow so called non-regenerative anemia. On the contrary, aggregate reticulocytes exist in the blood 1-2 days prior to turning to mature RBC (like dog). Thus, continue seeing them in blood indicates responsive bone marrow or regenerative anemia. The peak reticulocyte response is at 1-2 weeks after onset of anemia.

Regenerative anemia is characterized by absolute reticulocyte count over 50,000/µl in correlation with polychromatophilic RBC and non-regenerative anemia is characterized by absolute reticulocyte count less than 50,000 per µl. Normally cats can have aggregate reticulocyte count 0 - 30,000 per µl and punctate reticulocyte count of much higher.

Based on bone marrow responsiveness, the causes of anemia can be grouped into two.

1. Causes for non-regenerative anemia

   1.1 Primary bone marrow disease

   Feline leukemia virus (FeLV) subtype C induced anemia is the most common cause of pure red cell aplasia due to primary viral infection of hematopoietic stem cell and viral infection of stromal cells in the bone marrow. Thus, FeLV non-regenerative anemia is oftenly seen in association with thrombocytopenia alone or, in some cases, thrombocytopenia and macro - thrombocytosis. Feline immunodeficiency virus (FIV) also causes non-regenerative anemia and less frequently thrombocytopenia by unknown mechanism. The other causes of bone marrow suppression are idiopathic aplastic anemia, neoplasia (myeloproliferative disease, lymphoma) and myelofibrosis.

   1.2 Inadequate erythropoiesis

   Secondary bone marrow failure is considered to be the most common cause of anemia in cats. The majority of these extra marrow diseases are chronic renal failure (inadequate erythropoietin), endocrinopathies and chronic inflammatory diseases (chronic liver disease, feline infectious peritonitis virus infection, iron deficiency in kitten). Three factors are involved in the development of non-regenerative anemia in chronic inflammatory diseases which are shortened survival RBC, decreased iron availability and decreased bone marrow response to erythropoietin.

2. Causes for regenerative anemia

   2.1 Hemolytic disease

   Secondary destruction of peripheral RBCs is the most common cause of hemolytic anemia but somehow the disease process is gradual and periodic.

   The most important cause of hemolytic anemia is co-infection of FeLV subtype A /FIV and immune-mediated disease caused by
Mycoplasma haemofelis (Haemobartonella felis).
RBC parasites i.e Mycoplasma haemofelis, Babesia felis and Cytauxzoon felis can be primary cause of acute, subacute or chronic immune-mediated hemolytic anemia.

Another causes of hemolytic anemia are neonatal isoerythrolysis, oxidant - induced RBC injury or denaturation of hemoglobin (i.e acetaminophen, DL-methionine) and hypophosphatemia associated with diabetes mellitus.

Primary or idiopathic autoimmune hemolytic anemia (IMHA) previously suspected to be rare in cat has been currently suggested to be more common. The anemia can be mild to life - threatening due to active hemolysis. In this regard, the demonstration of autoagglutination of RBC in EDTA - anticoagulated blood, in a tube or on a warmed glass slide, is acceptedly validated for the diagnosis in substitution of Coomb’s testing. Regardless of the cause, diagnosis of immune - mediated hemolysis is important since it requires the use of immunosuppressive therapy.

2.2 Blood loss
Anemia due to hemorrhage either inherited or acquired is not common in cats compared to dogs. Inherited coagulopathies such as hemophilia A and B, vitamin K - dependent coagulopathy have been reported in various cat breeds and Devon rex respectively. The possible causes of acquired hemorrhagic anemia are aspirin and other NSAIDS toxicity, anticoagulant rodenticides, heparin and warfarin therapy in feline aortic thromboembolism (FATE), neoplasia, disseminated intravascular coagulopathy(DIC), secondary thrombocytopenia in renal failure and vasculopathies. Diagnosis of blood loss anemia is often helped by history of trauma or bleeding. If the bleeding is not obviously seen, then plasma protein is helpful. In external blood loss, the loss of plasma protein with blood causes a low plasma protein while in internal blood loss, the plasma protein is retained in the body so hypoproteinemia is not expected.

References

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