Anemia in Camelids

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Anemia in Camelids

Jane Woodrow

I. Definition of anemia

- Decrease in red cell mass measured by reduction in RBC numbers, PCV and hemoglobin levels
- Decreases the oxygen carrying capacity

II. Causes

- Blood loss: Bone marrow is normal and will respond with erythropoiesis
  - External: Trauma, artery rupture, GI parasites, GI ulcers, GI neoplasia, renal loss, ectoparasites, coagulopathies
  - Internal: Trauma, artery rupture, coagulopathy
- Hemolysis: Bone marrow is normal and will respond with erythropoiesis
  - Intravascular hemolysis
    - Red blood cells lyse in circulation -> Release hemoglobin into circulation
    - Discolors the plasma -> Hemoglobinemia
    - If at a high level, hemoglobin is filtered through the kidneys -> Hemoglobinuria
    - Usually extravascular hemolysis occurring as well
  - Causes of intravascular hemolysis: Immune mediated, Erythoparasites (Babesia), other organisms (Lepto, Clostridium), Oxidant injury/Heinz Body anemia (copper, red maple leaf), Severe hypophosphatemia, end stage renal or liver failure
  - Extravascular Hemolysis
    - Red Blood cells are phagocytized by macrophage in the liver, spleen, or bone marrow
    - No hemoglobin is released into circulation -> NO hemoglobinemia or -uria
    - This can happen alone or in combination with intravascular hemolysis
  - Causes of Extravascular hemolysis: Autoimmune, Erythoparasites, Other organisms
  - Inadequate erythrocyte production
    - Anemia of chronic disease or chronic inflammation
    - Nutritional deficiency (iron, B12, Folic acid)
    - Aplastic anemia, bone marrow failure
    - Inadequate erythropoietin (chronic renal disease)

III. Diagnostics

- Color of whole blood, plasma and urine
- PCV: Normal between 20% and 30%
- RBC count: Count less than 10x10^6 cells/ul as a break point for anemia
- Hemoglobin: Concentration less than 10g/dL as a break point for anemia
- FAMACHA
• Hemogram
  o Mean Corpuscular Volume (MCV)
    ▪ A reflection of mean erythrocyte size
    ▪ *Increased* MCV (macrocytosis) indicates regeneration, larger RBCs
    ▪ *Decreased* MCV (microcytosis), can be result of iron deficiency
    ▪ Not used in camelids because the elliptical shape has an inconsistent effect on automated analysis
  o Mean Corpuscular Hemoglobin (MCH)
    ▪ An estimation of the amount of hemoglobin in the blood per erythrocyte
    ▪ *Increased* MCH may indicate the presence of reticulocytes or hemolysis
    ▪ *Decreased* MCH may be due to iron deficiency
  o Mean Corpuscular Hemoglobin Concentration (MCHC)
    ▪ Measure of the concentration of hemoglobin in a given volume of packed red blood cells
    ▪ *Increased* MCHC may be due to hemolysis (in vitro or in vivo)
    ▪ *Decreased* MCHC may be due to iron deficiency
  o Basophilic stippling
    ▪ Blue granules are residual DNA
    ▪ Can be normal with regeneration
    ▪ If no signs of regeneration, may indicate lead poisoning
  o Heinz Bodies
    ▪ Due to oxidative stress to RBCs causing denaturation of hemoglobin that then precipitates as aggregates
    ▪ Methylene blue staining
    ▪ Think of onions, brassica plants, red maple leaves, copper

• Chemistry: Renal and liver enzymes, Albumin level, Phosphorus
• Iron profile of iron deficiency

<table>
<thead>
<tr>
<th>Serum Iron</th>
<th>Decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIBC</td>
<td>Increased</td>
</tr>
<tr>
<td>% Iron Saturation</td>
<td>Decreased</td>
</tr>
<tr>
<td>Bone Marrow Iron</td>
<td>Decreased</td>
</tr>
<tr>
<td>Bone Marrow Histology</td>
<td>Can appear hypercellular; can be increased numbers of metarubricytes</td>
</tr>
<tr>
<td>Ferritin</td>
<td>Decreased</td>
</tr>
</tbody>
</table>

IV. Most common in the hospital
Parasites
Poor body condition
Not necessarily common, but always R/O Mycoplasma haemolamae as a confounding factor

V. Clinical Signs
Variable signs, dependent on etiology
Primary clinical sign is mucous membrane pallor
Underweight, recent weight loss
Dyspnea, depression, +/- icterus, hemoglobinemia/-uria, methemoglobinemia/-uria, fever

VI. Treatment
Based on the cause
Blood transfusion can be life saving
Blood volume is about 7% of their body weight
DO NOT take more than 20% of the blood donor’s volume, or about 10-15ml of blood/kg of body weight
Transfusion volume (L)= blood volume * (PCV_{desired}-PCV_{actual})/PCV_{donor}
2-3mls/kg of whole blood increases PCV by 1%
Proper deworming
Proper nutrition, TPN or PPN
Iron, B12 supplements

References