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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, Erythroparasites (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, Erythroparasites, 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 10×10^6 cells/ul as a break point for anemia
- Hemoglobin: Concentration less than 10g/dL as a break point for anemia
- FAMACHA

- Hemogram
 - 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
 - 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
 - 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
 - Basophilic stippling
 - Blue granules are residual DNA
 - Can be normal with regeneration
 - If no signs of regeneration, may indicate lead poisoning
 - 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

Serum Iron	Decreased
TIBC	Increased
% Iron Saturation	Decreased
Bone Marrow Iron	Decreased
Bone Marrow Histology	Can appear hypercellular; can be increased numbers of metarubricytes
Ferritin	Decreased

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

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