

Anemia in the Dog

Anemia is defined as a reduced number of red blood cells or hemoglobin, or both. It is a symptom, not a specific disease. It is a significant finding because red blood cells, or erythrocytes, are needed to transport oxygen to the tissues. When the total numbers of red blood cells are reduced, there can be insufficient oxygen delivery to vital organs, resulting in poor function or even long term damage.

Red blood cells are produced in the bone marrow, or hollow core of the bones, by specialized cells. Before being released into circulation, the precursor cells must undergo a specific sequence of steps to reach full maturity. Once released by the bone marrow, the red blood cell lives about 120 days in dogs. Interestingly, the red blood cell lives much shorter in cats, about 60-70 days.

Prevalence

Anemia is probably the most frequent laboratory abnormality involving the blood cells. It is a relatively common finding in dogs of all ages and breeds.

Symptoms

The most easily observed sign of anemia is a loss of the normal pink color of the gingiva (gums). Anemic dogs also have little endurance so they seem very weak or tired. If severe, anemia can cause fainting with exercise. Pale gingiva and lethargy make us want to perform some tests on blood to document anemia. Sometimes, anemia can cause the heart rate to elevate and a heart murmur to develop. If the anemia is caused by red blood cell destruction, the skin may have a yellow tint (jaundice or icterus). When certain cancers are the underlying cause of anemia, the lymph nodes, spleen, intestines, or liver might be enlarged.



normal gum color



pale gum color



yellow gum color

Severity of symptoms depend on severity of anemia and how quickly it developed. Dogs with anemias that develop over a long period of time may show milder symptoms than those who develop anemia quickly.

Diagnosis and Evaluation

Initial Tests

The initial tests performed on blood are needed to determine the severity of the anemia and the ability of the bone marrow to respond to the anemia. The most common test for anemia is the **packed cell volume (PCV)**; it is also called the **hematocrit (HCT)**. A blood sample is placed in a centrifuge to separate the red blood cells from the plasma (the liquid part of the blood). This takes only a few drops of blood and can be performed in about five minutes. The normal PCV of the dog is 35%-50%; anemia is defined as a PCV below 30-35%.

A more complete assessment of the red blood cells can be calculated by sophisticated lab equipment. These include hemoglobin, as well as the diameter and volume of individual red blood cells. Others tests to determine anemia include the **red blood cell count (RBC)** and the **hemoglobin count (Hb)**. If these are below $5.5 \times 10^6/\text{mm}^3$ or 12 g/dl, respectively, the dog is anemic.

Responsiveness of the bone marrow to the anemia is evaluated by the reticulocyte count. The reticulocyte is a young adult red blood cell. It has not quite completed all of the steps to maturation. A rough index of the reticulocyte numbers can be gleaned by examining a blood smear. The precise count is easy to determine by mixing a small amount of blood with a special stain and then re-examining the blood smear. Reticulocyte count must be done by hand in order to be accurate – machine counts are not reliable. It is generally preferable to have a reticulocyte count that reflects the ability of the bone marrow to respond to the anemia; this is called a “regenerative anemia.” When the marrow appears unresponsive based on reticulocyte numbers, this is called a “non-regenerative anemia.”

Additional Tests

A careful study of the blood smear is important to look for parasites that might be causing red blood cell destruction and abnormal cells that could indicate leukemia. A test to look for immune-system destruction of red blood cells, called “autoagglutination,” may also be done in some cases.

A bone marrow biopsy or aspirate is a procedure that recovers a small sample of cells from the bone marrow for evaluation by the veterinary pathologist. Studying these cells can give valuable information about the cause of some anemias and the condition of the bone marrow. Sometimes it is prudent to give the bone marrow up to a week or more to respond to the anemia if there is a suspicion of recent blood loss. When this is the case, a bone marrow aspirate may be temporarily postponed. In some situations, it is clear that the anemia is long-standing and a bone marrow evaluation should be done as soon as possible.

A biochemical profile and urinalysis are other important tests for anemic dogs. These tests evaluate organ functions and electrolyte levels. They will often provide important information about the total health of the dog, as well as possible causes of anemia. A fecal exam is also important for identification of parasites in the intestinal tract that might be causing blood loss.

Causes/Transmission

There are many diseases that cause anemia. These are grouped into 1) diseases that cause blood loss, 2) diseases that cause hemolysis (red blood cell breakdown), and 3) diseases that decrease the production of red blood cells (bone marrow disease).

The main causes of blood loss in dogs include:

- Trauma or injury that severs blood vessels or internal organs
- Parasites such as fleas, ticks, and hookworms
- Tumors of the intestinal tract, kidneys, and urinary bladder, or other internal organs such as the liver or spleen
- Diseases that prevent proper clotting of blood

The main causes of hemolysis in dogs include:

- Autoimmune disease
- Chemicals or toxins – onions, garlic, swallowing objects containing zinc or copper, and others.
- Neoplasia (cancer)
- Blood parasites (rare)

The main causes of bone marrow suppression in dogs include:

- Any severe, chronic disease
- Very poor nutrition or nutritional imbalances
- Hormonal (endocrine) diseases
- Autoimmune disease
- Chemicals or toxins
- Neoplasia (cancer)

It is noteworthy that while iron deficiency anemia is a common finding in people, especially women, it is uncommon in dogs and only occurs secondary to some form of chronic blood loss, most often from the

gastrointestinal tract. It is occasionally seen in puppies with severe hookworm infections or that are being fed very poor diets.

Treatment

If your dog's anemia is so severe that it is life threatening, a blood transfusion is needed. This may be performed immediately after a blood sample is taken for testing. The main purpose of a blood transfusion is to stabilize the dog long enough that a determination of the cause of the anemia can be made.

Further treatment will be determined once the underlying disease has been diagnosed.

Prognosis

The prognosis is dependent upon identification of the underlying cause and a positive response to appropriate therapy. Sometimes, the prognosis cannot be given for a few days because all of the diagnostic tests may not be completed.

References:

1. Sharon Fooshee - Home Care Handouts
2. Ernest Ward – Lifelearn Handouts
3. Wendy Blount – Practical Vet Med
4. Celeste Clements - VetCentric