Blood loss

Common causes of blood loss include: trauma, gastrointestinal ulceration, thrombocytopenia, coagulopathy, thrombocytopathia, neoplasia and parasites. Identifying blood loss is usually not a diagnostic challenge when an animal is anaemic. However, low-grade blood loss especially into the gastrointestinal tract and, less commonly, into the urinary tract may go unnoticed and if tissue stores of iron are not depleted, potentially high reticulocyte counts will be seen and the haematocrit is maintained within reference interval limits. In these cases, abnormalities in red blood cell morphology such as microcytosis and hypochromasia may be present along with the reticulocytosis prior to the development of anaemia.

Haemolytic disease

Haemolytic destruction of red blood cells can be secondary to immune-mediated disease, mechanical or oxidative injury to the red blood cells, metabolic disease that results in increased red blood cell fragility, infectious causes including some vector-borne diseases, hereditary conditions that shorten red blood cell life span, and other miscellaneous conditions. Morphologic abnormalities of the red blood cells accompany many of these diseases. Microscopic review of the blood film could reveal he presence of spherocytes in immune-mediated haemolytic disease, Heinz bodies secondary to oxidative injury, schistocytes secondary to microangiopathic conditions including heartworm disease and hemangiosarcoma, acanthocytes in liver and splenic disease, etc. Red blood cell inclusions, such as babesia and feline haemotropic mycoplasma, may also be identified on microscopic review of a blood smear.

Absolute erythrocytosis

When a reticulocytosis is present and the RBC and/or a hematocrit are at the high end of the reference intervals or just above the upper reference interval limits, endocrine causes should be investigated. Hyperthyroidism, acromegaly and hyperadrenocorticism should be considered. Androgens can also stimulate erythropoeisis; therefore, a condition resulting in an excess of androgens could potentially cause an absolute erythrocytosis and reticulocytosis.

When a reticulocytosis is present and the RBC and haematocrit are significantly increased above the reference intervals, secondary causes of an absolute polycythemia should first be considered. Appropriate causes of polycythemia result from systemic hypoxia. Causes include right-to-left heart defects, pulmonary diseases, upper airway obstruction, and very high altitude. Inappropriate causes of secondary polycythemia can result from renal conditions including vascular defects and tumors or other EPO-producing tumors. If secondary causes of polycythemia are eliminated, then primary polycythemia is diagnosed and polycythemia vera is most likely.

Interpretive Guidelines

In the dog, a reticulocyte count > 110.000/µl of blood is considered evidence of bone marrow response to an increased peripheral demand. Depending on the degree of anaemia, a reticulocyte count < 110.000/µl may indicate an inadequate bone marrow response. Serial monitoring of the blood count and reticulocyte count may be useful to evaluate bone marrow responsiveness over time.

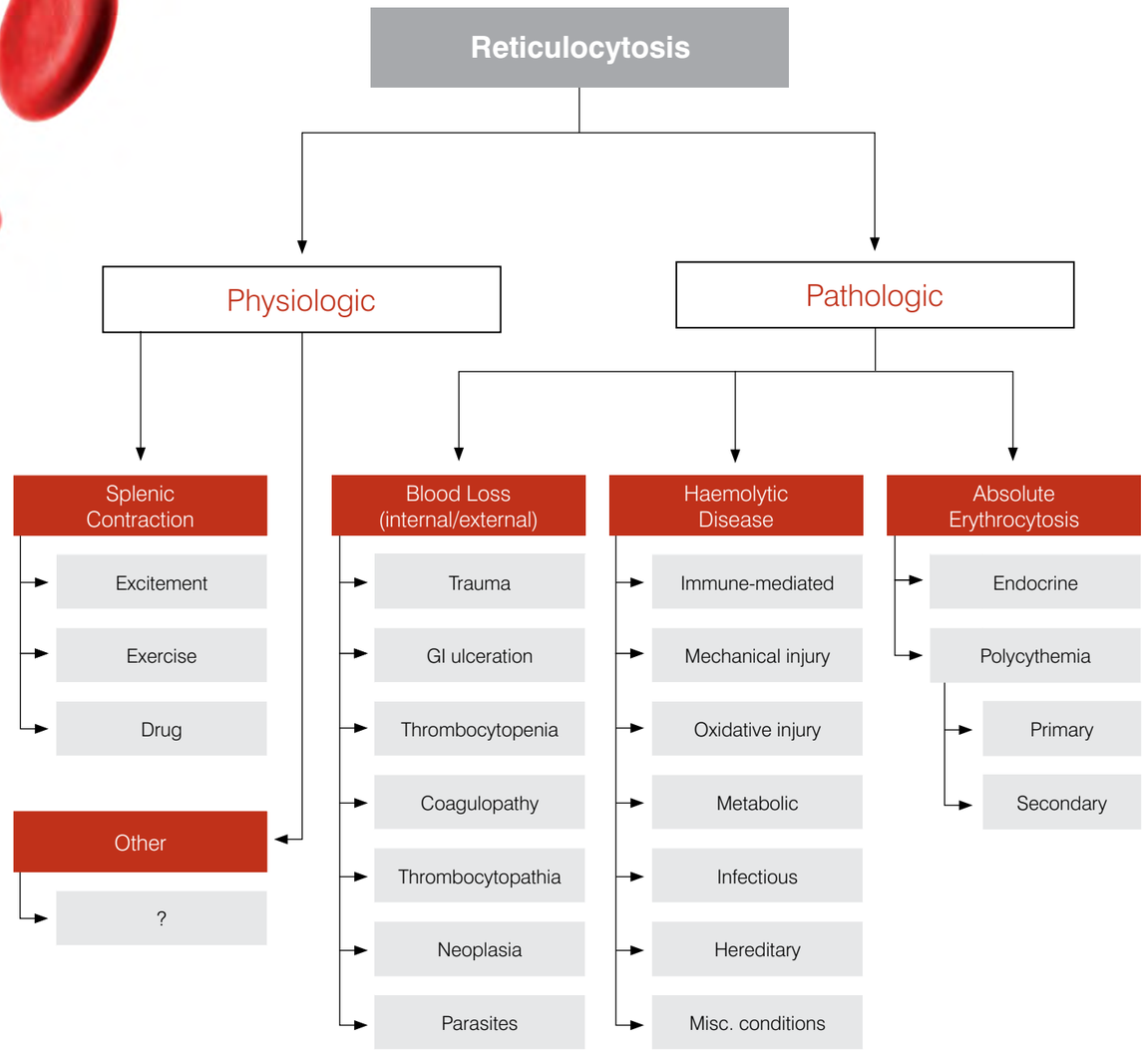
In nonanaemic dogs, a reticulocyte count > 110.000/µl of blood may be a transient physiologic response or evidence of bone marrow response to an increased peripheral demand. A persistent reticulocyte count > 110.000/µl may indicate occult blood loss, underlying haemolytic disease or disorder that causes an absolute erythrocytosis. Serial monitoring of the erythrogram and reticulocyte count may help determine the significance of this finding.

In the cat, a reticulocyte count > 50.000/µl of blood is considered evidence of bone marrow response to an increased peripheral demand. Depending on the degree of anaemia, a reticulocyte count < 50.000/µl may indicate an inadequate bone marrow response. Serial monitoring of the blood count and reticulocyte count may be useful to evaluate bone marrow responsiveness over time.

In nonanaemic cats, a reticulocyte count > 50.000/µl of blood may be a transient physiologic response or evidence of bone marrow response to an increased peripheral demand. A persistent reticulocyte count > 50.000/µ may indicate occult blood loss, underlying haemolytic disease or disorder that causes an absolute erythrocytosis. Serial monitoring of the blood count and reticulocyte count may help determine the significance of this finding.

Causes of Reticulocytosis

This diagnostic algorithm provides an overview of the causes of reticulocytosis. There are two broad causes of reticulocytosis: physiologic and pathologic.



Contacting IDEXX

Our medical consulting team is available for complimentary consultation.

IDEXX LABORATORIES

NEW Reticulocyte counts in dogs and cats

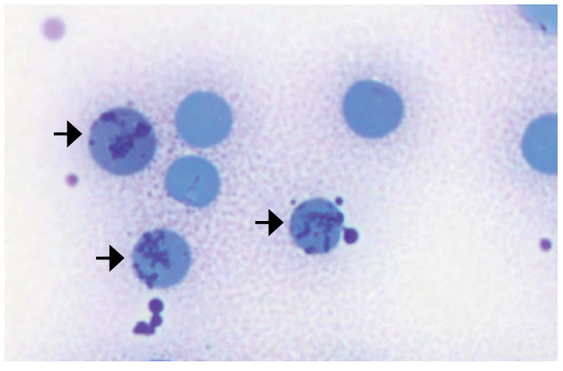
Reticulocyte counts will be reported with every complete blood count (CBC) from mid March

Background

Reticulocyte counts have traditionally been performed on anaemic patients to classify the anaemia as regenerative or nonregenerative. This information can be used to direct the diagnostic work up appropriately to determine the underlying aetiology of the anaemia. In nonanaemic animals, reticulocytosis can also be present and may be a transient physiologic response or a key indicator that the bone marrow is responding to a need for increased red blood cell production. This can occur during the recovery phase of blood loss or a haemolytic process and last until the haematocrit returns to the patient's baseline value. Alternatively, a persistent reticulocytosis in nonanaemic animals may indicate a compensated or partially compensated ongoing occult blood loss or underlying haemolytic disease, or a disorder that causes an absolute erythrocytosis. Early identification and management of the underlying disease process will result in more successful case outcomes.

Reticulocyte Reporting

IDEXX Laboratories provides the most advanced and sensitive objective measurement of reticulocyte counts from both our reference laboratories and our in-house hematology solutions. From the middle of March, an absolute reticulocyte count and reticulocyte percentage will be routinely reported as part of the erythrogram in all canine and feline complete blood counts (CBCs) provided by our reference laboratory. IDEXX in-house hematology Analysers (LaserCyte® Hematology Analyser and ProCyte Dx® Hematology Analyser) will continue to provide this additional information on all CBCs.



Canine reticulocytes (New methylene blue stain) showing numerous dark-staining aggregates of ribosomes (arrow head).

Since the reticulocyte percentage is impacted by the red blood cell count, no reference interval is provided. The absolute reticulocyte count is the most objective measure of bone marrow responsiveness to an increase in peripheral demand and a reference interval is provided.

Causes of Reticulocytosis

Reticulocytosis can result from both physiologic and pathologic processes. The remainder of this update provides an overview of the known physiologic causes and the more common pathologic causes of reticulocytosis.

Physiologic Reticulocytosis

Physiologic causes of reticulocytosis are poorly understood because, historically, measuring reticulocytes in nonanaemic animals has not been routine. However, because the bone marrow releases reticulocytes prematurely and most travel to and remain in the spleen for their final stages of development, anything that causes splenic contraction may result in release of reticulocytes into the blood. Causes include: excitement just prior to or at the time of blood draw, exercise, and certain drugs including epinephrine. Reticulocytosis would be transient and morphology of red blood cells would be normal. Our understanding of additional causes of physiologic reticulocytosis will increase as we gain more experience in interpreting reticulocytosis in nonanaemic animals.

Pathologic Reticulocytosis

Pathologic causes of reticulocytosis usually result from an increase in bone marrow production of red blood cells secondary to external or internal blood loss and haemolytic disease. If the rate of red blood cell loss or destruction is greater than the rate of new red blood cell production by the bone marrow, the animal will be anaemic. If the rate of red blood cell production matches or is greater than the rate of red blood cell loss or destruction, then the animal will not be anaemic. Reticulocytosis can also occur with conditions that cause an absolute erythrocytosis. The RBC count and/or haematocrit may be within the upper end of the reference interval(s) but increased above normal for the individual patient or above the reference interval(s) with obvious polycythemia present.

IDEXX LABORATORIES

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