

Thrombocytopenia in dogs and cats

By Sandra Forsyth

Thrombocytopenia, the term used for a platelet count that is below the reference interval, is a common finding in a complete blood count. This finding has numerous causes, but with careful examination it is possible to determine the culprit.

Analysers and reference intervals

To start, it is worth noting that reference intervals vary between analysers due to different methods of analysis. Consequently, analyser-specific ranges should be used when looking at platelet counts.

Reference intervals should be species specific because they differ for cats and dogs, and sometimes breeds of dog. For example, Cavalier King Charles Spaniels may have counts as low as $30 \times 10^9/L$ that are not associated with abnormal bleeding. Greyhounds and Shiba Inus can also have lower platelet counts than other dog breeds, but these typically fall within the range of $130\text{--}180 \times 10^9/L$.

Artifact

With reference intervals accounted for, the other most common cause of thrombocytopenia is platelet clumping, which prevents an analyser establishing an accurate count. This is particularly common in cats because of their platelets' propensity to clump after collection.

A blood smear must be examined in every patient with a low platelet count to confirm that it is a true finding. An estimate of platelet count can be made by counting the number of platelets in 10 high-power fields (100x) and establishing the mean.

Ten to 15 platelets per field indicate a normal count. The presence of platelet clumps or more than three platelets per high-power field suggests that platelet numbers are high enough to prevent spontaneous haemorrhage.

Compared to ethylenediaminetetraacetic acid (EDTA) samples, citrated blood produces lower platelet counts and citrate should not be used as an anticoagulant when accurate platelet counts are needed.

True thrombocytopenia

Once analysers and artifacts have been ruled out, it is possible to look at potential clinical causes. Spontaneous bleeding may occur when platelet numbers fall below $25 \times 10^9/L$, and bleeding associated with trauma or surgery may occur when the platelet count is $<50 \times 10^9/L$.

Thrombocytopenia may result from decreased production, increased destruction or excessive consumption of platelets from any of the following.

Decreased bone marrow production

Platelets are cytoplasmic fragments derived from megakaryocytes located in the bone marrow, and thrombocytopenia develops when megakaryocyte numbers decrease. Patients often have concurrent leukopenias and may also show non-regenerative anaemia.

Bone marrow injury causing thrombocytopenia may result from exposure to toxins (such as from chemicals or plants), medications, viral infections (including feline leukaemia virus and canine distemper), infiltration by neoplastic cells, myelodysplasia or immune-mediated disorders.

Sequestration

Mild thrombocytopenia may be seen in animals with splenomegaly, which induces platelet entrapment.



TABLE 1. Causes and severity of thrombocytopenia

CAUSES	SEVERITY	SUPPORTING DIAGNOSTIC TESTS
Artifact	Mild to severe	Examination of blood smear
Immune-mediated destruction	Often severe, may be mild to moderate	Diagnosis of exclusion
Decreased bone marrow production	Often severe	Leukopenia ± anaemia on the CBC
Sequestration	Mild	Splenomegaly
Vaccine administration	Mild	History
Disseminated intravascular coagulation	Often severe, may be mild to moderate	Elevated activated partial thromboplastin time (APTT), prothrombin time (PT), thrombin time (TT), decreased fibrinogen
Haemorrhage	Mild, occasionally moderate	History, clinical exam
Neoplasia/Chemotherapy	Mild to severe	History

Increased destruction

Immune-mediated destruction (IMTP) may be a primary condition in which autoantibodies form against platelet membrane components, or it may be secondary to antibodies formed against infectious agents and drugs or toxins that have adsorbed onto the platelet surface.

Secondary IMTP may also accompany neoplasia, infectious diseases and hepatic disorders. In primary IMTP, platelet lifespan is markedly shortened and the resulting thrombocytopenia is often severe. Secondary IMTP does not usually cause as profound a decrease in platelet count.

Vaccine-induced thrombocytopenia

Platelet count may mildly decrease three to 10 days after vaccination with modified live virus vaccines against canine distemper and canine and feline parvovirus. This may be a form of IMTP, but it has not been proven conclusively.

Increased consumption

Platelets are consumed during the clotting process and thrombocytopenia may be seen following significant haemorrhage. Counts may fall to below $100 \times 10^9/L$, although they are usually within $150-175 \times 10^9/L$. In less severe haemorrhage the count may not fall below the reference interval.

Increased platelet consumption occurs in disseminated intravascular coagulation (DIC), vasculitis, endocarditis

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and haemolytic-uraemic syndrome. DIC usually causes a severe thrombocytopenia; however, it may produce a mild to moderate decrease in platelet count depending on the stage of the disease at the time of examination.

Neoplasia

Neoplasia and its treatment are frequent causes of reduced platelet counts. Chemotherapeutics often induce thrombocytopenia, the severity and duration of which are dependent on the particular agent that is being administered. Neoplastic cells may invade the bone marrow and spleen, causing myelophthisis and microangiopathic disorders such as DIC. Additionally, lymphoma and lymphoid leukaemia can be associated with immune-mediated thrombocytopenia.

In summary

There are multiple causes of thrombocytopenia, of which many can be excluded by careful smear examination and by determining the severity of the decrease in platelet count. ^{vs}

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