

| | Cytology | ACT | PTT | PT | BMBT | Platelets | MPV/PDW | FDPs/d-Dimers, TT | Exam | Bone Marrow |
|---|---|--|----------------------------|----------------------------|--|---|-------------------------------|--------------------------------------|---|------------------------------------|
| Von Willebrand's Disease (vWF <30%) | Normal | Increased only if very severe | Increased only if severe | Normal | Prolonged | May have mild thrombocytopenia if hypothyroid | Normal | Normal | Any form of bleeding if severe | Not indicated |
| Hemophilia A (factor 8) & B (factor 9 – Christmas Disease) | Normal | Prolonged when <5% factor | Prolonged when <30% factor | Normal | Normal, then Re-bleeding | Normal | Normal | Normal | Hematomas, body cavity bleeds, re-bleeding | Not indicated |
| Hagemann (factor 12) & Hemophilia C (Factor 11) | Normal | Prolonged when <5% factor | Prolonged when <30% factor | Normal | Normal | Normal | Normal | Normal | Bleeding absent with 12 and mild with 11 | Not indicated |
| Factor 7 Deficiency | Normal | Normal | Normal | Prolonged when <30% factor | Usually Normal | Normal | Normal | Normal | Hematomas, body cavity bleeds, re-bleeding | Not indicated |
| Factor X (10) Deficiency | Normal | Prolonged when <5% factor | Prolonged when <30% factor | Prolonged when <30% factor | Normal, then Re-bleeding | Normal | Normal | Normal | Hematomas, body cavity bleeds, re-bleeding | Not indicated |
| Liver Failure | Acanthocytes target cells codocytes leptocytes | Prolonged if severe | Prolonged | Prolonged | Normal, then Re-bleeding | Normal | Normal | Increased if AT3 low TT prolonged | Hematomas, body cavity bleeds, re-bleeding | Not indicated |
| Anticoagulant rodenticide | Normal | Prolonged if severe | Prolonged | Prolonged (most sensitive) | Mild – normal then re-bleeding Severe - Prolonged (not recommended) | Normal, or low if severe bleeding | Increased if chronic bleeding | Normal TT normal | Any form of bleeding if severe | Not indicated |
| DIC, massive hemorrhage | Schistocytes | Prolonged | Prolonged | Prolonged | Prolonged AVOID THIS TEST | <150,000/ul | Increased if chronic bleeding | Increased | Any form of bleeding | Normal to increased megakaryocytes |
| Ehrlichia | May see <i>E Platys</i> in platelets | Normal to slightly prolonged (<10 sec) | Normal | Normal | Usually prolonged | <150,000/ul | Variable | Normal | Possible petechiae, ecchymoses, epistaxis due to vasculitis | Plasma cells |
| Immune mediated thrombocytopenia | | Normal to slightly prolonged (<10 sec) | Normal | Normal | May be prolonged if platelets <20,000/ul | Low, often < 20,000/ul | MPV Low in 50% of cases | Normal | Bleeding is rare until end stage, then severe | Normal to increased megakaryocytes |
| Tpenia due to bone marrow dz | few platelets | Normal to slightly prolonged (<10 sec) | Normal | Normal | May be prolonged if platelets <20,000/ul | Low | MPV normal to high | Normal | Petechiae, epistaxis, ecchymoses, GI blood | Decreased megakaryocytes |
| Thrombocytopathia (abnormal platelet function) | Otter hounds giant bizarre platelets | Normal to slightly prolonged (<10 sec) | Normal | Normal | Prolonged | Usually normal, Otter hounds low | MPV normal to high | Normal | Petechiae, epistaxis, ecchymoses, GI blood | Not indicated |
| Vasculitis | Giant platelets | Normal | Normal | Normal | Prolonged | Low | MPV normal to high | Normal | Petechiae, epistaxis, ecchymoses, GI blood | Normal to increased megakaryocytes |

ACT = activated clotting time (less sensitive substitute for PTT)

BMBT = buccal mucosal bleeding time (assesses platelet and capillary function)

DIC = disseminated intravascular coagulopathy

FDPs = fibrin degradation products, aka FSP = fibrin split products (screens for fibrinolytic activity)

MPV = mean platelet volume

PDW = platelet distribution width

PTT = activated partial thromboplastin time (assesses intrinsic and common coagulation pathways)

PT = prothrombin time (assesses extrinsic and common coagulation pathways)

TT = Thrombin Time

Thrombocytopathia = platelet function defect (eg, von Willebrand's disease, paraneoplastic disease especially lymphoma, aspirin, congenital in Basset hounds, Otter hounds, Spitz, Great Pyrenees, and cocker spaniels)

Bleeding Times

--If you suspect a severe hemostatic problem such as rat poisoning or severe DIC, don't do a BMBT (bleeding may never stop), don't take blood from a jugular vein (hematoma can result in suffocation), and don't perform cystocentesis, Increased ACT or platelets <40,000/ul indicate severe hemostatic problem.

Platelets

--Platelets can be low any time there is active bleeding that is severe

--Platelet clumping at the feathered edge of the blood smear indicates that another sample needs to be taken, to get an accurate platelet count

--King Charles Cavalier Spaniels often have very large platelets, and low platelet counts, but this is rarely clinically significant, and all clotting tests are normal

Platelet mass = platelet count x MPV, usually normal

--Large, bizarre platelets can be seen in Otter hounds with thrombasthenic thrombopathis and in cats with myeloproliferative disease

--Lipid droplets can falsely increase platelet count in lipemic animals

RBC fragments can falsely increase platelet count in dogs with IMHA (immune mediated hemolytic anemia)

Sharp spikes on the platelet histogram and low MPV suggest this error

--small RBC due to iron deficiency can be counted as platelets, MPV will be low

--dogs and cats with normal platelet counts will have at least 8-10 platelets per high power (100x) field

--antiplatelet and antimegakaryocytic antibodies can diagnose IMT (immune mediated thrombocytopenia) directly

--Platelet count must be less than 50,000/ul to cause spontaneous bleeding due to thrombocytopenia alone

Coagulation Factors

--intrinsic pathway – factors 8, 9, 11, 12, PF3

--extrinsic pathway – factor 7

--common pathway – 2 (prothrombin), 5, 10, PF3, fibrinogen

--vitamin K dependent factors – 2, 7, 9, 10 (7 is most sensitive)

--Diagnose von Willebrand's by sending vW factor off to Cornell (transfusion will falsely increase), <30% at risk for bleeding

--PT or PTT shorter than usual are not clinically significant; PT <3 sec above normal and PTT <5 sec above normal may not be clinically significant

--Hemophilia A and B are sex linked (more common in males)

FDPs and d-Dimers

--FDPs can be high any time there is chronic clot formation and breakdown – can happen with chronic bleeding, or diseases that cause hypercoagulable states (protein losing enteropathy, Cushing's Disease, Immune mediated hemolytic anemia, nephrotic syndrome, neoplasia, etc.)

--d-Dimers are more specific for DIC than FDPs

Causes of Vasculitis

--uremia, severe infection, rickettsial disease and immune mediated disease are the most common causes of vasculitis

Snake Bite Coagulopathy

--is multifactorial, looks very much like DIC except normal d-Dimers, and responds only to antivenin or tincture of time.