

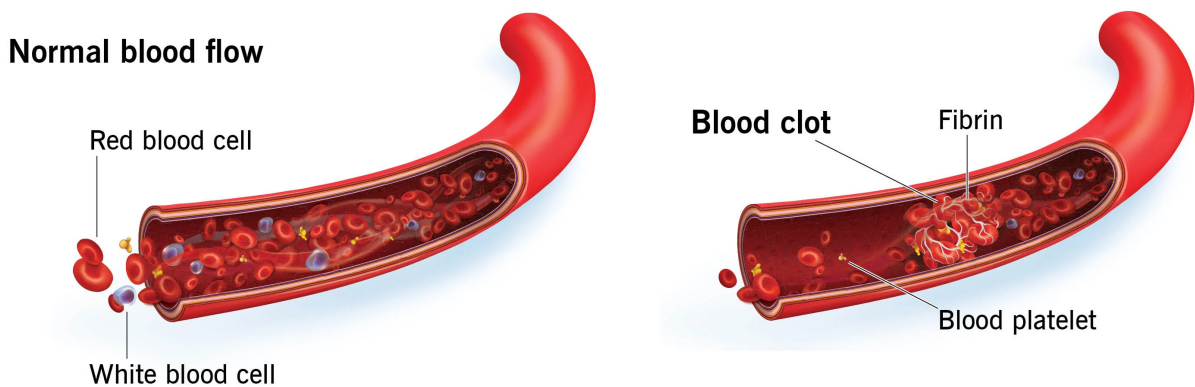
Vcheck D-dimer

Quantitative D-dimer Assay
for Screening Canine Thrombosis



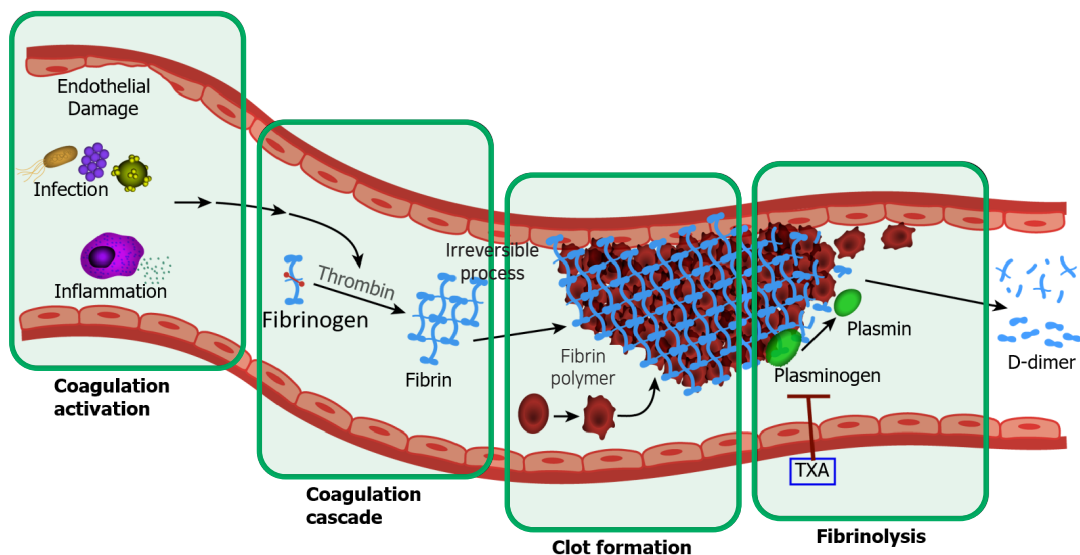
Essential Blood Coagulation Mechanism

When blood vessels are damaged due to trauma or illness, the blood clotting process occurs to prevent blood leakage. This involves vascular constriction and the primary hemostasis process (formation of a platelet plug), as well as the secondary hemostasis process (activation of clotting factors). Together, these processes achieve complete hemostasis, which is an essential and vital mechanism for maintaining life. Without blood clotting, even minor bleeding could lead to excessive hemorrhage and death. Once the damage is sufficiently repaired, a process of dissolving the fibrin formed during hemostasis ensures the normal flow of blood^{1,2}.



Mechanism of D-dimer Generation

In the secondary hemostasis process of blood clotting, fibrinogen in the bloodstream is converted into fibrin by the enzyme thrombin, ultimately forming a **fibrin clot**³. Fibrinolysis, the subsequent reaction, involves the dissolution of blood clots, thereby preventing the obstruction of blood vessels. Plasmin dissolves the fibrin clot, generating fibrin degradation products. Among these products, D-dimer serves as a highly sensitive indicator for thrombotic activity. **D-dimer is one of those fibrin degradation products and serves as a highly sensitive marker for coagulation activity.**



Clinical Utility of D-dimer Testing

D-dimer, a degradation product generated during the fibrinolysis process, is used as an adjunctive tool in thrombosis screening. Since this substance is not artificially produced during the blood collection process, the presence of D-dimer in the blood reflects the in vivo coagulation and fibrinolysis status⁴. D-dimer testing, renowned for its high sensitivity, proves valuable in screening for thromboembolism (TE) or disseminated intravascular coagulation (DIC) in high-risk dog⁵.

Clinical Utility 1 Thrombosis Screening in Patients with Severe Illnesses

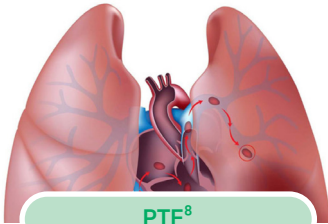
Periodic testing of D-dimer for thrombosis risk screening in various severe conditions with potential thrombotic complications^{6,7}

- Systemic bacterial infections/sepsis
- Viral infections (e.g., Parvovirus)
- Parasitic infections (Heartworm disease, Babesiosis, etc.)
- Immune-mediated hemolytic anemia (IMHA), Immune-mediated thrombocytopenia (IMT)
- Tumors (lymphoma, mammary tumors, hemangiosarcoma, etc.)

- Heatstroke
- Liver disease
- Heart failure, Kidney failure
- Endocrine disorders (Cushing's, diabetes)
- Protein-losing disorders (gastrointestinal disorders)
- Other conditions that may induce thrombosis (pancreatitis, pneumonia, pyometra, etc.)

Clinical Utility 2 Screening for Thromboembolism or DIC

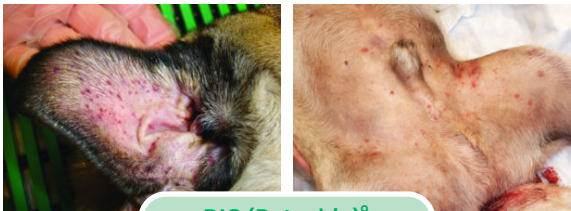
Pulmonary thromboembolism (PTE)



PTE⁸

PTE occurs when a blood clot lodges in one of the arteries that feed into the lungs as a complication to a number of commonly encountered clinical diseases.

Disseminated intravascular coagulation (DIC)



DIC (Petechia)⁹

DIC is a severe complication of life-threatening disorders and can arise from a range of conditions, including severe inflammation, infections, tumors, trauma, platelet disorders, and more.

- A comprehensive assessment of D-dimer results, along with other blood coagulation tests (aPTT, PT, platelet count, antithrombin III, FDP, fibrinogen, etc.), is essential for diagnosis.

Clinical Utility of D-dimer Testing

Clinical Utility 3 Anticoagulation Therapy Monitoring

- Monitoring thrombosis treatment through D-dimer testing during anticoagulation therapy in patients confirmed with thromboembolism

Example 1

Thromboembolism in a dog with Immune Mediated Hemolytic Anemia (IMHA)¹⁰

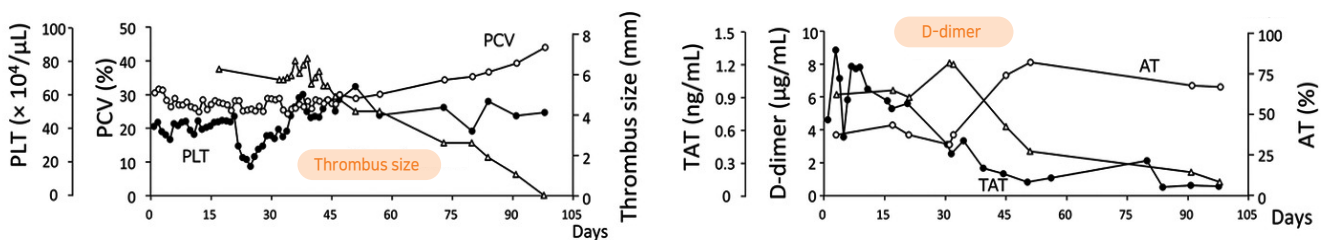
- Monitored D-dimer levels during anticoagulant therapy in a dog with thromboembolism (Graph 1)
- Confirmed decreased D-dimer levels with a reduction in thrombus size (D-dimer: Day 1 6.25 ug/ml, Day 98 negative)

Example 2

Dogs requiring thromboembolism monitoring due to heartworm infection¹¹

- Evaluated possibility of 'pulmonary thromboembolism' through D-dimer level monitoring in dogs undergoing heartworm disease treatment
- Confirmed increased D-dimer levels approximately 2 months after treatment in a group with a high burden of heartworms (indicating the formation of embolization from dead heartworms in the pulmonary vessels)

Graph 1. Treatment monitoring of a dog with thromboembolism during IMHA treatment



Reduction in thrombus size and D-dimer levels during anticoagulation therapy¹⁰

- In patients at high risk of thromboembolism or DIC,
- For therapeutic monitoring in patients undergoing anticoagulation treatment,

Screen for the possibility of thrombosis through periodic D-dimer testing in severely ill patients with multiple conditions!

Reference 1) J Korean Soc Neonatol 2011;18:1-5. 2) <https://my.clevelandclinic.org/health/diagnostics/22045-d-dimer-test> 3) World J Orthop 2023; 14(3): 90-102. 4) 대한영상의학회지 2012;66(1):93-103. 5) Journal of Small Animal Practice (2008) 49, 344-348. 6) J Vet Intern Med. 2013 Nov-Dec;27(6):1646-9. 7) Yaron Bruchim, et al. Disseminated Intravascular Coagulation. October 2008, Vol.30, No.10 8) Eur Respir J 2019; 53: 1800893 9) Brandy Tabor, Heatstroke in Dogs. todaysveterinarynurse 10) J Vet Med Sci. 2020 Sep 24;82(9):1271-1276. 11) J Vet Med Sci. 2020 Sep 24;82(9):1271-1276. 12) BIONOTE study 13) Validation of an immunoturbidimetric d-dimer Assay in canine citrated plasma. A. Diquélou, P. Menaut, C. Trumel, J. F. Guelfi. Ecole Nationale Vétérinaire de Toulouse, Toulouse, France.

Vcheck D-dimer

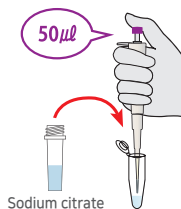
Specifications

- Species : Canine
- Sample : Plasma (Sodium Citrate 3.2%)
- Testing Time : 5 minutes
- Measurement Range : 0.1 - 10 $\mu\text{g}/\text{mL}$
- Storage Condition : 2 - 8 $^{\circ}\text{C}$

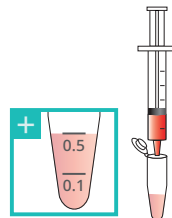


Test Procedure

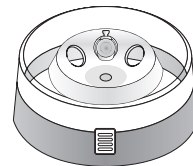
- 1 Add sodium citrate 50 μl to a 1.5 ml tube



- 2 Add whole blood 450 μl to 0.5 ml line of the tube containing sodium citrate

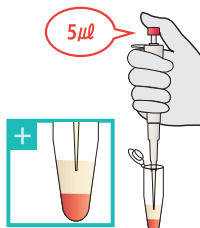


- 3 Mix the tube gently and centrifuge at 6,000 RPM for 5 min



* After collecting blood, immediately separate plasma by mixing sodium citrate and whole blood with 1:9 ratio and centrifuging.

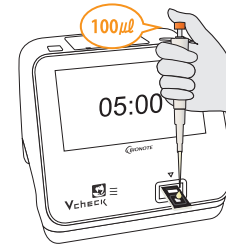
- 4 Add 5 μl of plasma to the assay diluent tube



- 5 Mix well 5~6 times by using a 100 μl pipette



- 6 Add 100 μl of the mixed sample into the test device



Reference Ranges

< 0.3 $\mu\text{g}/\text{mL}$

Normal

\geq 0.3 $\mu\text{g}/\text{mL}$

Abnormal (TED/DIC* probable)

* TED : Thromboembolic disease, DIC : Disseminated intravascular coagulation
(It is recommended that each laboratory establishes its own reference ranges.)

Ordering Information

Product No.	Product Name	Storage Condition	Packing Unit
VCF107DD	Vcheck D-dimer	2 - 8 $^{\circ}\text{C}$	10 Tests/Kit

Vcheck D-dimer

Performance Evaluation¹²

When comparing D-dimer results measured using the validated reference method for canine D-dimer measurement¹³, a high correlation ($y=0.9761x+0.053$, $R^2=0.9271$) was observed.

Comparative evaluation of D-dimer testing using canine plasma samples (N=54)

