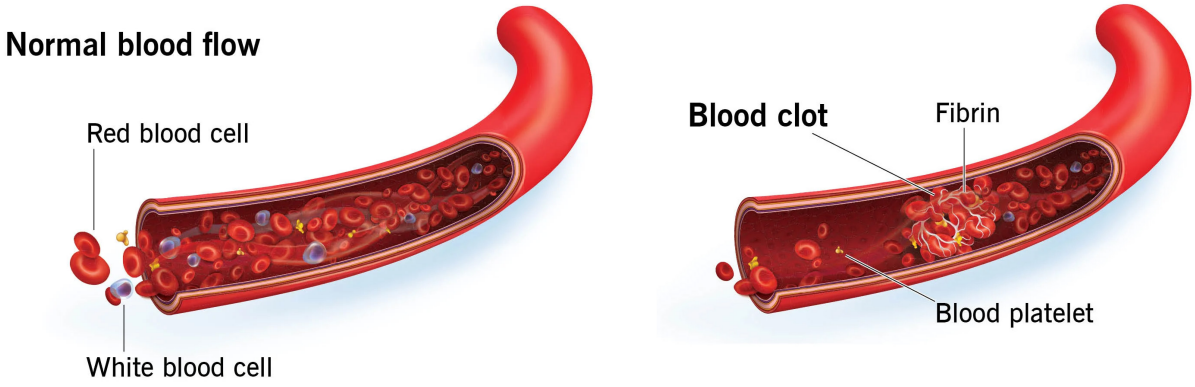
# Vcheck D-dimer

## Quantitative D-dimer Assay
## for Screening Canine Thrombosis


BIONOTE

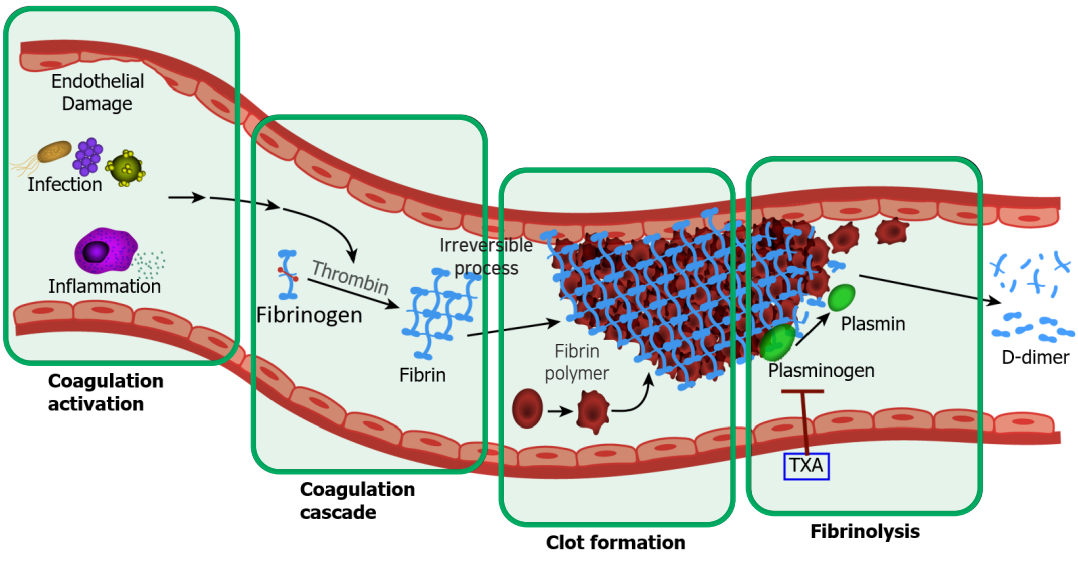
# Essential Blood Coagulation Mechanism

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 status[4]. D-dimer testing, renowned for its high sensitivity, proves **valuable in screening for thromboembolism (TE) or disseminated intravascular coagulation (DIC) in high-risk dog**[5].

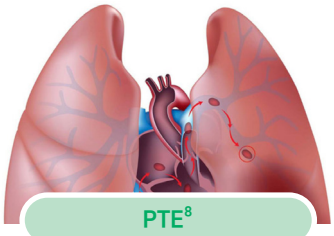
## Clinical Utility 1 Thrombosis Screening in Patients with Severe Illnesses

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

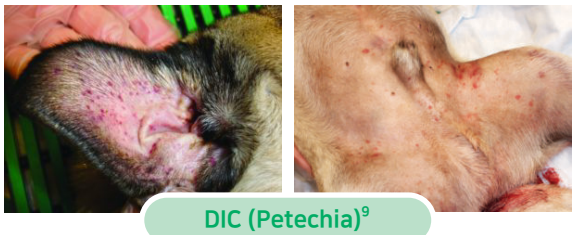
### Pulmonary thromboembolism (PTE)



PTE[8]

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]

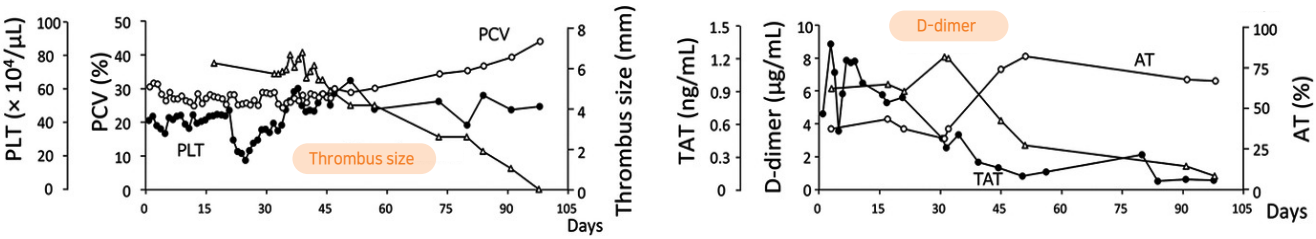
- Monitored D-dimer levels during anticoagulant therapy in a dog with thromboembolism (Graph 1)
- Confirmed decreased D-dimer levels with a reduction in thrombus size (D-dimer: Day 1 6.25 ug/ml, Day 98 negative)

**Example 2**

### Dogs requiring thromboembolism monitoring due to heartworm infection[11]

- 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 therapy[10]

1) In patients at high risk of thromboembolism or DIC,

2) 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.

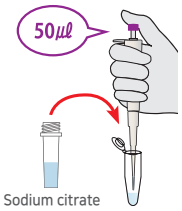
# Vcheck D-dimer

## Specifications

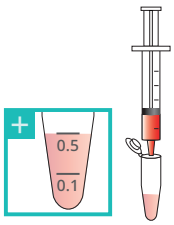
- **Species** : Canine
- **Sample** : Plasma (Sodium Citrate 3.2%)
- **Testing Time** : 5 minutes
- **Measurement Range** : 0.1 - 10 ㎍/㎖
- **Storage Condition** : 2 - 8 ℃


## Test Procedure

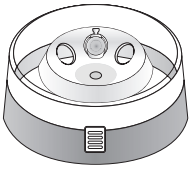
1 Add sodium citrate 50 µl to a 1.5 ml tube




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

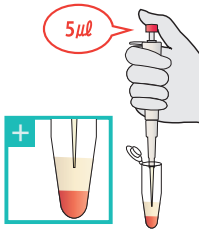



3 Mix the tube gently and centrifuge at 6,000 RPM for 5 min

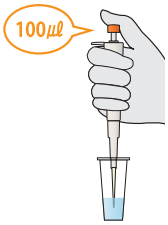


* After collecting blood, immediately separate plasma by mixing sodium citrate and whole blood with 1:9 ratio and centrifuging.

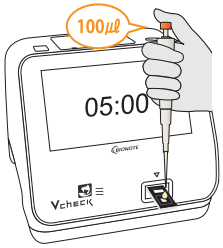
4 Add 5 µl of plasma to the assay diluent tube




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 ㎍/㎖ | ≥ 0.3 ㎍/㎖ |
|---|---|
| Normal | Abnormal (TED/DIC* probable) |

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

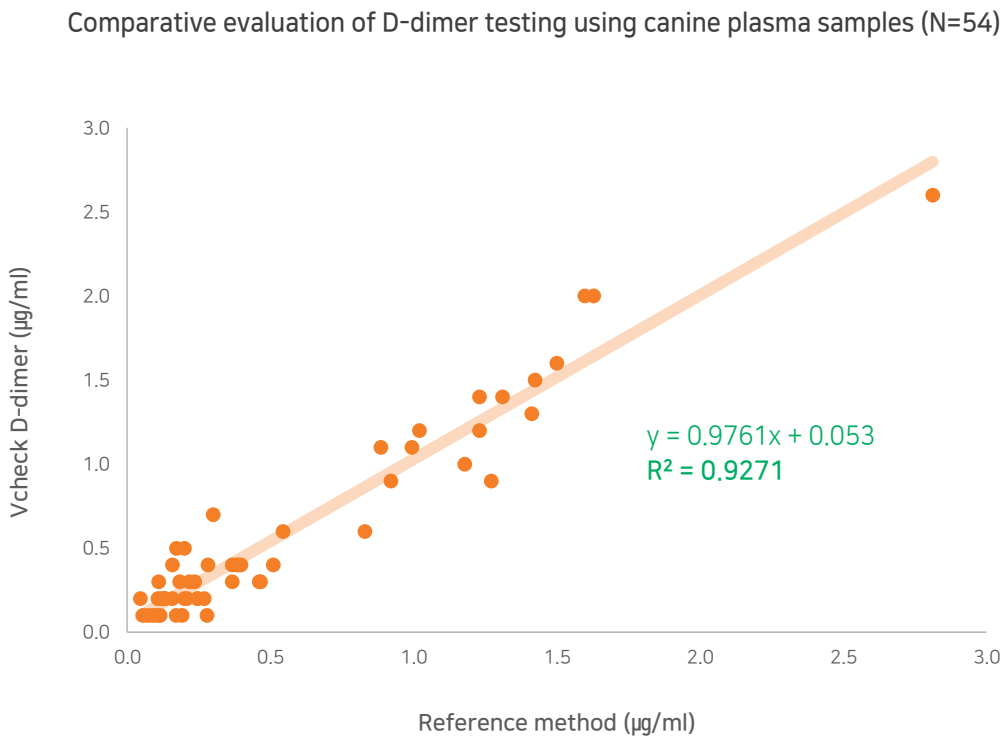
## Ordering Information

| Product No. | Product Name | Storage Condition | Packing Unit |
|---|---|---|---|
| VCF107DC | Vcheck D-dimer | 2 - 8 ℃ | 5 Tests/Kit |

# Vcheck D-dimer

## Performance Evaluation[12]

When comparing D-dimer results measured using the validated reference method for canine D-dimer measurement[13], a high correlation (y=0.9761x+0.053, **$R^2$=0.9271**) was observed.

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