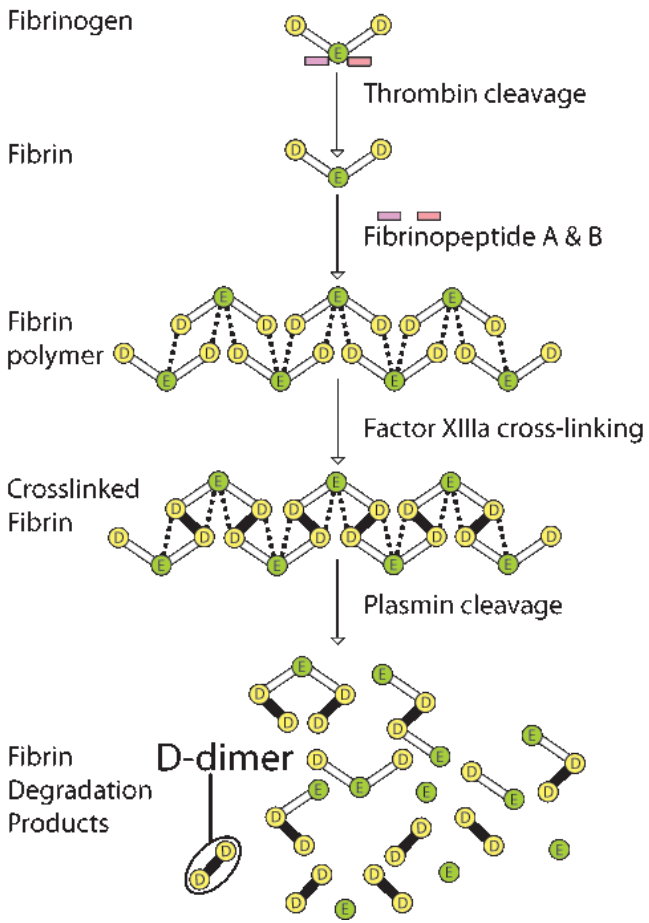
Overview

D-dimer Diagnosis

D-dimer Diagnosis

What is D-dimer?



D-dimer is a specific degradation fragment of cross-linked fibrin.

→ **High D-dimer**

① intravascular fibrin formation

② plasmin-mediated fibrinolysis

Diagnosis **DIC** (Disseminated intravascular coagulation)

Thromboembolism disease

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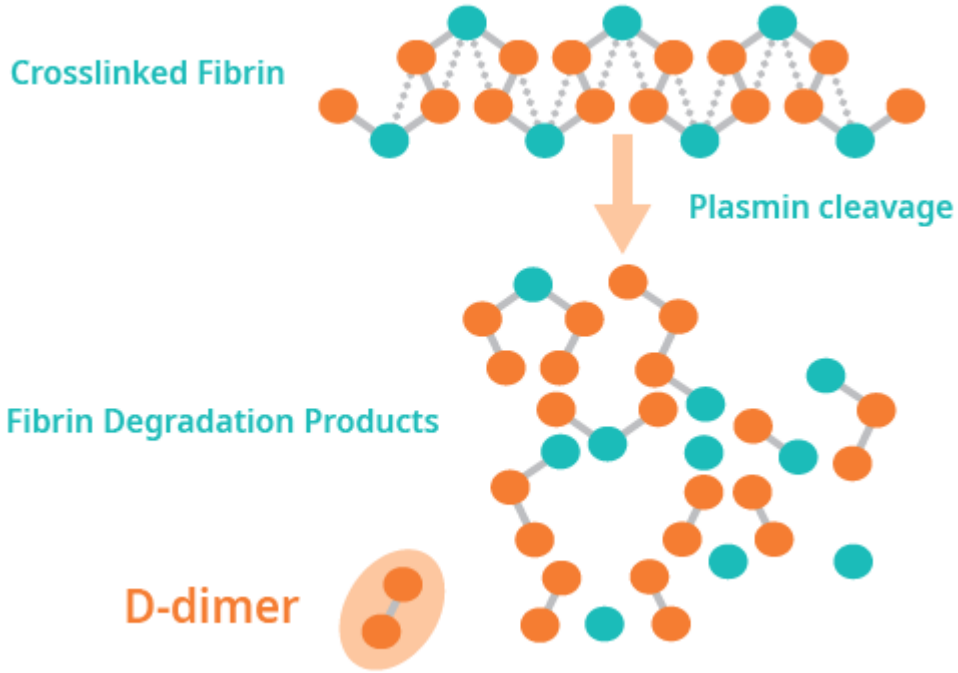
D-dimer Diagnosis

When Is It Done?

- DIC
- Pulmonary Embolism
- Systemic Thrombosis
- Chronic Congestive Heart Failure



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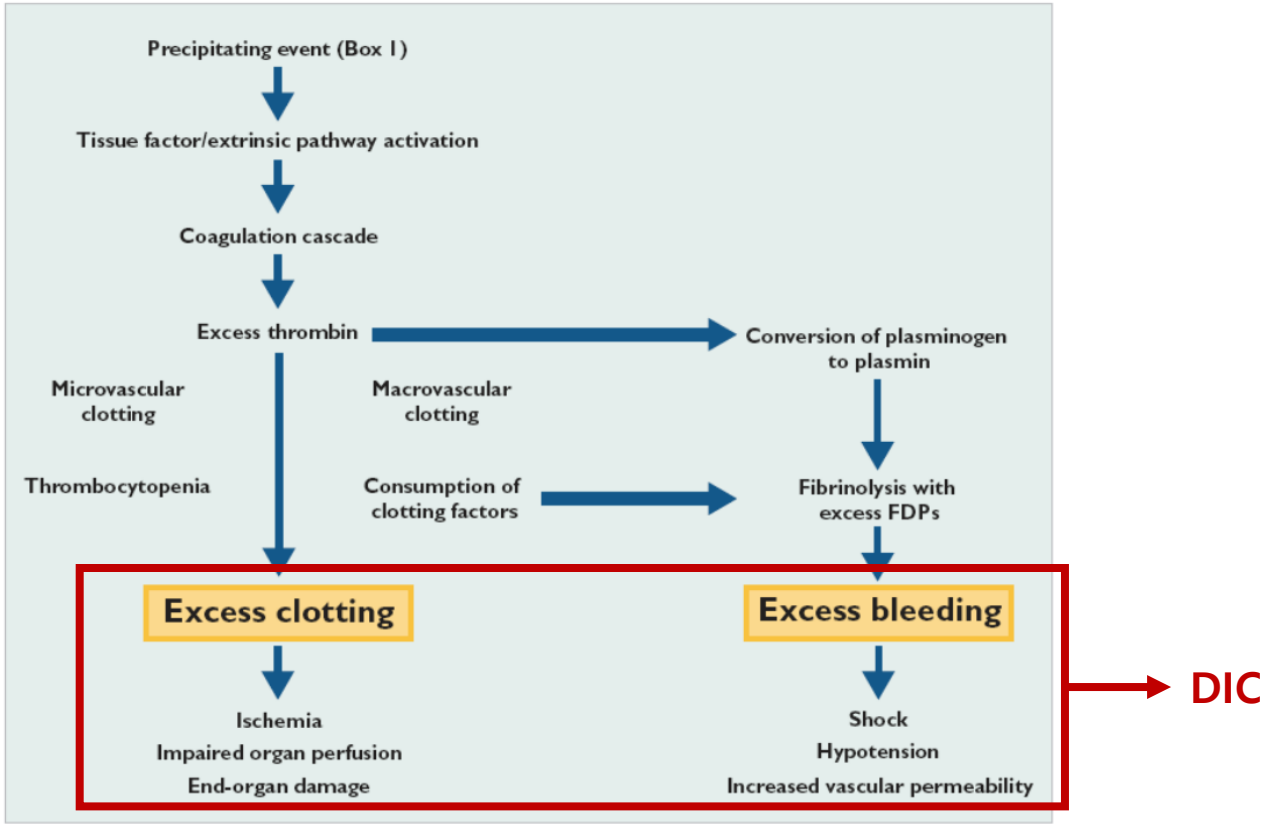
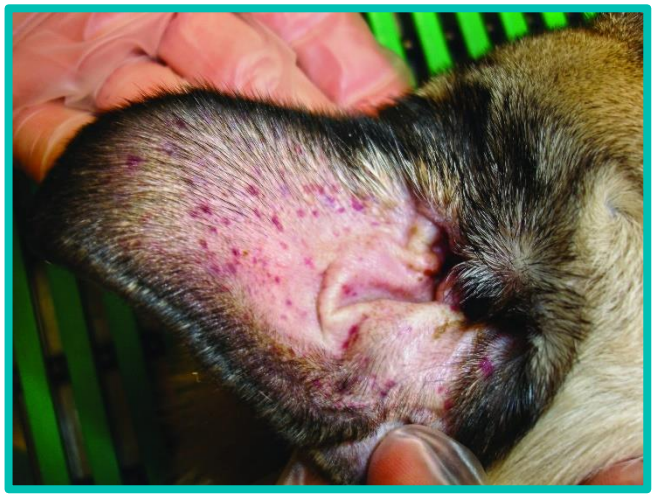
D-dimer Diagnosis

DIC in Dogs





◀ petechiae

Clinical signs

- Bleeding from the nose
- Blood in the eye
- Small pin-point bruising of the skin (called petechiae)
- Larger bruises (called ecchymosis)
- Increased heart rate
- Difficulty breathing
- Increased respiratory rate

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D-dimer Diagnosis

DIC in Dogs

Box 1. Clinical Conditions Potentially Associated with DIC

Systemic bacterial infections/sepsis
- Gram-negative bacteria (endotoxin)
- Gram-positive bacteria (bacterial coat mucopolysaccharide, enzymes)

Viral diseases
- Canine parvovirus
- Infectious canine hepatitis
- Feline panleukopenia
- FIP

Canine parasitic and rickettsial infections
- Babesiosis (*Babesia canis rosi*)
- Monocytic ehrlichiosis (*Ehrlichia canis*) and Rocky Mountain spotted fever (*Rickettsia rickettsii*)
- Leishmaniasis (*Leishmania infantum*)
- Spirocercosis (*Spirocerca lupi*)
- Heartworm disease (*Dirofilaria immitis*)
- Caval syndrome (*Angiostrongylus vasorum* and *Dirofilaria immitis*)

Neoplasia
- Solid tumors (e.g., mammary tumors)
- Lymphoid leukemia
- Myeloproliferative disorders
- Lymphoma
- Hemangiosarcoma (canine)
- Pulmonary adenocarcinoma

Immunologic disorders
- Immune-mediated hemolytic anemia
- Hemolytic transfusion reaction
- Transplant rejection

Vascular disorders
- Aortic aneurysm
- Vasculitis
- Hemangioma

Massive tissue injury
- Heatstroke and hyperthermia
- Gastric dilatation–volvulus (canine)
- Burns
- Head trauma
- Fat embolism
- Surgery (especially extensive and orthopedic)
- Severe mechanical trauma

Reaction to toxins
- Snakebite

Miscellaneous
- Pancreatitis
- Polycythemia
- Hepatic failure

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D-dimer Diagnosis

DIC in Dogs

At least 3 of the following criteria

- Abnormal aPTT, PT, or TCT value
- Low plasma fibrinogen concentration
- Low plasma AT III activity
- High serum FRA concentration
- Low platelet count

D-dimer Diagnosis

Thromboembolism in Dogs

Abnormalities in blood flow

⌄

Stasis of blood

⌄

Increased contact between platelets and coagulation factors with the endothelium

↓ promoting

Coagulation

KNOWN RISK FACTORS (Thromboembolism)

- ✓ **Protein-losing disease (nephropathy or gastrointestinal)**
- ✓ **Cancer**
- ✓ **Sepsis**
- ✓ **Pancreatitis**
- ✓ **Congestive heart failure**
- ✓ **Immune-mediated disease**
- ✓ **Endogenous, exogenous corticosteroids**

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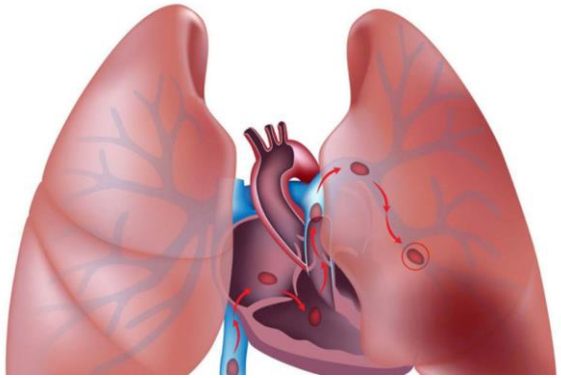
D-dimer Diagnosis

Thromboembolism in Dogs

Venous Thromboembolism

- **Pulmonary thromboembolism** (cat, **dog**)



Pulmonary Thromboembolism

- ✓ **Acute onset** of dyspnea, hypoxemia and hypocapnia & Tachycardia
- ✓ **Commonly have**: underlying cardiac disease, neoplasia, corticosteroid administration, DIC
- ✓ **Clinical signs**: nonspecific
  - lethargy
  - anorexia
  - weight loss

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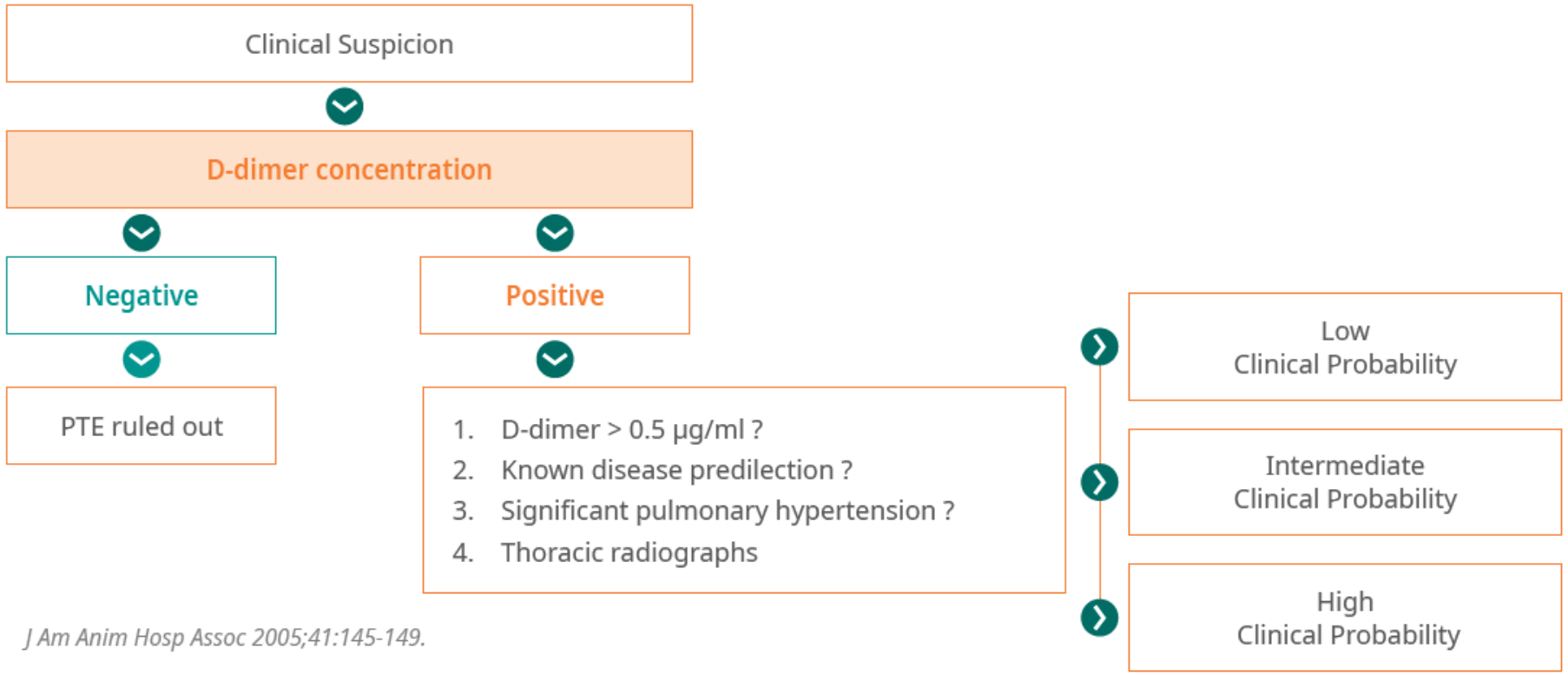
D-dimer Diagnosis

Algorithm for Pulmonary Thromboembolism (PTE) in dogs



J Am Anim Hosp Assoc 2005;41:145-149.

D-dimer Diagnosis

Table 1. Range and median D-dimer concentrations for all groups

Group (n)	D-dimer (mg/l)	
	Range	Median
Group 1 (26)	0·1-0·5	0·2
Group 2 (9)	0·5-8·0	2·0
Group 3 (58)	0·1-6·9	1·5

Group 1: clinically healthy adult dogs
Group 2: clinically ill dogs with TE/DIC
Group 3: clinically ill dogs without evidence of TE/DIC

Table 3. Distribution of D-dimer concentrations among groups investigated

Group	D-dimer concentration (mg/l)					Median (mg/l)
	0·1 to 0·5	>0·5 to <1	1 to <2	2 to <3	>3	
Healthy	26					0·2
Neoplastic	3	3	6	4	3	1·7
Immune mediated	1	2	1	1		0·6
Inflammation	3	3	6	1	1	1·0
Postoperative			3		1	1·6
Haemorrhage	6		1	1	1	0·4
Miscellaneous	2	3		1	1	0·7
TE/DIC	1	1	2	2	3	2·0

DIC Disseminated intravascular coagulation, TE Thromboembolic disease

Table 2. Plasma D-dimer concentrations in control, clinical illness, and TE dogs.

D-dimer (ng/mL)	<250	250–500	500–1,000	1,000–2,000	>2,000
Control	30				
Neoplasia	9	1	4	1[a]	1[a]
Heart failure	8		1		
Liver disease	4	4	4	1[a]	
Renal failure	5	2	1		
Postsurgery	11	3	6		
TE			4	9	7

TE, thromboembolic disease.
[a] Indicates 1 patient in category with hemoabdomen.

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D-dimer Diagnosis

Table 1. Laboratory Screening Tests for DIC*

Parameter/ Test	Early Hypercoagulable Phase	Clinical Manifestation Phase
Platelet count	=↓	↓
Schistocytosis	None	↑
PT	=↓	↑
aPTT	=↓	↑
Activated clotting time	=↓	↑
AT activity	=↓	↓
Fibrinogen	↓=↑[a]	↓
FDP	=↓	↑
D-dimer	=↓	↑
Total protein C	=↓	↓
TAT	↑	↓=↑
PAP	↑	=↓

There is no single specific laboratory test for the diagnosis of DIC.

D-dimer is still considered a good screening test for TE/DIC.

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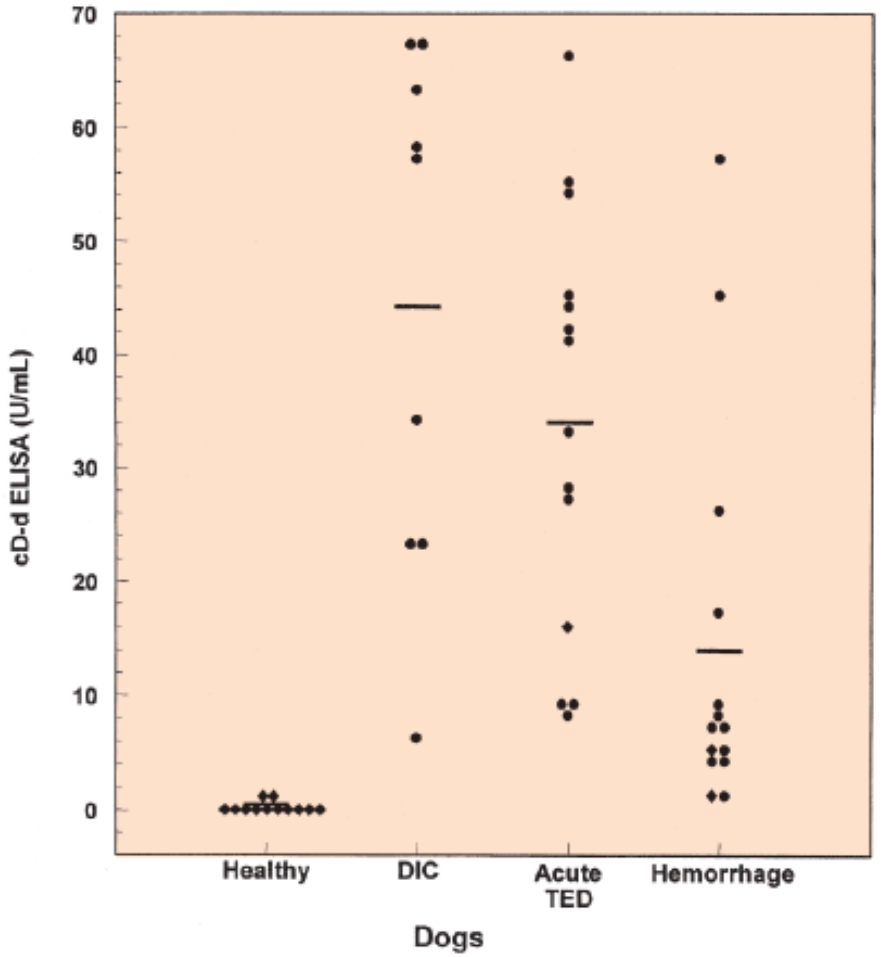
D-dimer Diagnosis

- A Good **Screening Test** For
  - **DIC (Disseminated intravascular coagulation)**
  - **Acute Thromboembolic Disease**

- **Assessment** of Pulmonary Thromboembolism
- **Monitoring** of **Antithrombotic therapy**
- Prediction of Survival Prognosis **after Surgery**

AJVR, 64(12), 1562-1569, December 2003



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D-dimer Diagnosis

Factors which increase D-dimer

- ✓ **Neoplastic** (Ex. lymphoma)

  ∵ a coagulopathy or hemorrhage from damaged vessels
- ✓ **Inflammatory**
- ✓ **Haemorrhagic**
- ✓ **Immune mediated**
- ✓ **Postoperative**
- ✓ **Miscellaneous** (idiopathic epilepsy and poisoning)

D-dimer concentration can be increased in a number of clinical conditions.

Elevations in D-dimer concentration alone should not be used as the basis for the diagnosis of TE/DIC.

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Product Overview

Vcheck D-dimer

Product Overview

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Product Overview :Vcheck D-dimer

Specifications

- ✓ Species : Dog
- ✓ Sample : Plasma (only Sodium Citrate)
- ✓ Testing Time : 5 minutes
- ✓ Measurement Range : 0.1 – 10 μg/ml
- ✓ Storage Condition: 1 – 30 °C

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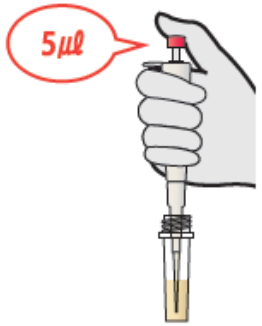
Product Overview :Vcheck D-dimer

Test Procedure

Coding	Sample	Mix	Apply
			
Select [Standard Test] and insert a test device	Add sample 5µl into an assay diluent tube	Mix well by using a 100µl pipette	Load all of the mixed sample

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Product Overview :Vcheck D-dimer

Reference Ranges

< 0.25 µg/ml	0.25 - 1.0 µg/ml	> 1.0 µg/ml
Normal	Elevated (Check other evidence of TE/DIC*)	Thromboembolic disease probable

* TE: Thromboembolism, DIC: Disseminated intravascular coagulation

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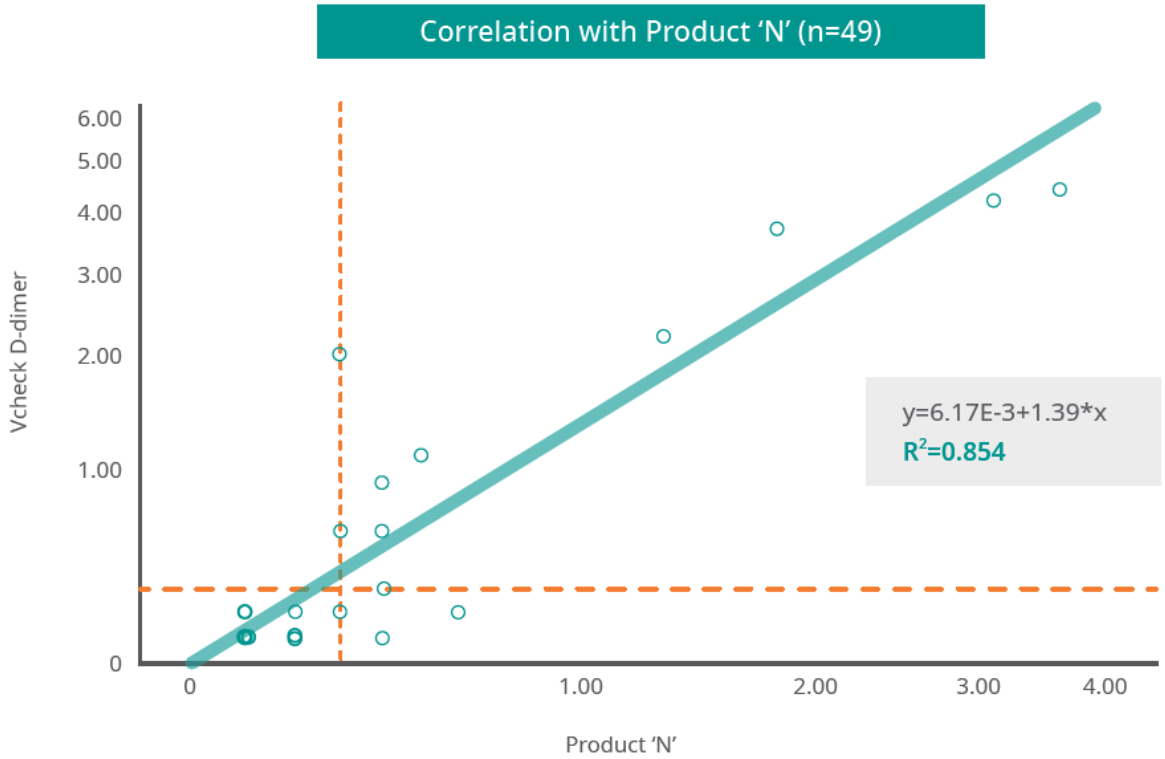
Product Overview :Vcheck D-dimer

Performance



Good Clinical Utility

Researched by Haemaru Small Animal Clinical Research Institute & Referral Animal Hospital

- ✓ **Stronger correlation with clinical sign**
- ✓ **High correlation with product 'N' (R^2=0.854)**

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