

# Training will be started at 10:10 AM(GMT +2)

Please chat us or unmute to speak if you would need any assistance

All participants would be muted to eliminate noise while presentation

Part.1  
Vcheck

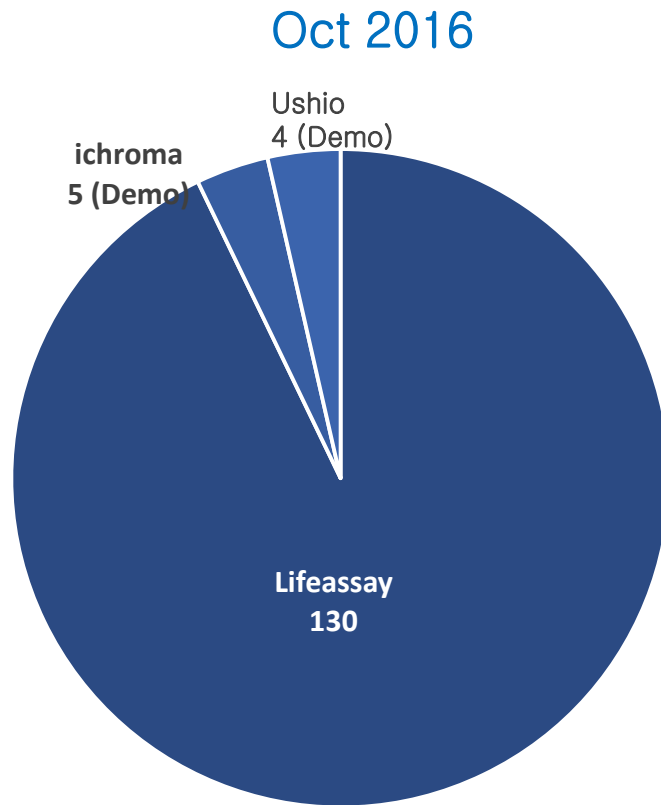
# CRP & SAA

Acute Inflammatory Markers

BIONOTE  
September. 2020

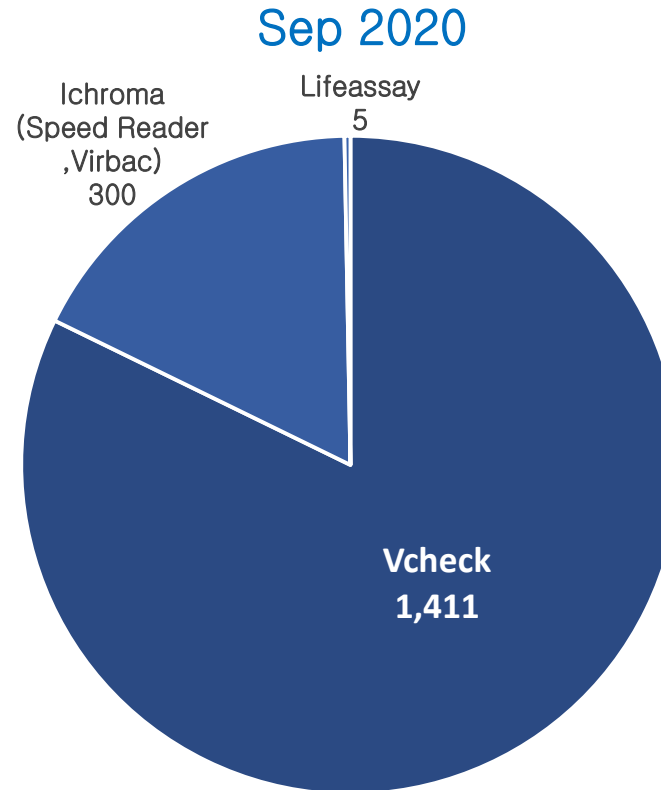


# CRP (C-reactive protein) & SAA(Serum Amyloid-A)



## 2016 CRP market situation

- 139 in total
- Vcheck launched in Oct 2016 with CRP, SAA



## 2020 market situation

- CRP market is the biggest
- CRP/SAA 2019 sales: around 110,000Tests
- Korea Vet clinic: 3,800EA

# CRP (C-reactive protein)

## The use of CRP in South Korea

- You can catch the patient's inflammation with CRP

CRP (C-Reactive Protein) is a type of acute phase protein (that increases rapidly in the blood according to inflammatory changes such as infection, and is produced by cytokines such as IL-1 and IL-6 in the liver.

Because it is an acute phase reaction substance, it reacts rapidly to tissue damages such as infections, autoimmune diseases, inflammation, trauma, surgery, and tumors, and shows numerical changes.

For this reason, most of the disadvantages that occur when monitoring inflammation with WBC alone can be solved by CRP.

In particular, when the patient's WBC level is continuously high after surgery, the clinical symptoms of the patient are improved, and when the WBC level is rather elevated, it is helpful in determining the patient's discharge time.

Professor Choi Eul-Soo (Department of Clinical Pathology, Chonbuk National University Veterinary Medical School) said, "CRP is a useful indicator for monitoring inflammatory diseases." and "Changes in WBC are not easy to interpret because they show more complex physiological changes than expected, but CRP can complement this".

## Daily VET

### CRP로 환자 염증도 잡고, 동물병원 경영도 챙기자

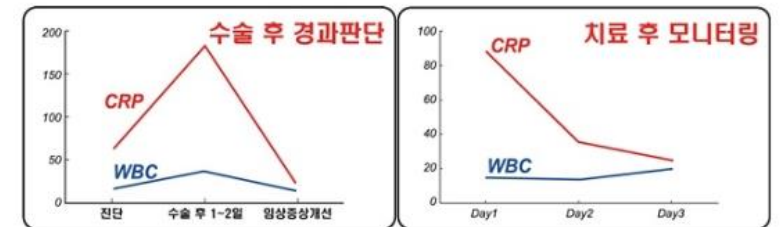
전국 6개 수의과대학 동물병원 이미 도입...하루 2건 검사하면 1년 순이익 1600만원

등록 : 2014.12.11 14:00:13 수정 : 2014.12.19 14:26:20

이학범 기자 dvmlee@dailyvet.co.kr

동물병원 경영이 점차 어려워지면서 경영 효율을 높여줄 수 있는 장비에 대한 관심이 높다.

'염증의 정량화'를 통해 WBC의 단점을 해결해주는 CRP 검사 장비도 그 중 하나다. 이미 서울대, 건국대, 전북대, 경상대, 충북대, 전남대 등 6개 수의과대학 동물병원에서 CRP를 사용하고 있으며, 로컬동물병원까지 합치면 CRP를 사용하는 동물병원은 수십 곳으로 늘어난다.



CRP(C-Reactive Protein)는 감염 등 염증성 변화에 따라 혈중에 빠른 속도로 증가하는 급성기단백질(Acute Phase Protein)의 일종으로 간에서 IL-1, IL-6 등의 사이토카인에 의해 생성된다.

# Vcheck CRP & SAA

## 01 Acute Phase Proteins

- ✓ CRP (C-reactive protein)
- ✓ SAA (Serum amyloid A)

## 02 Product Introduction

- ✓ Vcheck CRP
- ✓ Vcheck SAA

# 01 Acute Phase Proteins

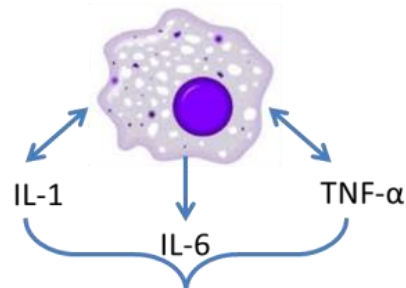
- What is Acute Phase Protein?
- CRP (C-reactive protein)
- SAA (Serum amyloid A)
- Case Study

# Acute Phase Proteins (APPs)

## What is Acute Phase Protein?

- The Acute Phase Response

Infection, Tissue damage,  
Inflammation, Neoplasia,  
Toxins, Surgery, Trauma



CRP, SAA, Haptoglobin  
Fibrinogen, Albumin

Triggering Causes

Inflammatory  
Response

- Stimulation of Macrophages, Monocytes
- Cytokine Secretion (IL-6, IL-1, IFN $\gamma$ , TNF $\alpha$ )

Hepatic Acute  
Phase Protein(APPs)

- Modulation of Protein Synthesis

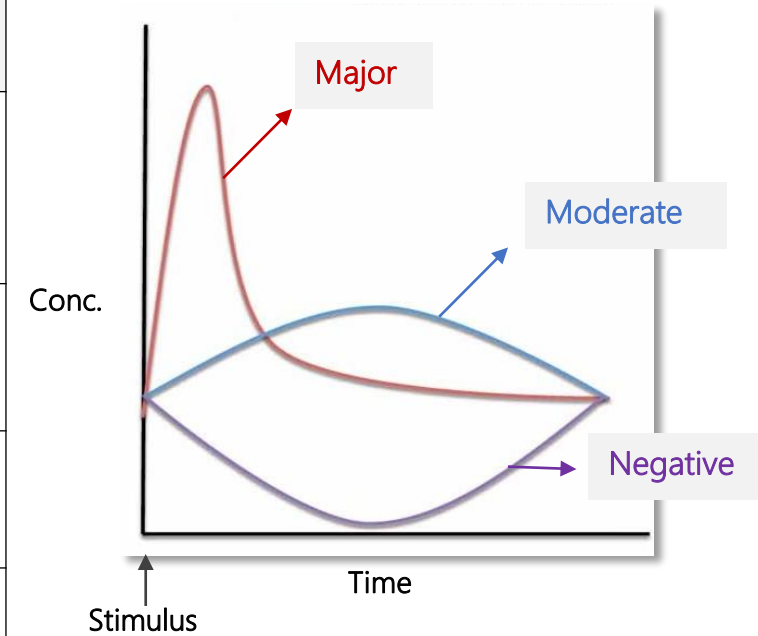
Production of APPs

# Acute Phase Proteins (APPs)

## What is Acute Phase Protein?

- Types of APPs

Types		Features	Example
Positive	Major	Low physiologic serum concentration and <b>rise dramatically by 100-1000 fold in stimulation, peaking at 24~48</b> and decline rapidly at recovery phase	CRP (dog), SAA (cat)
	Moderate	Increase some 5-10 fold on activation, peak after 2-3 days, and decrease more slowly than major APP responders	Haptoglobin
	Minor	Gradually increase by 50 – 100% of its resting level	Fibrinogen
Negative		Fall in concentration during the inflammatory response	Albumin

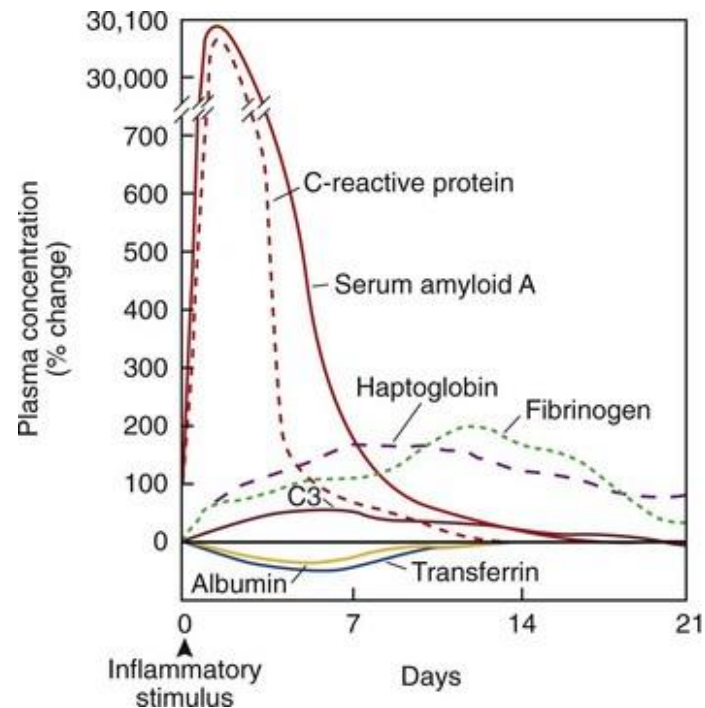




# Acute Phase Proteins (APPs)

## What is Acute Phase Protein?

- Types of APPs



## Acute Phase Protein (CRP, SAA)

- Low physiologic serum concentration
- Rises dramatically by 100-1000 fold in stimulation
- Peaks at 24~48 hours
- Declines rapidly at recovery phase

# 01 Acute Phase Proteins

- What is Acute Phase Protein?
- CRP (C-reactive protein) / SAA
  - What is CRP?
  - Changes in CRP levels
  - Clinical applications in dogs
  - Algorithm
  - Case study
- SAA (Serum amyloid A)
- Case Study

# CRP (C-reactive protein)

## What is CRP (C-reactive protein)?

- Diagnostic properties
  - ✓ CRP: Major APP in Dogs

- ✓ Rapid increase with Inflammatory diseases
- ✓ Peaks with in 24 hours up to 1,000 fold
- ✓ Prompt decrease after resolution of the stimulus (7 days)
- ✓ Half-life: Short (19 hours)
- ✓ Very low in healthy dog

These characteristics make  
CRP a useful marker of ongoing  
inflammatory activity!



# CRP (C-reactive protein)

## When can CRP be elevated?

Measurement of CRP is valuable in a clinical setting to diagnose systemic inflammation in dogs.

### Infection / Inflammation

- Pyometra
- Pneumonia
- Demodicosis
- Cystitis
- Periodontitis

### Tumor

- Hemangiosarcoma
- Lymphoma
- Nasal adenocarcinoma
- Cholangiocellular carcinoma
- Acute lymphoblastic leukemia
- Malignant histiocytosis

### Immune-mediated diseases

- Idiopathic polyarthritis
- IMHA
- IMT
- Sterile nodular panniculitis

### Etc.

- Acute pancreatitis
- Chronic hepatitis
- Cardiac tamponade
- Myelodysplastic syndrome

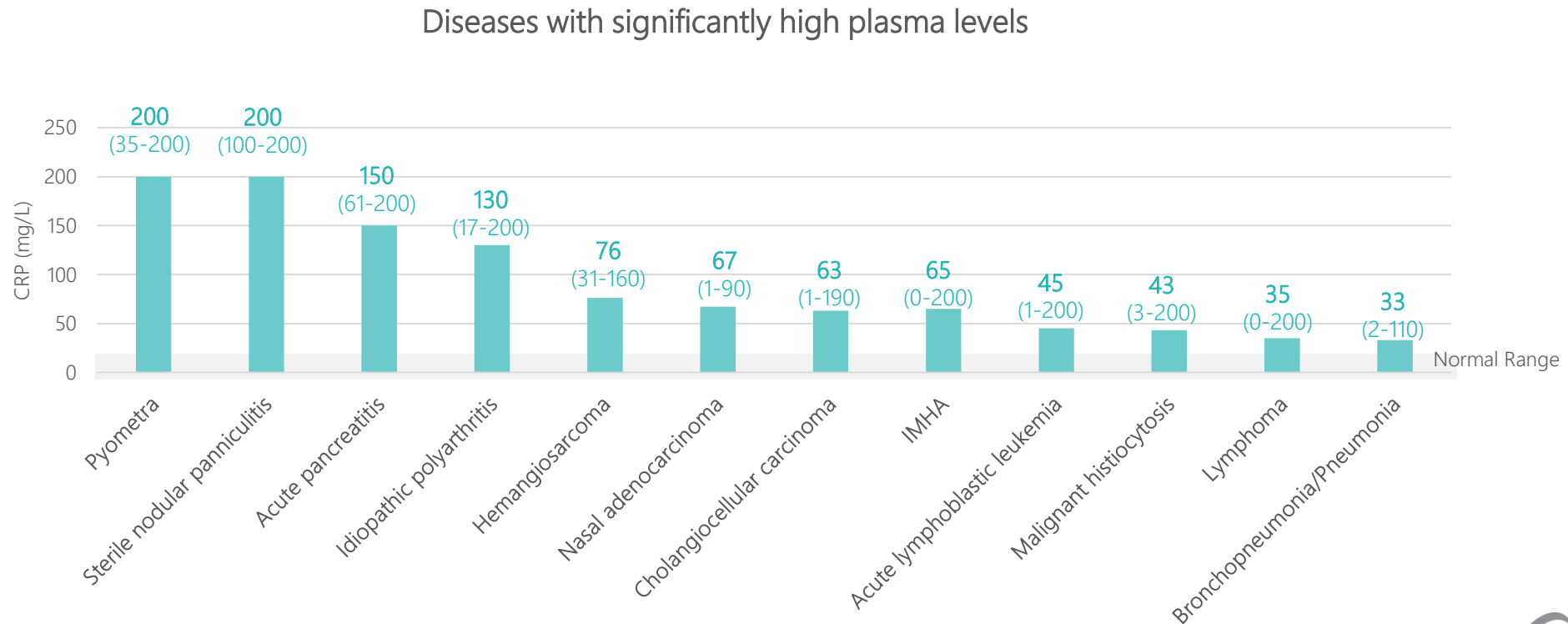
# Vcheck CRP & SAA

## CRP (C-reactive protein)

*J Vet Med Sci. 2008 Feb;70(2):127-31.*

### When can CRP be elevated?

- CRP increases reported in dogs



# CRP (C-reactive protein)

## CRP (C-reactive protein)

- CRP vs. WBC

Features	CRP	WBC
Affected by stress, steroid, NSAIDs or antibiotics	X	O
Sensitivity	High	Low
Proportional to the severity of inflammation	O	X
Serial measurement	O	X

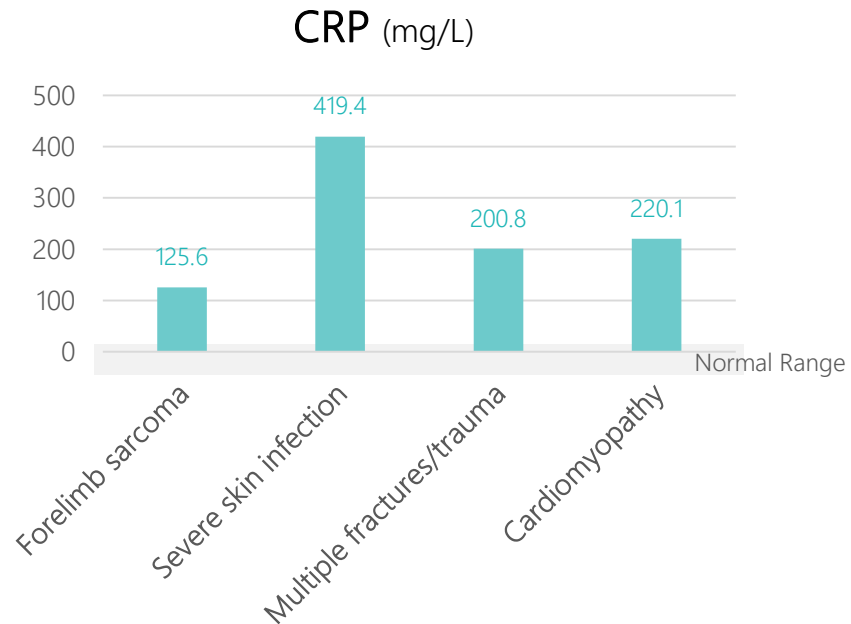
- WBC counts are inconsistent with clinical signs
  - ✓ Severe signs + normal WBC
  - ✓ Fully recovered + increasing WBC count
  - ✓ Healthy status + increased WBC count

# CRP (C-reactive protein)

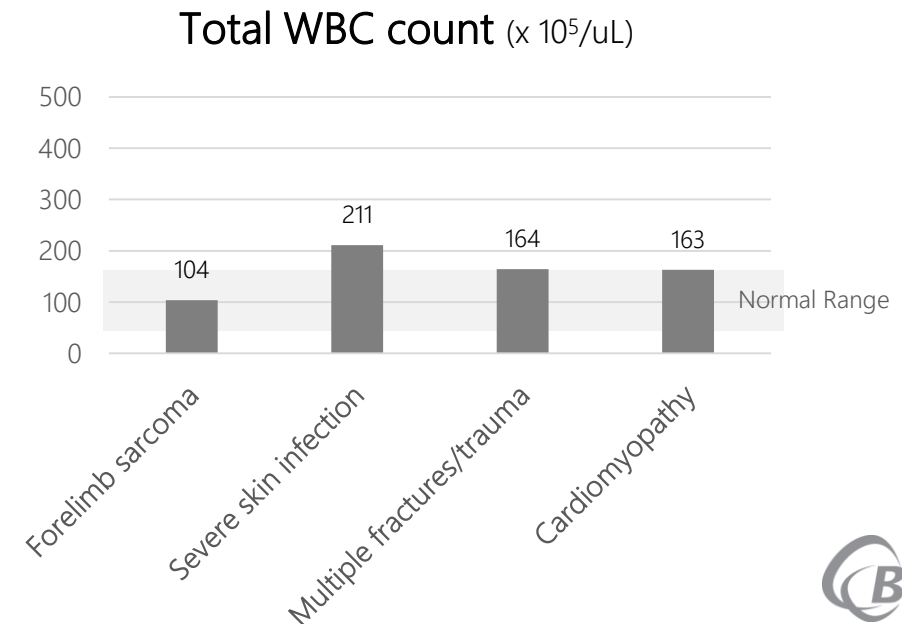
## CRP (C-reactive protein)

- CRP concentration and WBC count in severe diseases

- ✓ **Highly increased 21 fold** CRP across all clinical presentations
- ✓ The magnitude of increase makes for an enviable prognostic marker



- ✓ **Only increased 1.7 fold** in the clinically abnormal groups
- ✓ Often did not exceed normal reference range



# Changes in CRP levels

- ① Following surgery (Soft tissue, Orthopedic)
- ② Bacterial Respiratory Diseases
- ③ Pancreatitis

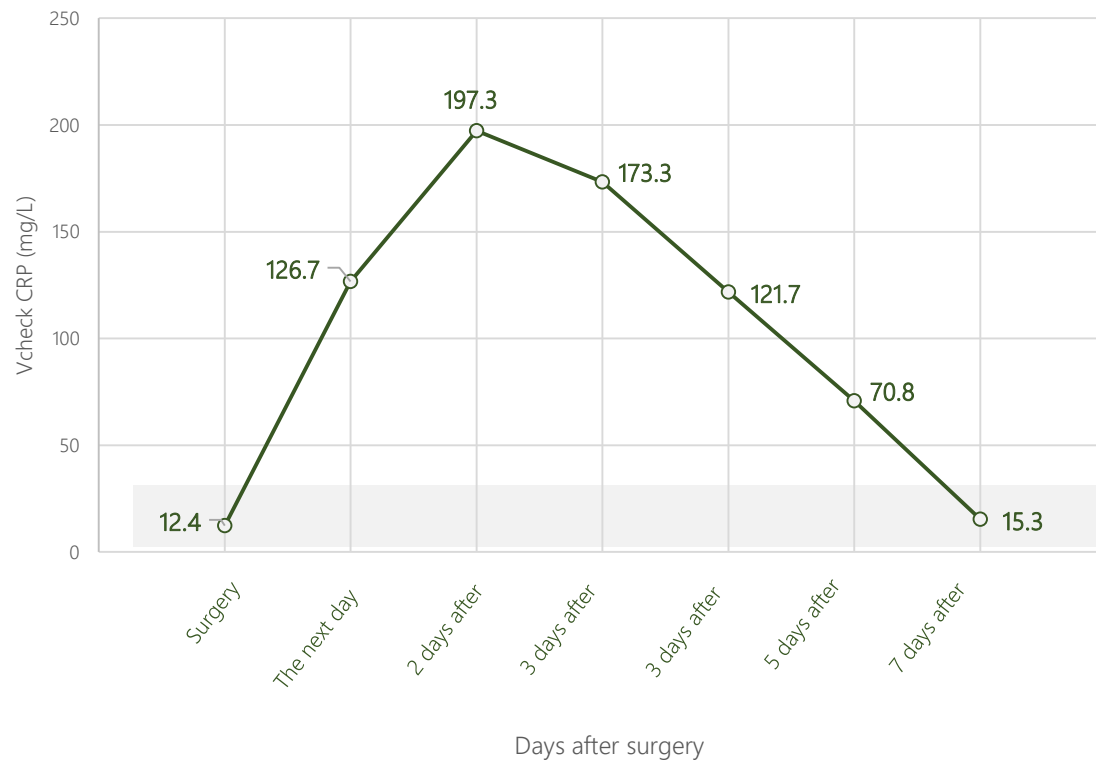


# Vcheck CRP & SAA

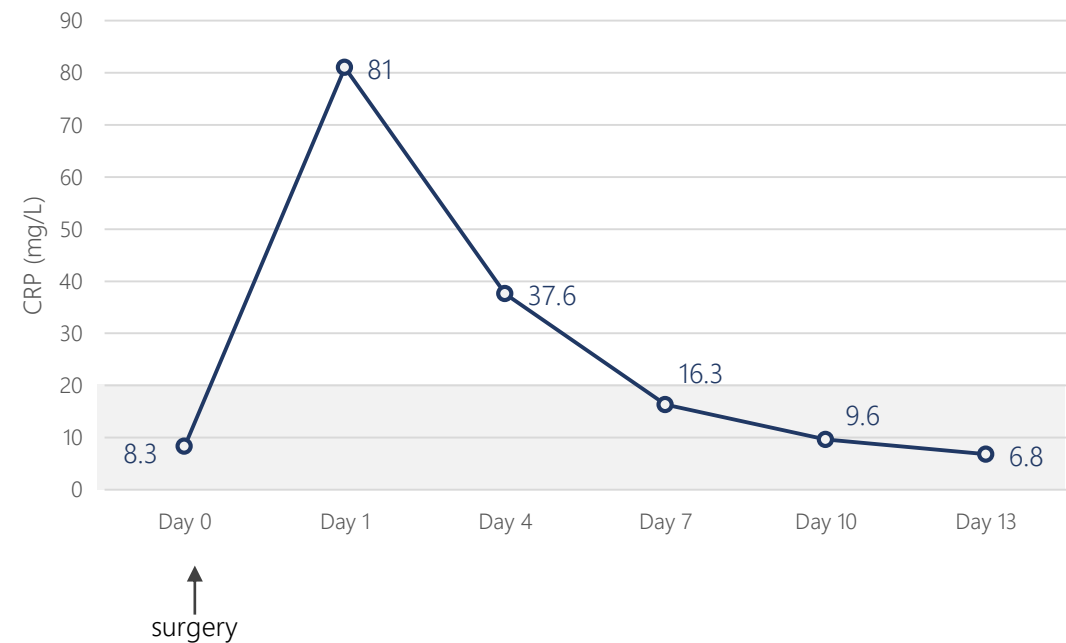
## CRP (C-reactive protein)

### Changes in CRP levels (① following surgery: Soft tissue, Orthopedic)

✓ Changes of CRP levels after gastrotomy



✓ Typical c-CRP change in orthopedic patients



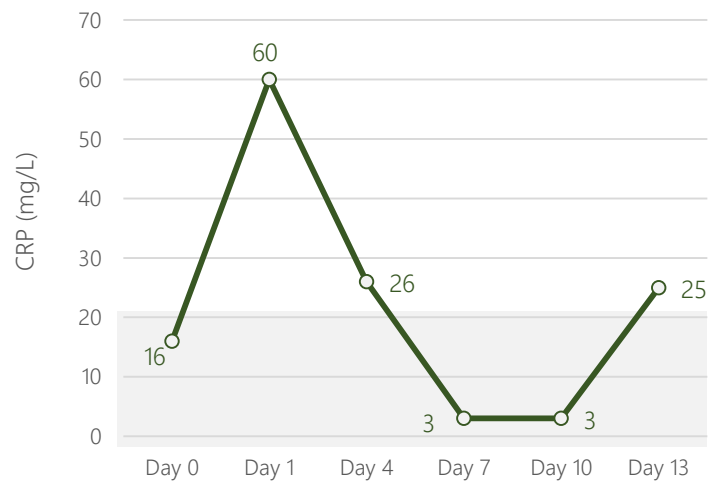
# Vcheck CRP & SAA

## CRP (C-reactive protein)

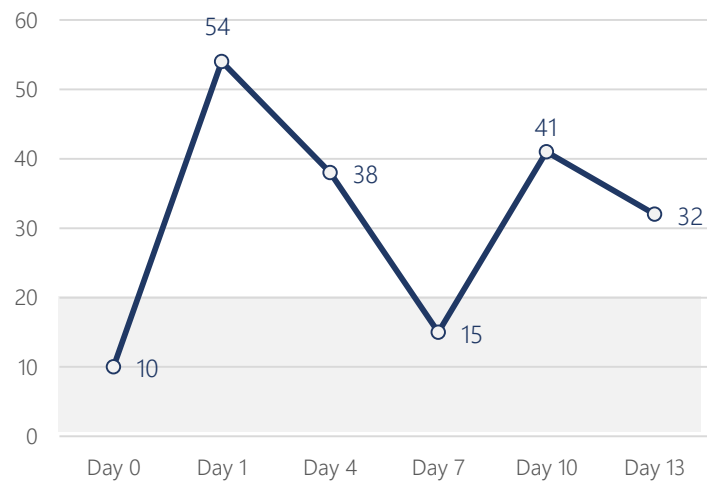
Acta Vet Scand. 2019; 61:33.

### Changes in CRP levels (① following surgery: Soft tissue, Orthopedic)

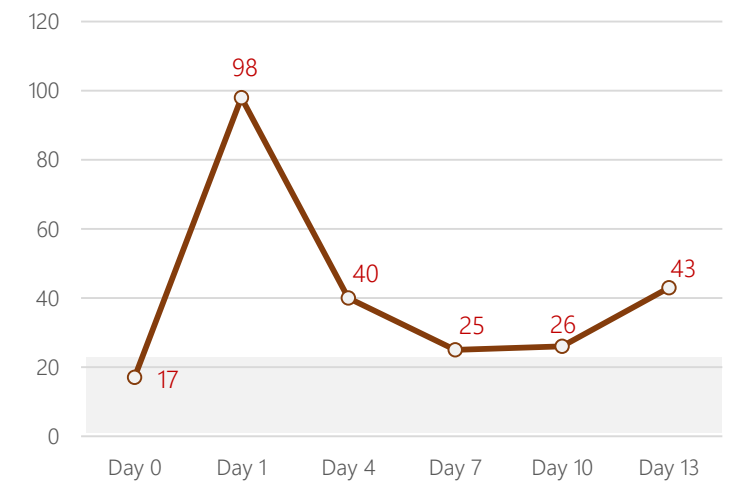
If deviation from this typical change is observed postoperatively, this may suggest possible complications.



- Surgery: Internal fixation for closed femoral fracture
- A bacterial infection was confirmed from femoral abrasions



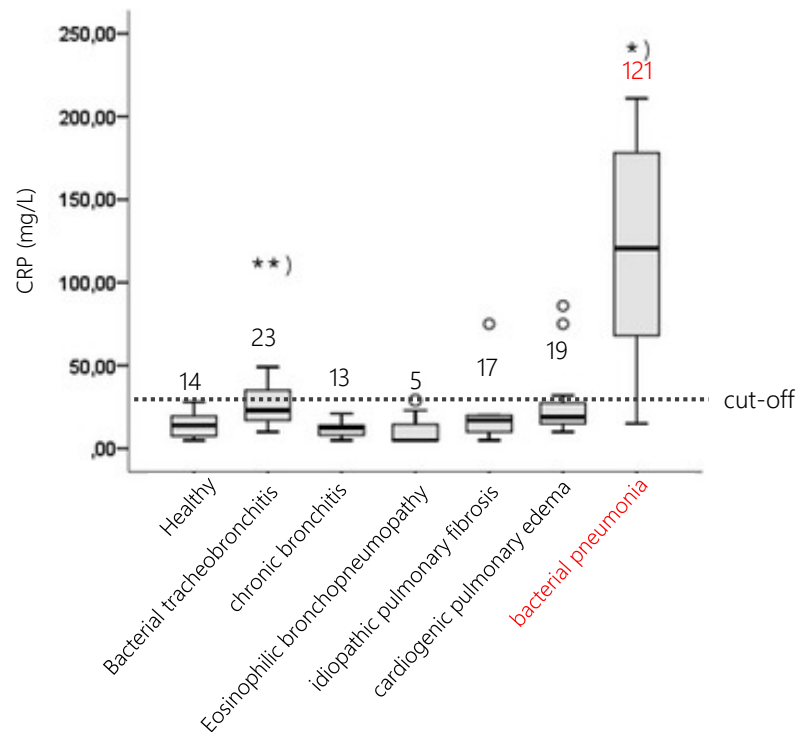
- Surgery: Internal fixation for radioulnar non-union
- A bacterial infection was confirmed from specimens collected intraoperatively



- Surgery: Internal fixation for radioulnar non-union
- Bacterial infection was confirmed from fluid within the surgical field

# CRP (C-reactive protein)

## Changes in CRP levels (② In Dogs with Bacterial Respiratory Diseases)



### Bacterial Pneumonia (BP)

- One of the most common systemic bacterial infections in dogs (high morbidity and mortality)

### CRP in dogs with respiratory diseases...

- Dogs with BP had significantly high CRP concentrations
  - Used as an additional diagnostic biomarker in BP
- CRP Increases are not typical in dogs with other respiratory diseases
  - If encountered in these patients, a secondary infectious process may be suspected

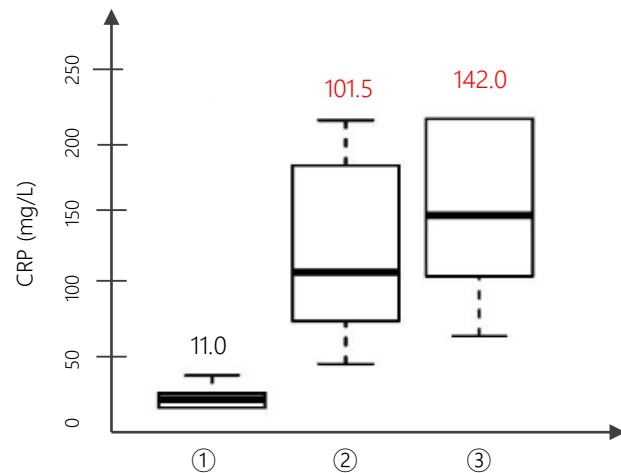
# Vcheck CRP & SAA

## CRP (C-reactive protein)

J Vet Intern Med. 2014 Jan-Feb; 28(1): 84-91.

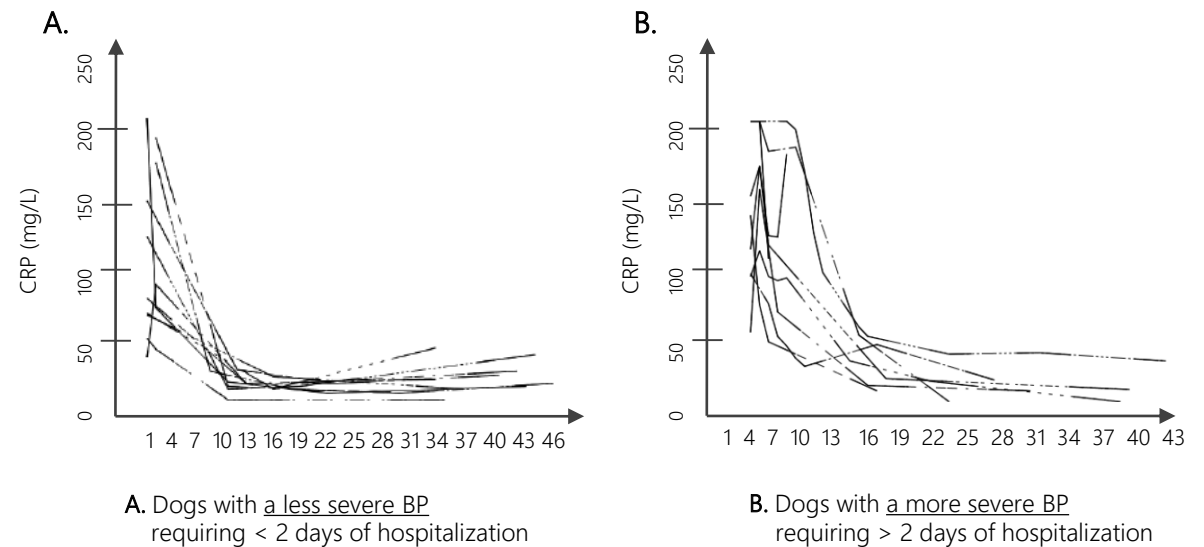
## Changes in CRP levels (② In Dogs with Bacterial Respiratory Diseases)

### ① Diagnosis



- ① Healthy dogs (n=64)
- ② Dogs with a less severe bacterial pneumonia requiring < 2 days of hospitalization (n=10)
- ③ Dogs with a more severe bacterial pneumonia requiring > 2 days of hospitalization (n=9)

### ② Treatment Monitoring



# CRP (C-reactive protein)

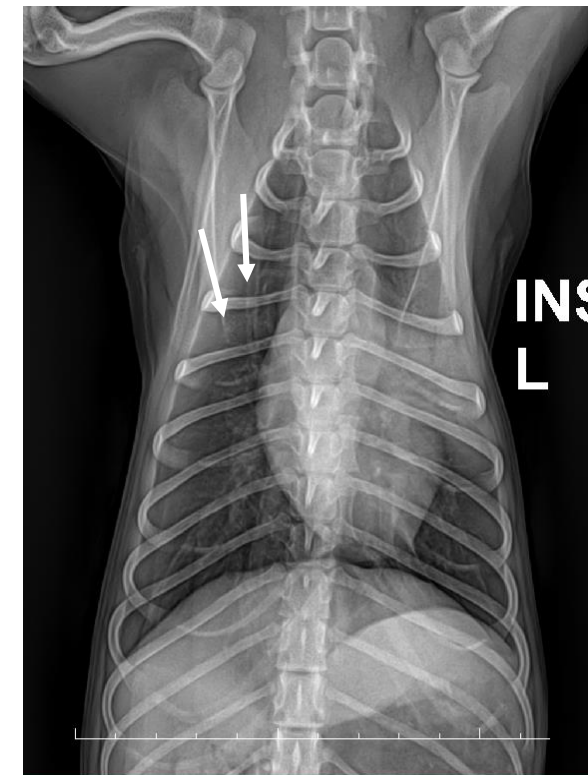
## Changes in CRP levels (② In Dogs with Bacterial Respiratory Diseases)

### Signalment

- Maltese, CM, 4 yrs

### History

- Regurgitation
- Coughing after a walk
- Vomiting once
  
- Antibiotics injection yesterday



Pulmonary infiltration

Date/Time : 2017-10-02 오후 3:02:19

Name	Unit	Min	Max	Result
cCRP	mg/L	0	10	103 HIGH

- \* High CRP associated with Pneumonia
- \* Low CRP associated with Pulmonary Edema

# Vcheck CRP & SAA

## CRP (C-reactive protein)

J VET EMERG CRIT CAR. 14(3), 183-186.  
J Vet Med Sci. 2017 Jan; 79(1): 35-40.

### Changes in CRP levels (③ In Dogs with Pancreatitis)

For diagnosing pancreatitis and monitoring hospitalized dogs

For predicting the prognosis

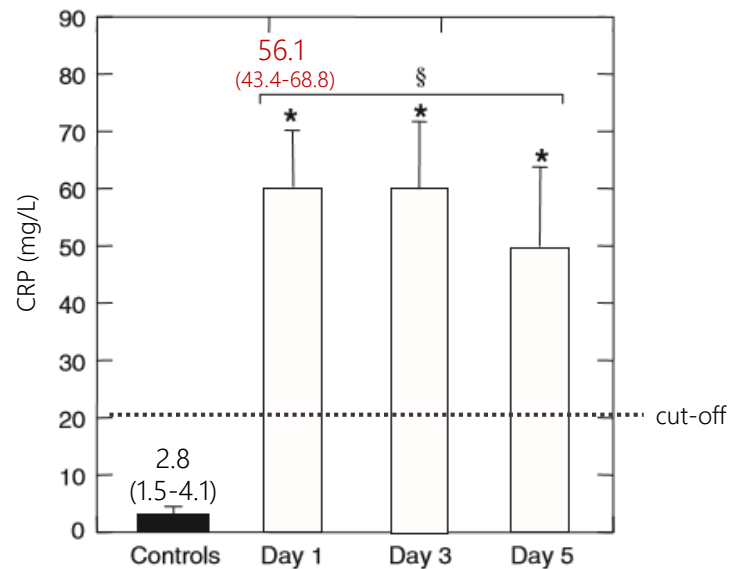


Fig 1. Mean CRP concentrations for healthy dogs and dogs with acute pancreatitis on Days 1, 3, and 5

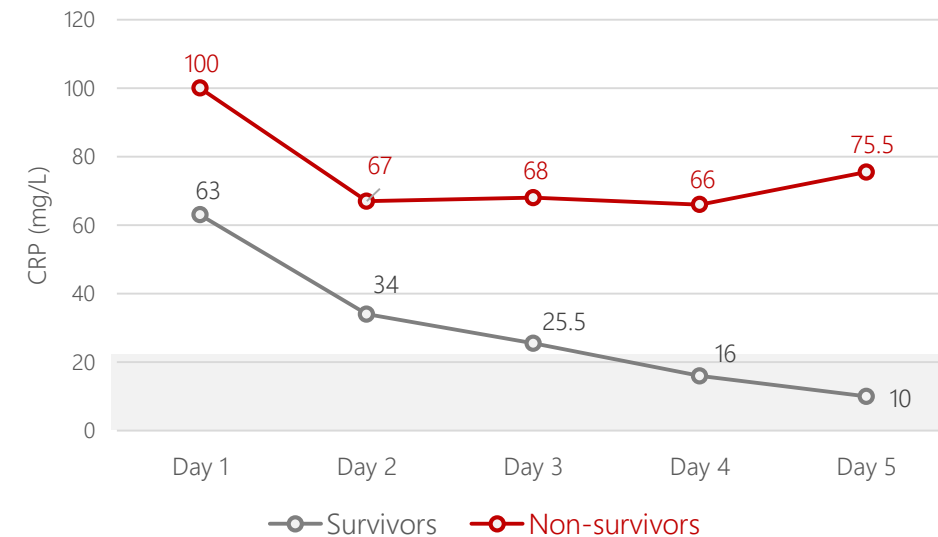


Fig 2. Time-course (days 1 to 5) change of CRP concentration in survivors and nonsurvivors

Vcheck CRP

# Clinical Applications in dogs

# CRP (C-reactive protein)

## Clinical Applications

When should we test for CRP?

- ① Regular Health Check
- ② Monitoring Response To Therapy By Serial Monitoring
- ③ After Surgery





# CRP (C-reactive protein)

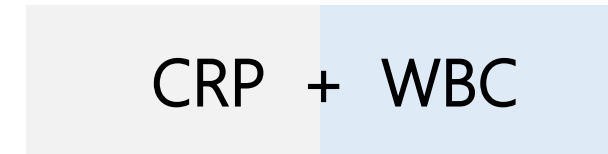
## Clinical Applications

### ① Regular Health Check

Confirms the presence of underlying inflammation

#### CRP, as a Regular Check

- ✓ Very useful to detect inflammation that cannot be detected by other inflammatory markers, such as WBC, neutrophil or ALB.
- ✓ So, the examination of CRP concentration is essential as a routine diagnostic test.



▲ Main Inflammatory markers  
(Combination)

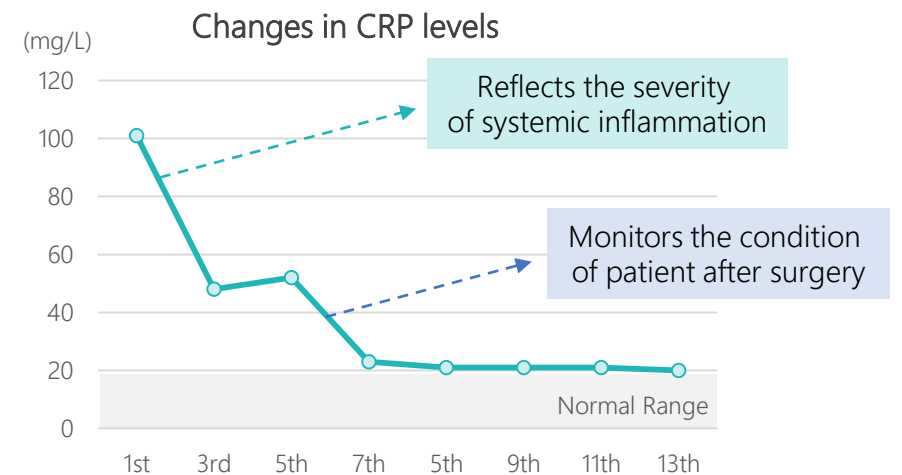
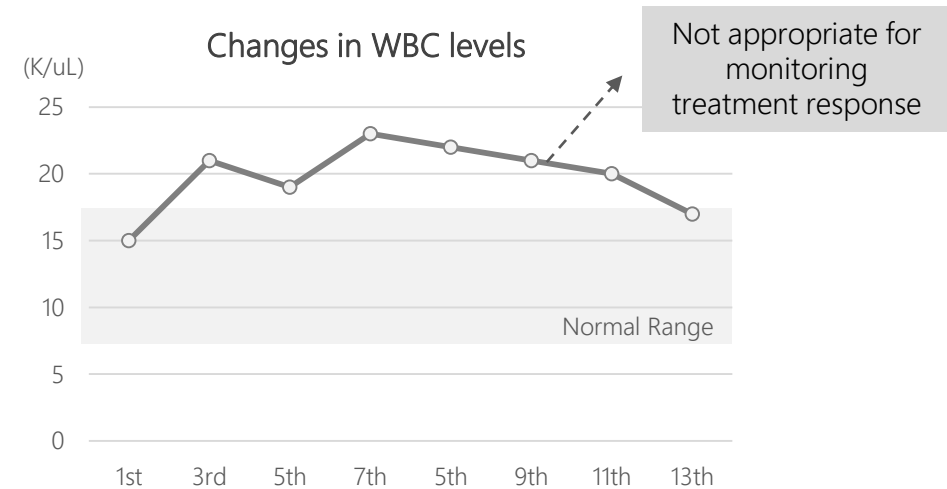
# CRP (C-reactive protein)

## Clinical Applications

### ② Monitoring Response To Therapy By Serial Monitoring

For evaluating treatment efficacy

- ✓ Promptly reflects the inflammatory extent of the body
- ✓ Choose an appropriate antibiotics by checking if the infection is responding to antibiotic therapy
- ✓ Measurement of the CRP concentration in dogs will be clinically valuable for detection of inflammation as well as determination of disease severity and evaluation of response to treatment.



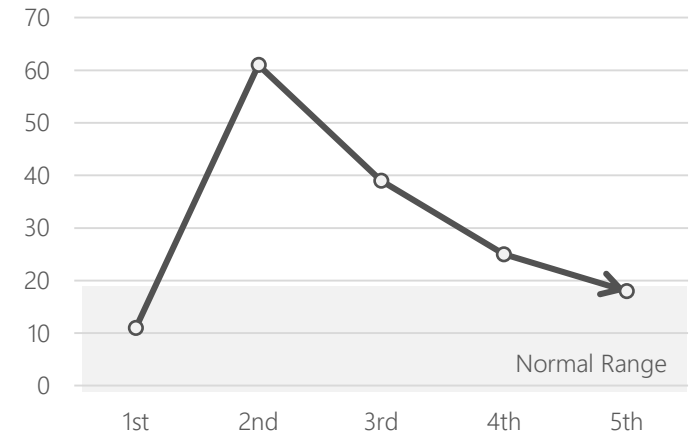
# CRP (C-reactive protein)

## Clinical Applications

### ③ After Surgery

Monitoring of post-operative effects and recovery

- ✓ CRP is a **useful marker of surgery** related systemic inflammation in dogs.
- ✓ Routine measurements of CRP concentrations could improve the assessment of postoperative inflammation and clinical decision making during recovery after surgery in dogs.

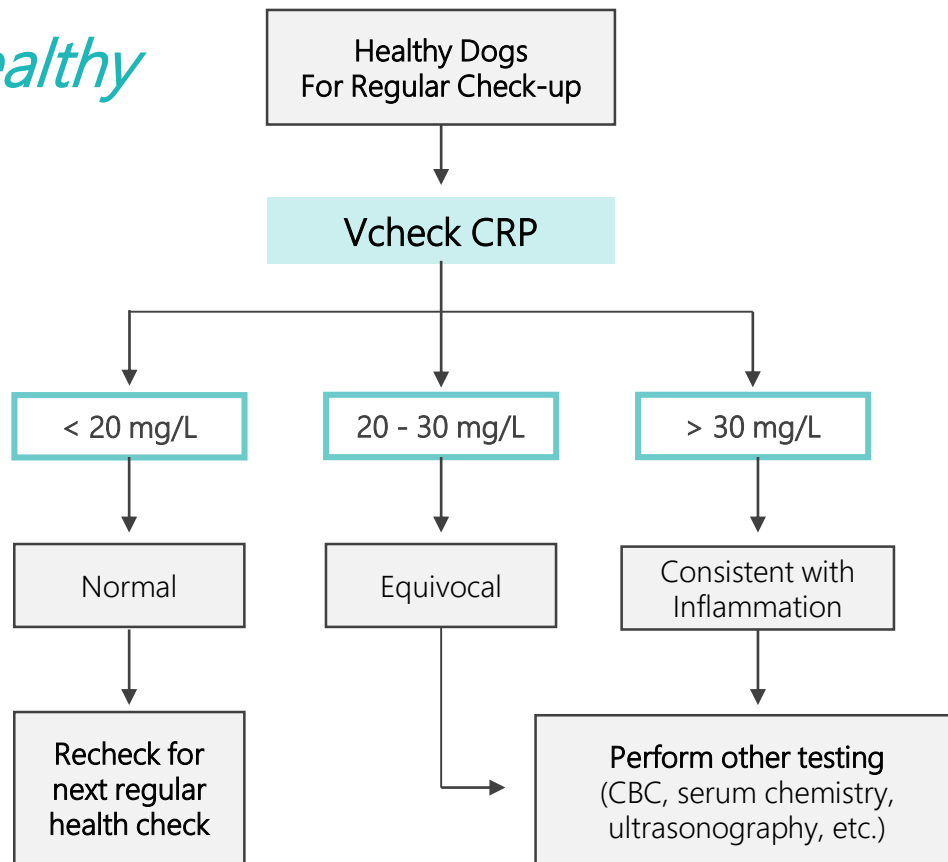


Changes in CBC levels after mastectomy

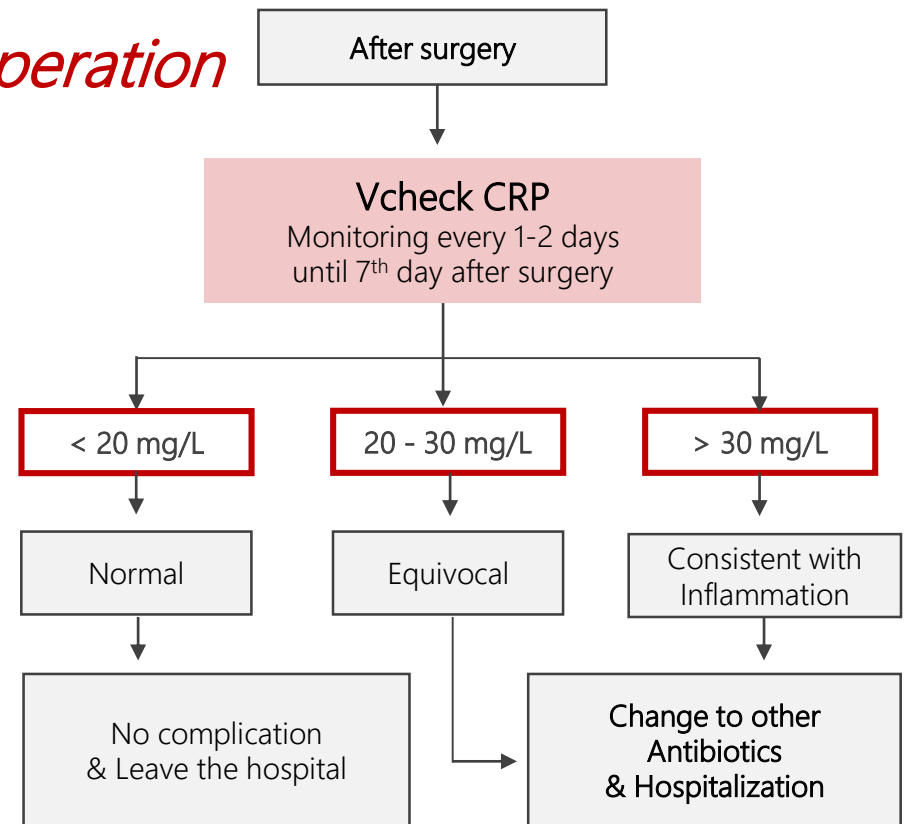
# CRP (C-reactive protein)

## Diagnostic Algorithm

### Healthy



### Post-operation



# CRP (C-reactive protein)

## Case Study 1

### Signalment

- Breed: Maltese
- Sex: Castrated Male
- Age: 15 yrs

### Chief Complaint

- Diarrhea (a couple of days)
- Anorexia (from yesterday)
- Vomiting (a couple of days, vomits often)
- Depression

### CRP level

- 160 mg/L

### Final Diagnosis

- Acute hepatitis



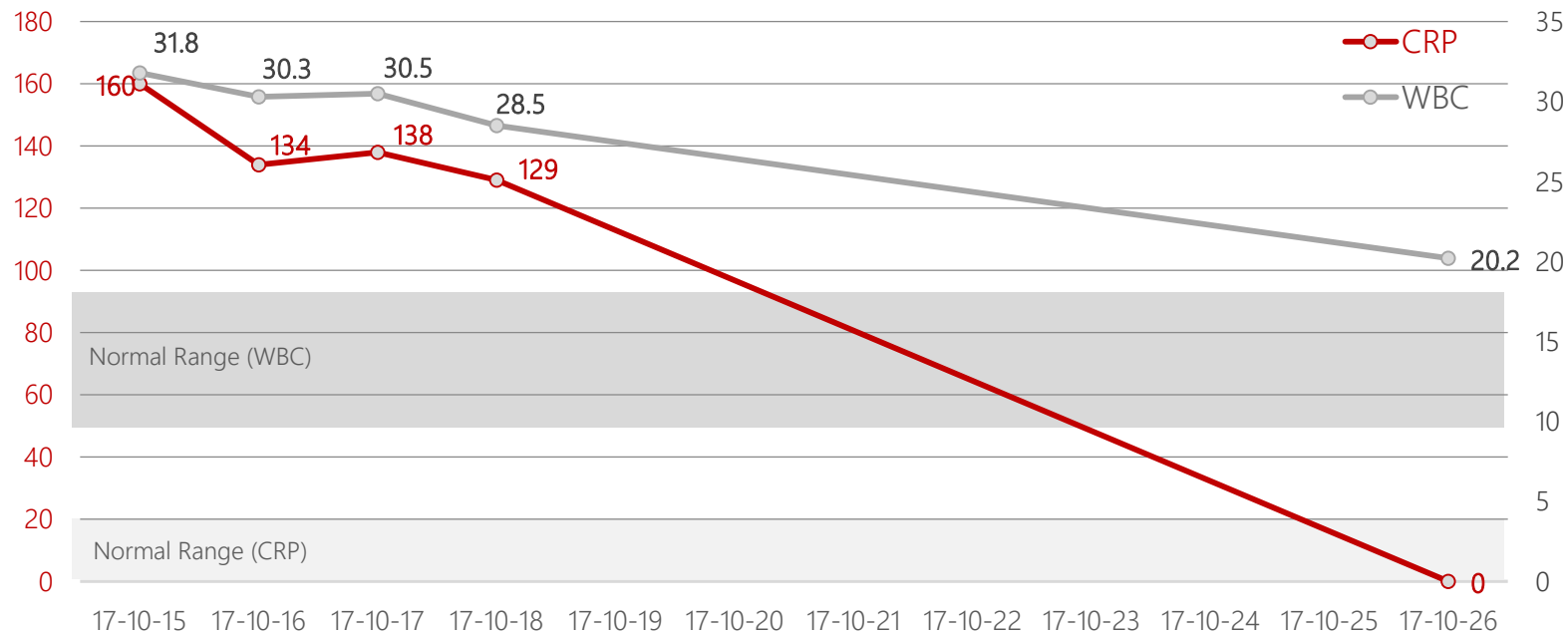
▲ Maltese, 15Y, Castrated Male

# Vcheck CRP & SAA

## CRP (C-reactive protein)

### Case Study 1

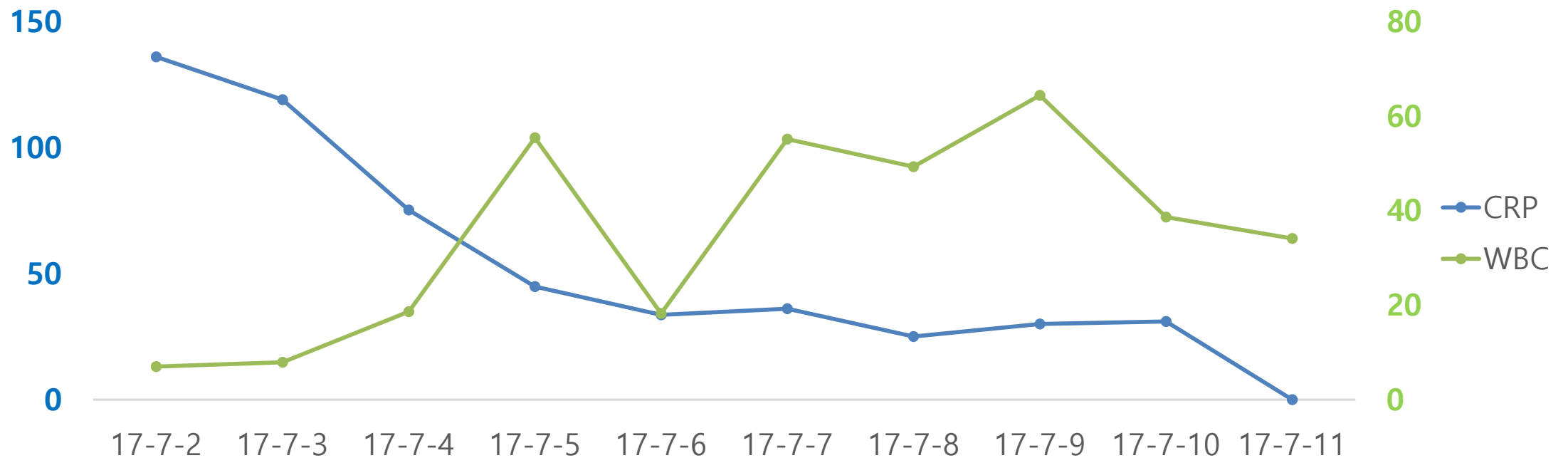
- CRP level was sharply decreased as the patient recovered.



▲ Maltese, 15Y, Castrated Male

# CRP (C-reactive protein)

## Case Study 2 (Pancreatitis & CRP)



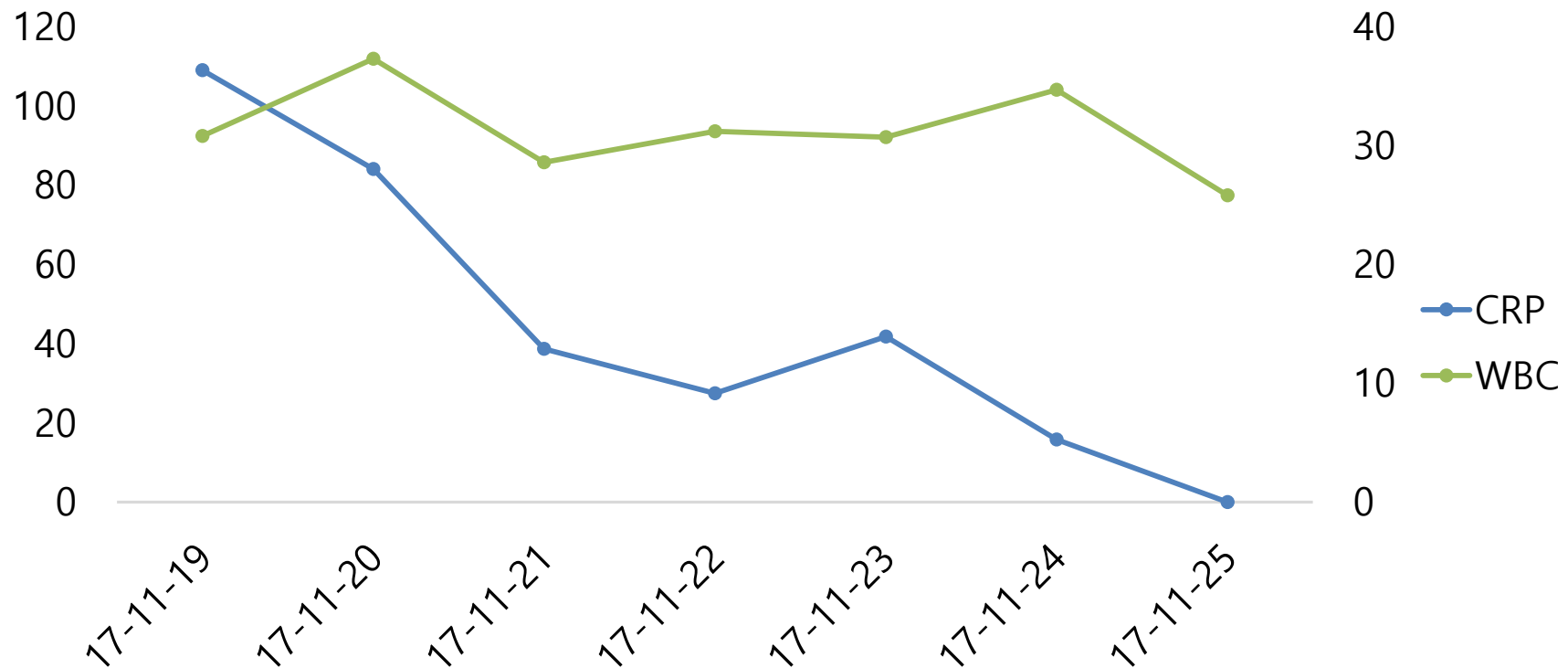
Recovered (started eating from 6<sup>th</sup> July)

→CRP level was decreased to a normal range (an accurate reflection of the animal's inflammatory status)

→On the other hand, there were fluctuations in the WBC count

# CRP (C-reactive protein)

## Case Study 3 (Otitis Interna Surgery & CRP)

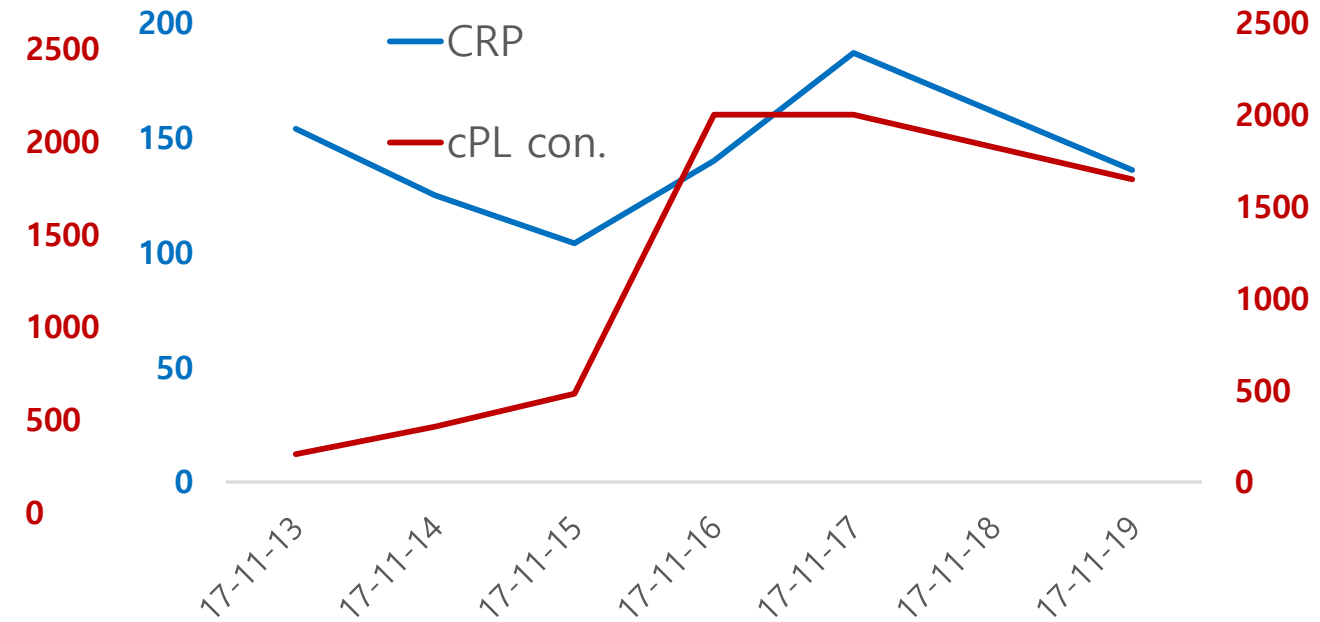
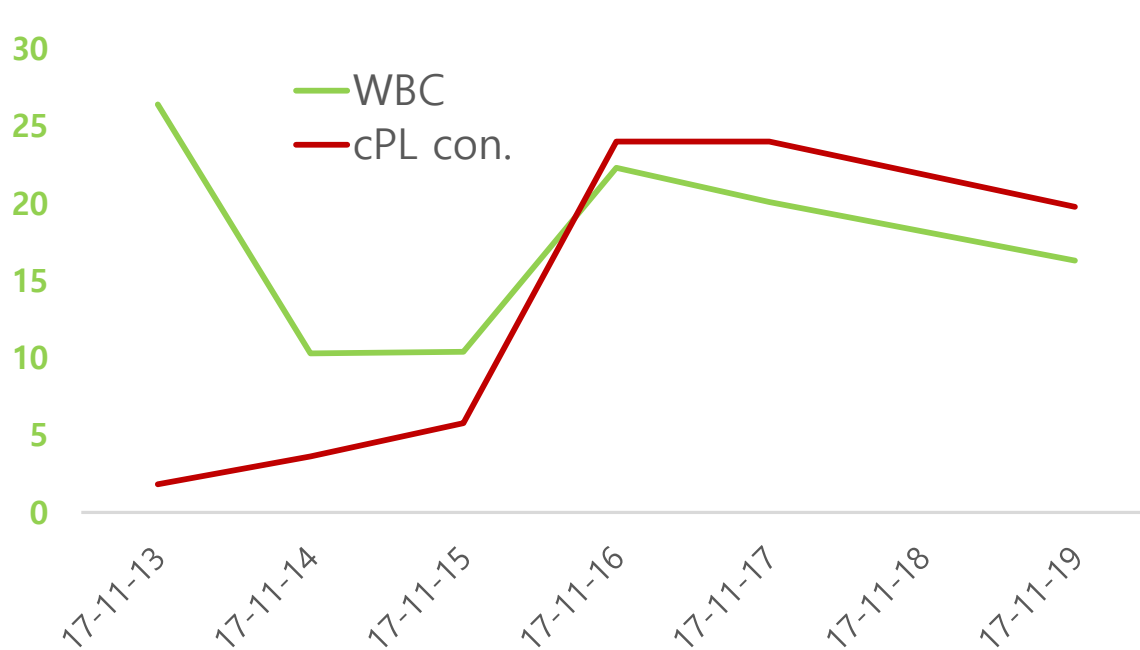


- 1 week post-surgery, the dog was suffered from circling, nystagmus and pain. Pet owner complained.
- However, CRP was continuously decreasing so that vet was ensured of good prognosis
- The dog was discharged and recovered afterall



# CRP (C-reactive protein)

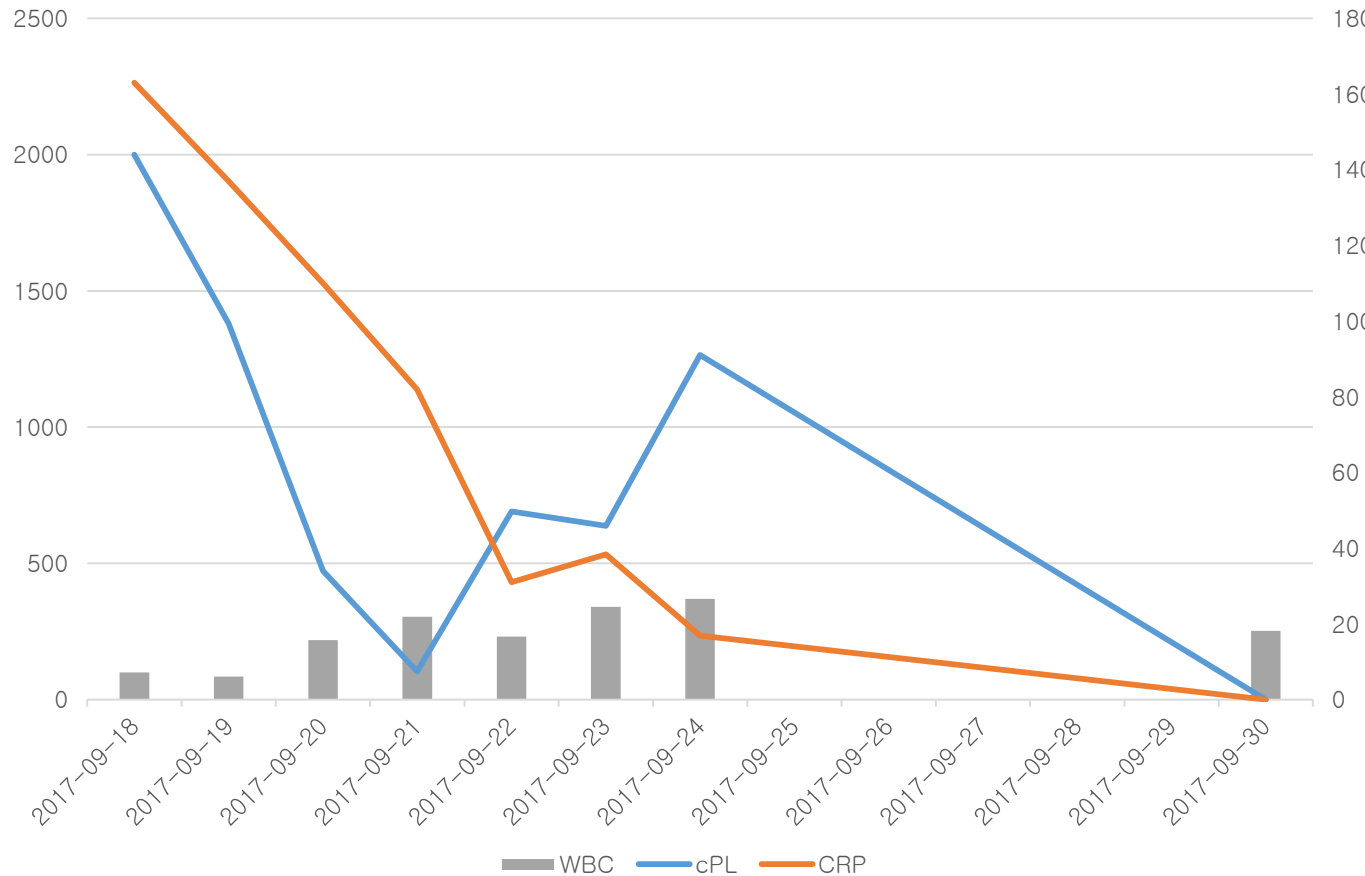
## Case Study 4 (Pancreatitis & CRP)



- 17yrs, Yorkshire Terrier
- CRP was high in entire time which indicates bad prognosis.
- The dog eventually died at 19<sup>th</sup> Nov but the vet expected it already from 5<sup>th</sup> Nov.
- Vet informed pet owner to be ready for his death.

# CRP (C-reactive protein)

## Case Study 5 (Pancreatitis & CRP)



\* Following proper Tx, clinical signs were absent.

\* When the animal started to eat on 21st Sept, cPL level was slightly increased (at the same time, CRP was still decreasing)

\* However, when the animal was fully recovered, CRP and cPL levels were decreased to a normal range in the end

# 01 Acute Phase Proteins

- What is Acute Phase Protein?
- CRP (C-reactive protein)
- SAA (Serum amyloid A)
- Case Study

# SAA (Serum amyloid A)

## Diagnostic properties

- ✓ SAA: Major APP in Cats
- ✓ Very low in healthy cats
- ✓ Increases up to 1,000-fold due to
  - Infection
  - Trauma
  - Tumors
  - Surgery
- ✓ Reaches a maximum 24 hours
- ✓ Prompt decreases after resolution of the stimulus
- ✓ Influenced by the severity of the inflammation
- ✓ Half-life: Short (20-24 hours)



These characteristics make  
**SAA** a useful marker of ongoing  
inflammatory activity!

# SAA (Serum amyloid A)

## When can SAA be elevated?

In cats, SAA concentration increases not only in inflammatory diseases but also in neoplastic and non-inflammatory diseases (Ex. diabetes mellitus, hyperthyroidism)

### Inflammatory diseases

- Gastroenteritis
- Feline infectious peritonitis (FIP)
- Cholangitis
- Rhinitis

### Neoplastic diseases

- Lymphoma
- Adenocarcinoma
- Mesothelioma
- Squamous cell carcinoma

### Other diseases

- Renal failure
- Diabetes mellitus
- Hyperthyroidism

# SAA (Serum amyloid A)

## When can SAA be elevated?

### Verification of Measurement of the Feline Serum Amyloid A (SAA) Concentration by Human SAA Turbidimetric Immunoassay and Its Clinical Application

K. SASAKI *ET AL.*

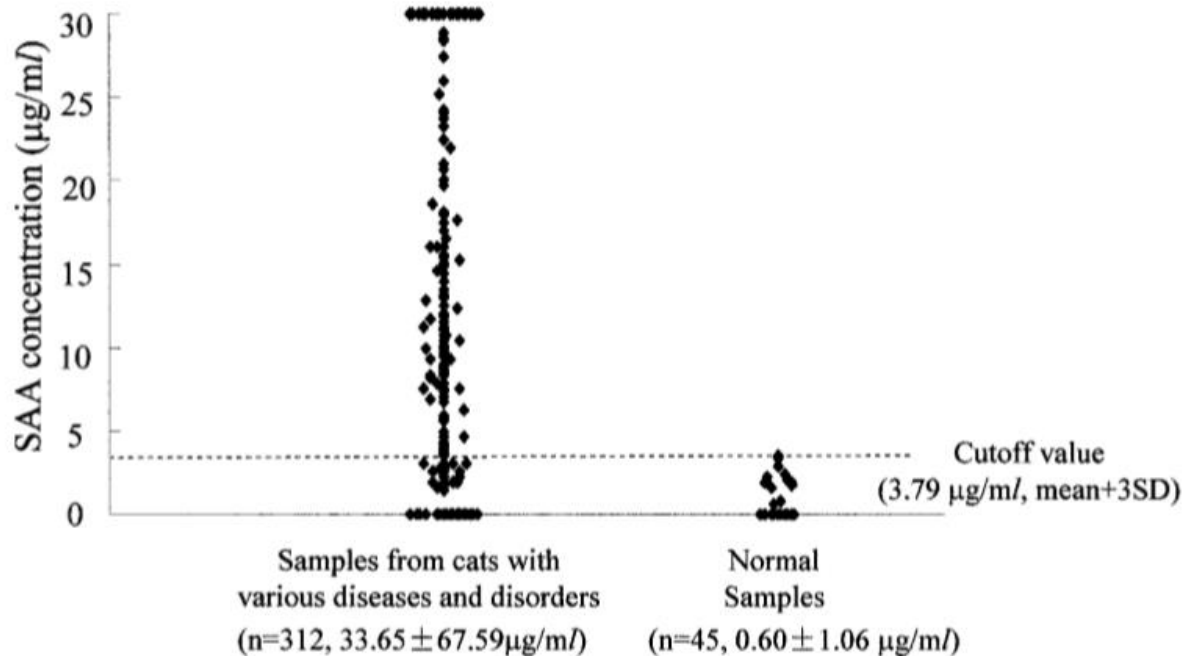
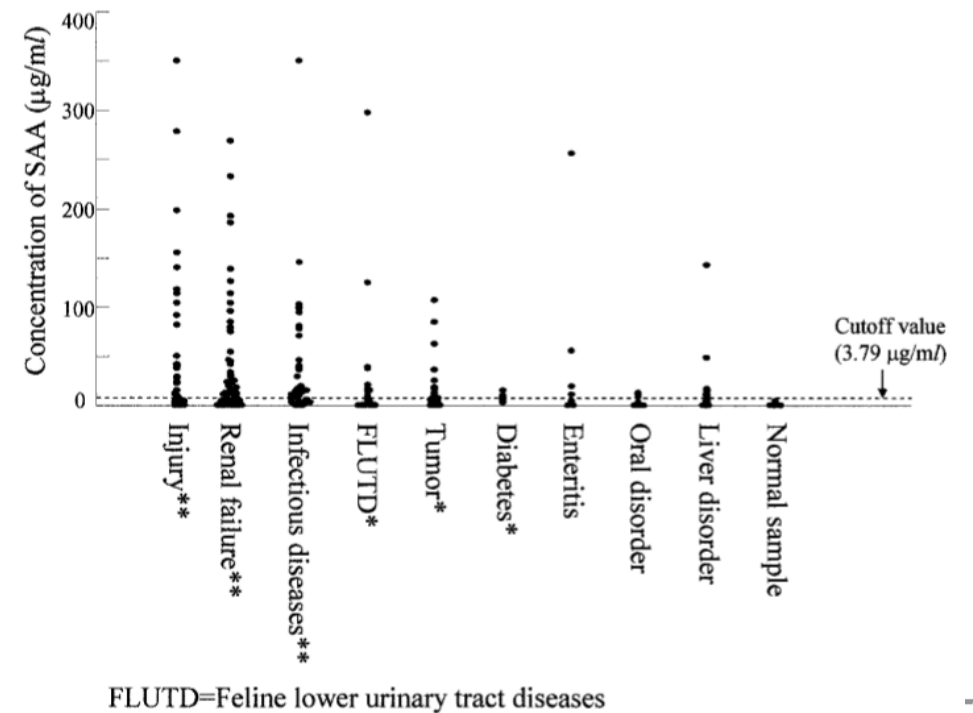


Fig. 1. Concentrations of fSAA in normal cats and diseased cats. The positive cutoff value was estimated as 3.79 µg/ml, and indicated by a dotted line. To make the figure clear, the values which are higher than 30 µg/ml are plotted as 30 µg/ml.

FELINE SAA AS AN INFLAMMATORY MARKER



FLUTD=Feline lower urinary tract diseases

Fig. 2. SAA concentrations in cats suffering from various diseases. The serum samples showing significant difference to the normal samples are marked by \*\* ( $p < 0.001$ ) and \* ( $p < 0.05$ ).

Vcheck SAA

# Clinical Applications in cats

# SAA (Serum amyloid A)

## Clinical Applications

When should we test for SAA?

- ① After Surgery
- ② Serial Monitoring During Treatment
- ③ Regular Health Check





# SAA (Serum amyloid A)

## Clinical Applications

When should we test for SAA?

### ① After Surgery

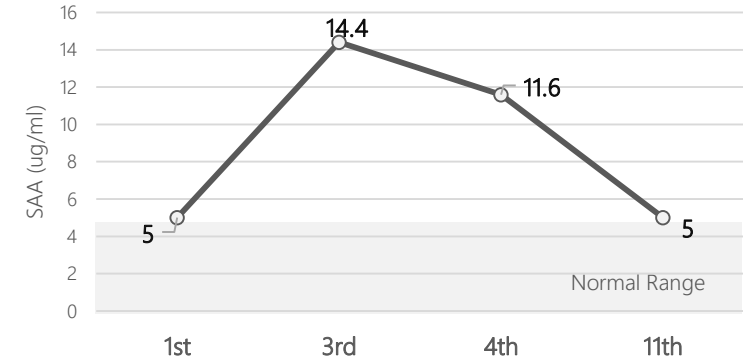
Monitoring the post-operative effects and recovery after surgery

- Useful in early detection of post-surgical infections
- Changes in SAA concentrations at different time points can be used to detect infectious post-surgical complications.

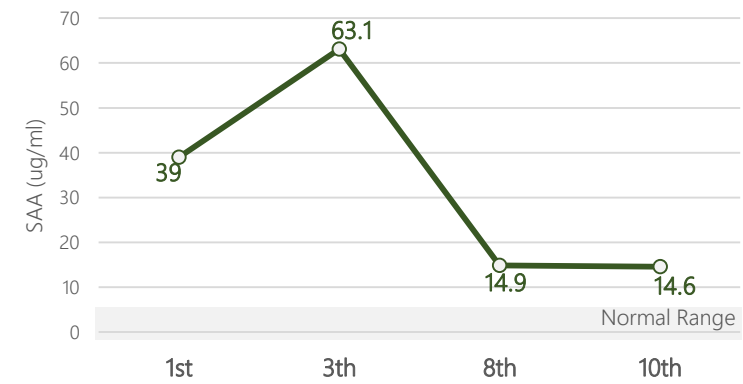
### Serial measurements

(Recommended)

- ① Before surgery
- ② Immediately after surgery
- ③ 2-3 times every 12 hours



▲ After diaphragmatic hernia repair



▲ After cystolithotomy

# SAA (Serum amyloid A)

## Clinical Applications

When should we test for SAA?

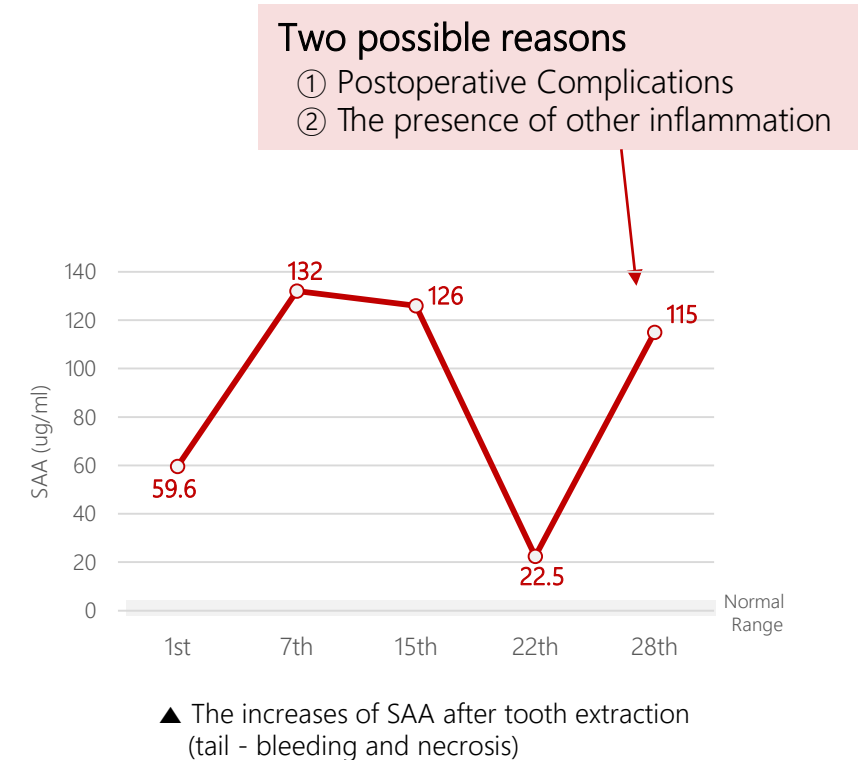
### ① After Surgery

Monitoring the post-operative effects and recovery after surgery

- Useful in early detection of post-surgical infections
- Changes in SAA concentrations at different time points can be used to detect infectious post-surgical complications.

Serial measurements  
(Recommended)

- ① Before surgery
- ② Immediately after surgery
- ③ 2-3 times every 12 hours



# SAA (Serum amyloid A)

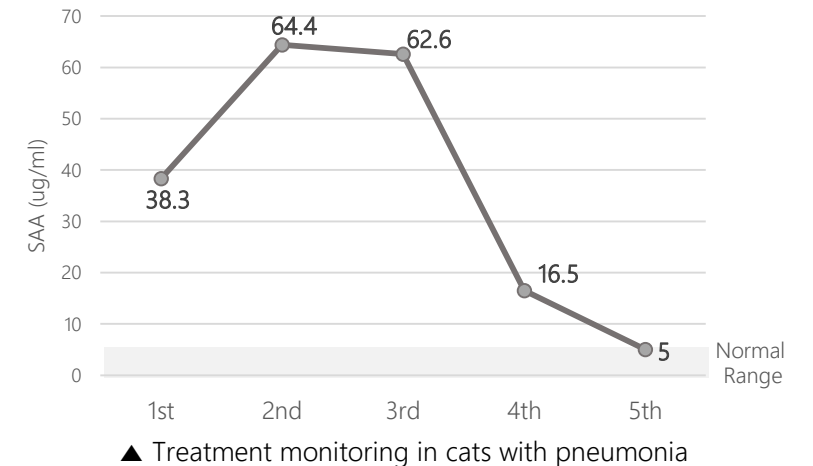
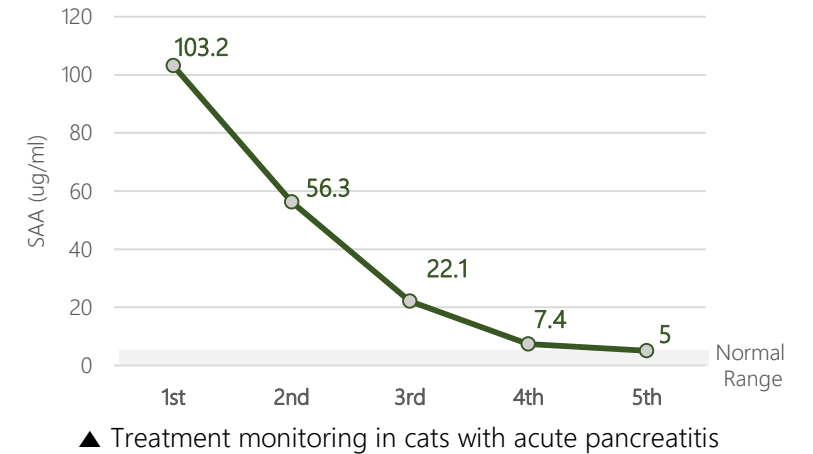
## Clinical Applications

When should we test for SAA?

### ② Serial Monitoring During Treatment

Monitoring the treatment response to inflammation

- Cats with high SAA values at the first visit  
: Useful as a monitoring tool for the response to treatment
- A decrease in SAA conc. between two consecutive time points  
: Positive response to treatment





## Clinical Applications

When should we test for SAA?

### ③ Regular Health Check

Detecting the presence of inflammation in cats with no clinical signs

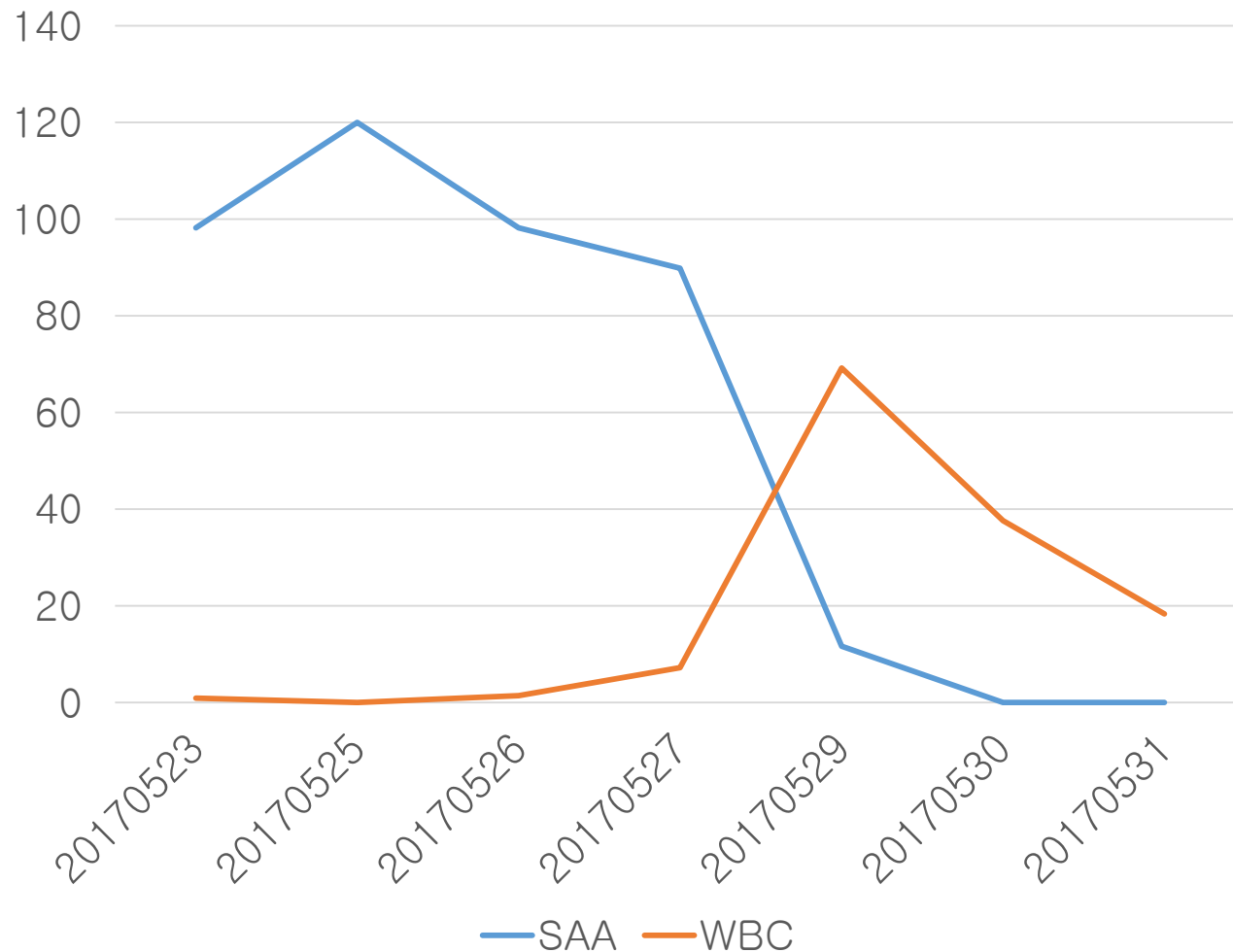
- Increase in the early stage of inflammation and in cases of tissue damage
- Enables early detection of inflammation before the presence of clinical symptoms

Cats have a deep natural instinct to hide their pain.

Even if no other signs or symptoms are present initially, assessment of inflammation should be performed.

# SAA (Serum amyloid A)

## Case Study 1 (Feline Parvo virus & SAA)



- KSH/Female/2month
- Clinical sign  
diarrhea, anorexia, dehydration, depression
- FPV(panleukopenia virus) Ag positive  
FPV decreases WBC
- SAA is helpful for monitoring disease.

## Case Study 2 (Pancreatitis& SAA, WBC, TLI)

Veterinary Clinical Pathology ISSN 0275-6382

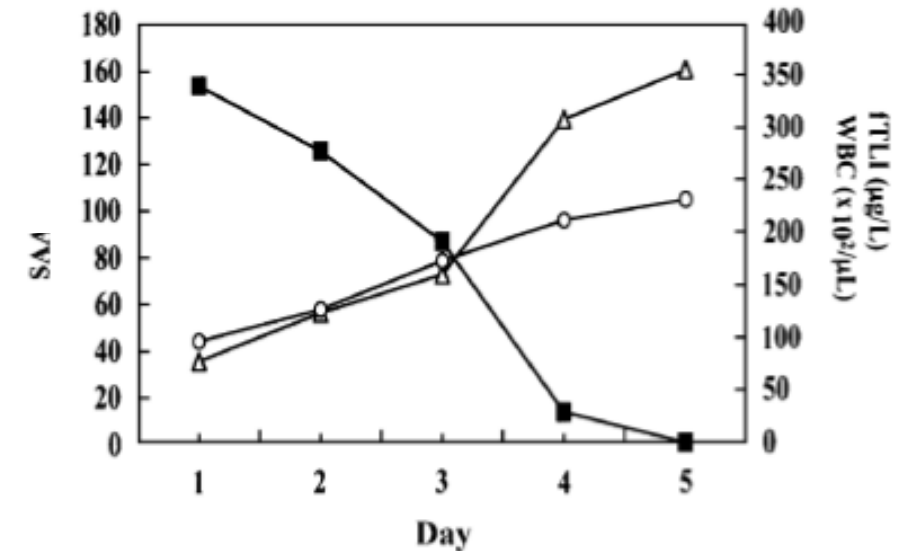
### CASE REPORT

#### Time-course monitoring of serum amyloid A in a cat with pancreatitis

Takashi Tamamoto, Koichi Ohno, Aki Ohmi, Izumi Seki, Hajime Tsujimoto

Department of Veterinary Internal Medicine, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan

- 6-year-old, neutered male, domestic shorthair
- 2-day history of anorexia, vomiting and fever
- On day 1 of treatment SAA conc. was markedly higher( 153.5mg/L)
- On day 1 of treatment fTLI conc was within the reference interval (79ug/L) ; Reference range(12~82 ug/L)
- WBC, fTLI had increased (WBC 23,100/ul; segmented neutrophils 20,790/ul; band neutrophils 690/ul; fTLI 355ug/L)



**Figure 1.** Time-course of changes in SAA concentration (■), WBC count (○), and fTLI concentration (△) in a cat presenting with pancreatitis on day 1 and during 5 days of treatment with plasma transfusion, intravenous fluids, prednisolone, and antibiotics.

## Precautions in CRP/SAA analysis

### End-stage hepatic failure

- **Liver:** only source of APPs
- In end-stage liver disease, CRP/SAA are not consistent with disease status

### Immune-compromised / young animals (under 3 months)

- Cytokine production unavailable due to lack of immunity → **low CRP production**
- Impair diagnostic sensitivity

### Normal increase in pregnant animals

- Period: 21~55 days after ovulation
- Due to endometrial injury caused by implantation

### Low Specificity of APP

- Underlying diseases of pathologic conditions may mask the changes of APPs from treatment

# Product Introduction

- Vcheck CRP 2.0
- Vcheck SAA 2.0



# Vcheck CRP 2.0, SAA 2.0

## Specifications

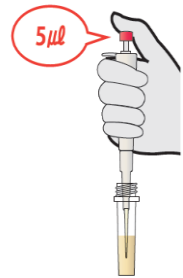


- Species: Dog
  - Sample: Serum, Plasma(heparin) 5  $\mu$ l
  - Testing Time: 5 min.
  - Measuring Range: 10 - 200 mg/L
  - Storage temperature: 1 - 30  $^{\circ}$ C
- 
- Species: Cat
  - Sample: Serum, Plasma(heparin) 5  $\mu$ l
  - Testing Time: 5 min.
  - Measuring Range: 5 - 200  $\mu$ g/mL
  - Storage temperature: 1 - 30  $^{\circ}$ C

# Vcheck CRP 2.0, SAA 2.0

## Test procedure & Interpretation

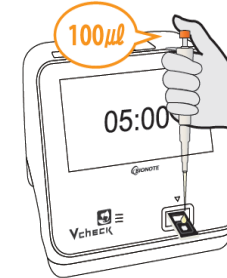
- Simple procedure and quick results within 5 min.



Draw 5 µl of sample and add it into an assay diluent bottle



Mix well 5-6 times



Add 100 µl of mixture in the sample hole of the test device



< 20 mg/L	20 - 30 mg/L	> 30 mg/L
Normal	Equivocal Systemic inflammation possible Re-evaluation recommended	Abnormal Consistent with inflammation



< 5 µg/ml	5 – 10 mg/L	> 10 mg/L
Normal	Equivocal Systemic inflammation possible Re-evaluation recommended	Abnormal Consistent with inflammation

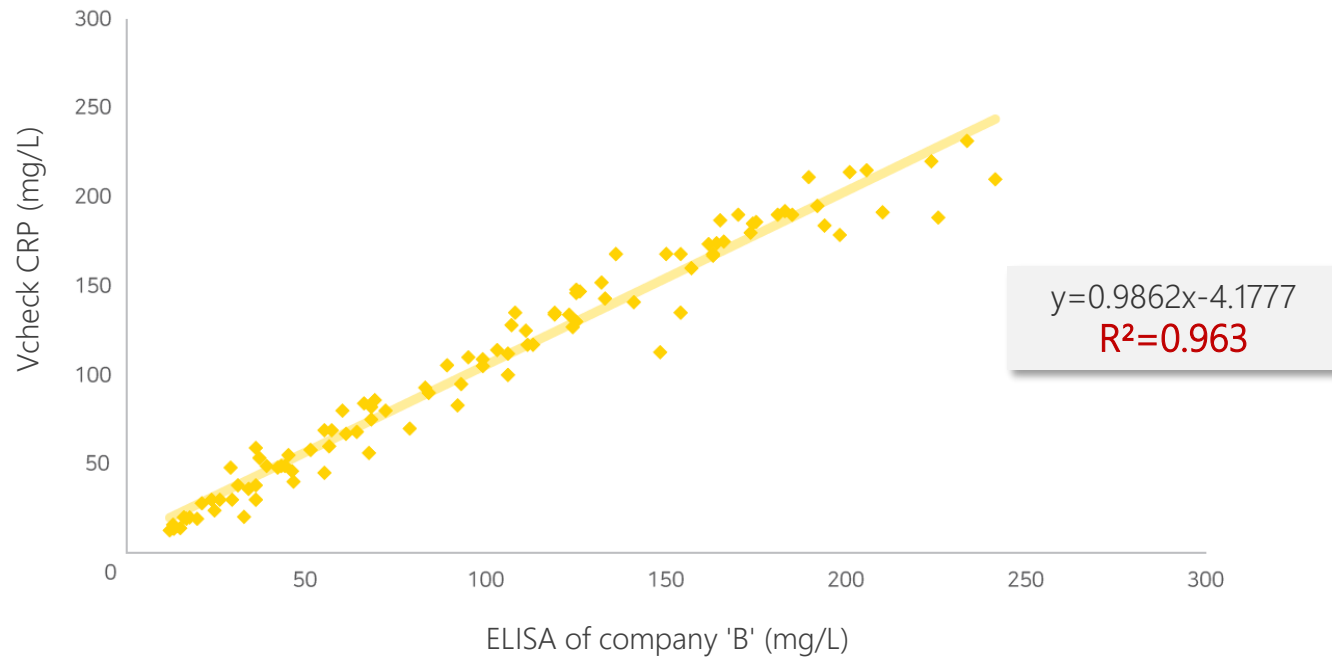
※ For more information, refer to the diagnostic algorithm.

# Vcheck CRP 2.0, SAA 2.0



## Evaluation Data

- Correlation with ELISA of company 'B' (N=100)
  - Proven Accuracy and Reproducibility
  - Correlated against gold standard methods

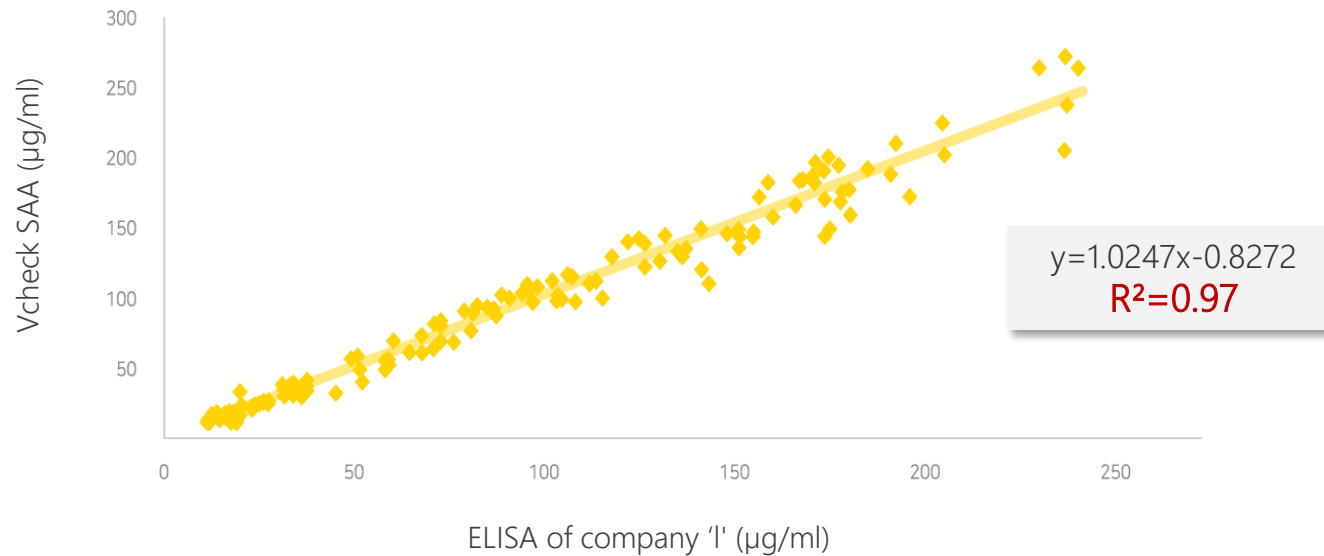


# Vcheck CRP 2.0, SAA 2.0



## Evaluation Data

- Correlation with ELISA of company 'I' (N=135)
  - Proven Accuracy and Reproducibility
  - Correlated against gold standard methods



# Vcheck CRP 2.0, SAA 2.0



## Evaluation Data

- Correlation between the results of Vcheck cCRP and company 'I' CRP in canine samples (n=22)

Evaluated by Videbaek Veterinary Clinic, Denmark

Measurement of CRP	(mg/L)	Vcheck cCRP			Sum
		Normal	Equivocal	Abnormal	
IDEXX < 10.7 Normal	Normal	19	1	0	20
	Equivocal	0	0	0	0
	Abnormal	0	1	1	2
	Sum	19	2	1	22

Based on these results, the Vcheck CRP provides accurate and reliable test results in blood samples from dogs, as compared to company 'I' laboratories results.

**Evaluation of the correlation between Bionote Vcheck and IDEXX for canine biomarkers (cCRP, cPL, cT4)**

**Key words:** Bionote, Vcheck, V200, CRP, cPL, T4, Canine pancreatitis, Canine hypothyroidism

**Introduction**  
C-reactive protein (CRP) plays an important role in the acute phase reaction and is elevated in canine patients with inflammatory conditions. Measuring the CRP concentration along with WBC counts is clinically valuable as a screening test for new patients to detect inflammation.

**Materials and Methods**  
Twenty-two, client-owned dogs were presented to the Videbaek Veterinary Clinic, Denmark. A total 22 canine blood samples were analyzed with Vcheck (V200) and an IDEXX device according to the manufacturer's instructions. CRP, cPL, and canine T4 concentrations were measured in blood samples.

**Results**  
The test results for the correlation of CRP, cPL, and T4 between Bionote Vcheck (V200) and IDEXX are shown in figures 1, 2 and 3.

**Conclusion**  
This study indicates that Vcheck CRP, cPL and T4 have high correlation with an IDEXX device used in Videbaek Veterinary Clinic, Denmark. Based on these results, the Vcheck CRP, cPL and T4 provide accurate and reliable test results in blood samples from dogs, as compared to IDEXX results.

**Purpose**  
The objective of this test was to conduct a comparison of Canine biomarkers like CRP, cPL, cT4 between the Vcheck (V200) and IDEXX, in order to ensure that there are no significant differences between the results.

**References**  
1. J. Am. Vet. Med. Assoc. 2008;182(2): 127-131.  
2. Vet Clin North Am. 2003 Sep;38(3):363-373.  
3. Vet Clin North Am. 2003 Sep;38(3):313-324.  
4. W. J. Vet. 2011 May;38(5):105-114.

# Vcheck CRP 2.0, SAA 2.0

## Evaluation Data



- Correlation between the results of Vcheck fSAA and company 'I' SAA in feline samples (n=16)

Evaluated by Videbaek Veterinary Clinic, Denmark

Measurement of fSAA	(µg/ml)	Vcheck fSAA			Sum
		Normal	Equivocal	Abnormal	
IDEXX < 3.9 Normal	Normal	11	0	0	11
	Equivocal	0	0	0	0
	Abnormal	2	0	3	5
	<b>Sum</b>	<b>13</b>	<b>0</b>	<b>3</b>	<b>16</b>

Measurement of fSAA	(µg/ml)	Vcheck fSAA			Sum
		Normal	Equivocal	Abnormal	
IDEXX < 3.9 Normal	Normal	11	0	0	11
	Equivocal	0	0	0	0
	Abnormal	2	0	3	5
	<b>Sum</b>	<b>13</b>	<b>0</b>	<b>3</b>	<b>16</b>

### Evaluation of the correlation between Bionote Vcheck and IDEXX laboratories for feline biomarkers (fSAA, fPL, T4)

Key words: Bionote, Vcheck, V200, fSAA, fPL, T4, Feline pancreatitis, Feline hyperthyroidism

#### Introduction

Serum amyloid A (SAA) can be a useful marker for indicating the status of some inflammatory diseases of cats. The concentration of SAA increases significantly in some disorders, such as injury, infectious diseases and tumors. fPL (feline Pancreas-specific Lipase) originates exclusively from the exocrine pancreas. Owing to their high sensitivity and specificity for pancreatitis compared with those of other serum tests, concentrations of fPL have been demonstrated to be the serum tests of choice for evaluation of cats suspected of having pancreatitis. Feline hyperthyroidism is the most common endocrine disorder of cats. Most hyperthyroid cats develop a clearly high T4 level, confirming the diagnosis.

#### Purpose

The objective of this test was to conduct a comparison of feline biomarkers, such as fSAA, fPL and T4, between the Vcheck (V200) and an IDEXX device in order to ensure that there are no significant differences between the results.

#### Materials and Methods

Seventeen, client-owned cats were presented to the Videbaek Veterinary Clinic, Denmark. Total 17 feline blood samples were analyzed with Vcheck (V200) and at IDEXX laboratories according to the manufacturer's instructions. fSAA, fPL and feline T4 concentrations were measured in blood samples.

#### Results

The test results for the correlation of fSAA, fPL and feline T4 between Bionote Vcheck (V200) and IDEXX laboratories are shown in figures 1, 2 and 3.

#### Conclusion

This study indicates that Vcheck fSAA, fPL and feline T4 have high correlation with IDEXX laboratories used by Videbaek Veterinary Clinic, Denmark. Based on these results, the Vcheck fSAA, fPL and T4 provide accurate and reliable test results in blood samples from cats, as compared to IDEXX laboratories results.

Reference  
1. J. Am. Vet. Assoc. 2003 Apr;163(8):1045-8.  
2. Compend Contin Educ Vet. 2013 Aug;35(8):E3

Based on these results, the Vcheck fSAA provides accurate and reliable test results in blood samples from cats, as compared to company 'I' laboratories results.

# Vcheck CRP 2.0, SAA 2.0



## Clinical guidelines for users

- You can refer to the clinical guidelines for details about canine CRP and Feline SAA

### Vcheck cCRP

#### What is CRP?

- C-reactive protein (CRP) is a major acute phase protein in dogs.
- Its concentrations increase in dogs with systemic inflammation following surgery, trauma, infections, or neoplasia.



#### Why is CRP important?

- Compared to other markers of inflammation like body temperature and leukocyte counts, CRP has been suggested to be a more sensitive and reliable marker of systemic inflammation in dogs.
  - CRP concentration is very low in healthy patients
  - Increases within 4-6 h after inflammatory stimuli → Reaching peak concentrations 24-48 h
  - Normalizing quickly during recovery (when the causative agent ends)
- The magnitude of increase in CRP concentration reflects the degree of systemic inflammation, and CRP concentrations decline with successful treatment of inflammatory diseases. CRP can also be used to quantify the degree of inflammation.

#### When can CRP be elevated?

- Measurement of CRP is valuable in a clinical setting to diagnose systemic inflammation in dogs. Increased CRP concentrations have been reported in a large number of conditions, including bacterial, viral and parasitic infection, immune-mediated disease, neoplasia, sterile inflammation, and surgical trauma.

Infectious diseases	leishmaniasis, leptospirosis, parvovirus, ehrlichiosis, etc.
Specific inflammatory conditions	Inflammatory bowel disease, uremia, allergies, and immune-mediated disease, etc.
Endocrine and Metabolic disease	
Non-specified neoplastic conditions	



References  
 1. Iwama, M., et al. (2015). Canine C-reactive protein (CRP) concentration in dogs with various diseases. J. Vet. Med. Small Clin. Anim. Clin. 108(1), 45-50.  
 2. Matsuda, K., et al. (2015). Quantitative marker of surgical trauma and post-surgical complications in dogs: a systematic review. J. Vet. Med. Small Clin. Anim. Clin. 108(1), 45-50.  
 3. New Website: Canine C-reactive Protein (CRP) Update 2016

### Vcheck cCRP

#### When should we test for CRP?

- Regular check-up**  
To confirm the presence of underlying inflammation  
CRP can be useful to detect inflammation that cannot be detected by other inflammatory markers, such as WBC, neutrophil or ALB, suggesting that the examination of CRP concentration is essential as a routine diagnostic test.
- Monitoring response to therapy by serial monitoring**  
For evaluating treatment efficacy  
The CRP level promptly reflect the inflammatory extent of the body. Measurement of the CRP concentration in dogs will be clinically valuable for detection of inflammation as well as determination of disease severity and evaluation of response to treatment.



- After Surgery**  
To monitor post-operative effects and recovery  
CRP is a useful marker of surgery related systemic inflammation in dogs. Routine measurements of CRP concentrations could improve the assessment of postoperative inflammation and clinical decision making during recovery after surgery in dogs.



### Vcheck fSAA

#### What is SAA?

- Serum amyloid A (SAA) is one of the major acute phase proteins in cats.
- The acute phase response is part of the initial response to inflammatory stimuli such as infection, trauma, tumors and surgery.



#### Why is SAA important?

- SAA concentration may increase up to 1,000-fold due to inflammation in cats. Therefore, measurement of SAA concentration is considered useful for detecting inflammation.
  - Increases 3-6 h following an inflammatory stimulus
  - Reaches a maximum 21-24 h after initial stimulation
- The SAA concentration is influenced by the severity of the inflammation, such as systemic or focal, or nature of the inflammation, such as acute or chronic.

#### When can SAA be elevated?

- In cats, SAA concentration increases not only in inflammatory diseases but also in neoplastic and noninflammatory diseases, such as diabetes mellitus and hyperthyroidism.
  - Inflammatory diseases**
    - Gastroenteritis
    - Feline infectious peritonitis (FIP)
    - Cholangitis
    - Rhinitis
  - Other diseases**
    - Renal failure
    - Diabetes mellitus
    - Hyperthyroidism
  - Neoplastic diseases**
    - Lymphoma
    - Adenocarcinoma
    - Mesothelioma
    - Squamous cell carcinoma



References  
 1. Tanemoto T, Ohno K, Ohmi A, et al. (2008). Verification of measurement of the feline serum amyloid A (SAA) concentration by human SAA turbidimetric immunoassay and its clinical application. J. Vet. Med. 93: 1247-1252.  
 2. Tanemoto T, Ohno K, Tanemoto M, Hasegawa K, Fujie S, Tsujimoto H. Serum amyloid A as a prognostic marker in cats with various diseases. J. Vet. Med. Invest. 2015; 9: 422-427.  
 3. Li, M., et al. (2015). Evaluation of feline serum amyloid A (SAA) as an inflammatory marker. Journal of Veterinary Medical Science, 85: 349-354.  
 4. Li, M., et al. (2016). Evaluation of a Commercially Available Human Serum Amyloid A (SAA) Turbidimetric Immunoassay for Determination of Feline SAA Concentration. Vet. Research Communications, 30 (2016) 868-872.  
 5. Roberts Trolle, Marie Ovarin, et al. Serum amyloid A in the diagnosis of feline sepsis. J. Vet. Diagn. Invest. 20(6) 888-893.

### Vcheck fSAA

#### When should we test for SAA?

- After surgery**  
Monitoring the post-operative effects and recovery after surgery  
SAA test is useful in early detection of post-surgical infections. Changes in SAA concentrations at different time points can be used to detect infectious post-surgical complications.

- Serial measurements (recommended)
  - Before surgery
  - Immediately after surgery
  - 2-3 times every 12 hours



- Continuous Monitoring**  
Monitoring the treatment response to inflammation  
Serial measurements of SAA are useful as a monitoring tool for the response to treatment of cats with high SAA values at the first visit. A decrease in SAA concentrations between two consecutive time points could be associated with positive response to treatment.



- Regular check-up**  
Detecting the presence of inflammation in cats with no clinical signs  
Serum amyloid A (SAA) is reported to increase in the early stage of inflammation and in cases of tissue damage, enabling early detection of inflammation before the presence of clinical symptoms.

Thank you for your attention  
Any Questions?

BIONOTE Marketing team

Apr. 2020

