Clinical Significance and Application of Feline Serum Amyloid A (fSAA)

WOODLEY EQUIPMENT COMPANY LTD.

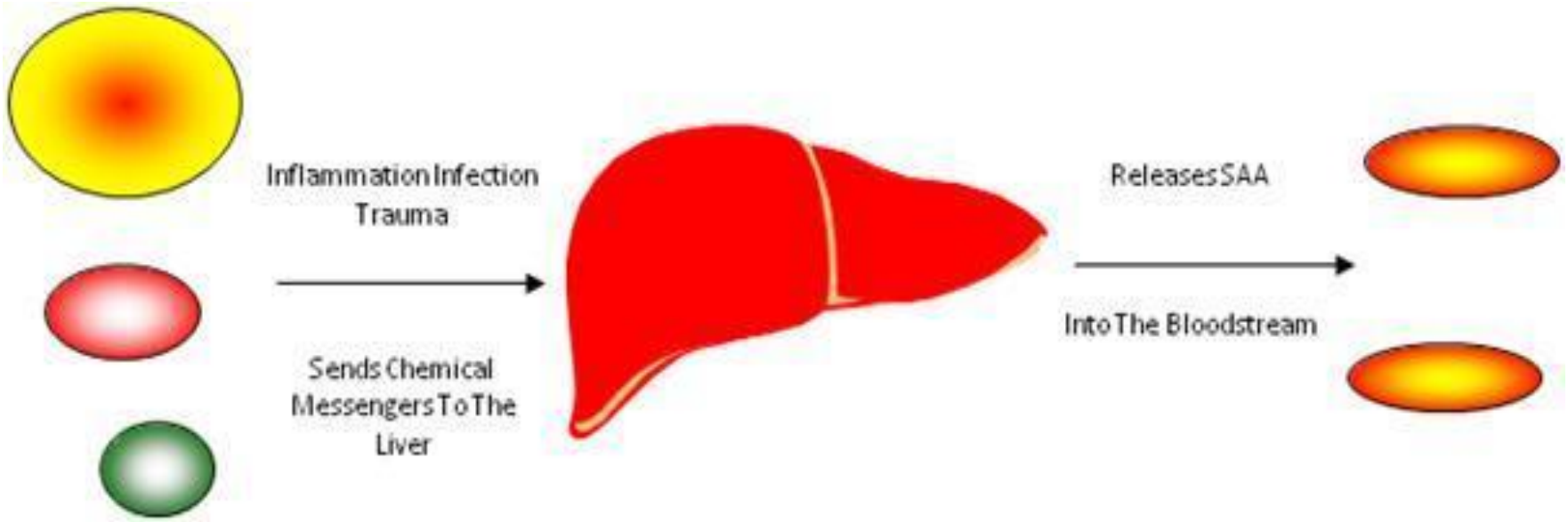
InSight V-IA®

Contents

InSight V-IA®

a. What is SAA?

SAA is an acute phase protein secreted by the liver and binds to high density lipoprotein (HDL) in plasma.

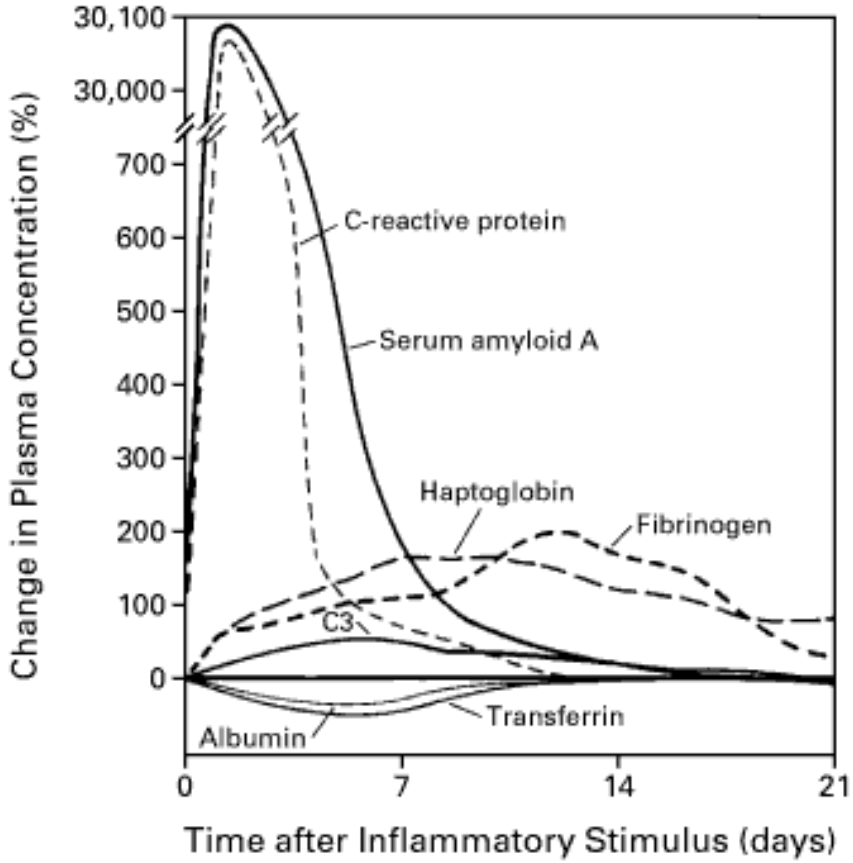


InSight V-IA®

a. What is SAA?

SAA concentrations may increase up to 1000-fold in inflammatory states in cats.

Therefore, the measurement of SAA suggests that the concentration can be used to detect the presence of inflammation.



InSight V-IA®

b. Clinical Significance

Research shows SAA is not only a marker of inflammation but also a prognostic marker of many diseases in cats, such as diabetes and hyperthyroidism.

The following table is the medical records of cats submitted by the veterinary medical centre of the University of Tokyo. A total of 175 effective cases were collected from 2006 to 2007 and follow-up data on mortality was collected until March 2012.

b. Clinical Significance

Table 1 – Study on Population and Clinical Characteristics of Cats

	Nonelevated SAA	Elevated SAA	*P*
Cats	110	65	NA
Median age (years)	8 (0.30–18)	9 (0.25–21)	0.3759
Median body weight (kg)	3.85 (1.2–7.8)	3.45 (0.9–8.15)	0.0465†
Sex			0.4556
Neutered male	49	29	
Intact male	15	4	
Spayed female	36	25	
Intact female	10	7	
Diagnostic category			0.1059
Neoplastic diseases	35	30	
Inflammatory diseases	46	18	
Other diseases	29	17	
WBC			0.0016‡
Normal	79	31	
Abnormal	29	32	
Anemia			0.0012‡
Absence	96	45	
Presence	11	19	
Platelet count			0.2938
Normal	41	30	
Abnormal	65	34	
Median SAA (mg/l)	0.15 (0–0.80)	18.1 (0.83–88.3)	NA

* The chi-square test was used for categorical data. The Mann–Whitney *U*-test was used for continuous data. Numbers in parentheses are ranges. SAA = serum amyloid A; WBC = white blood cell count; NA = not available.
† $P < 0.05$.
‡ $P < 0.01$.

InSight V-IA®

b. Clinical Significance

Cats were divided into two groups according to SAA concentration. The non-elevated SAA group included cats with SAA concentration within the reference range (≤0.82 mg/L).

The group of SAA elevated (>0.82 mg/L), the SAA concentration of cats was higher than the reference range.

In addition, cats are divided into three categories according to diagnosis: neoplastic diseases, inflammatory diseases and other diseases. Inflammatory diseases include infectious diseases such as feline infectious peritonitis.

b. Clinical Significance

A total of 175 cats with various diseases were included. Patient characteristics are summarised in Table 1.

There were 110 cats in the non elevated SAA group and 65 cats in the elevated SAA group. The median SAA concentrations in each group were 0.15 mg/L (range: 0-0.8 mg/L) and 18.1 mg/L (range: 0.83 -88.3 mg/L).

There were no significant differences in age, sex and platelet count between the two groups. However, the body weight of the group with increased SAA was significantly lower than that of the group without increased SAA ($P = 0.047$).

In the group with elevated SAA, 32 cats (49.2%) had abnormal WBC, 19 cats (29.2%) had anaemia. These percentages were significantly higher than those in the group without elevated SAA ($P = 0.002$ & 0.001).

b. Clinical Significance

According to the diagnostic category, 65, 64 and 46 cats were divided into tumour diseases, inflammatory diseases and other diseases, respectively. The diagnosis of each category and the number of cats with elevated SAA are shown in Table 2.

22 cats had concurrent diseases such as chronic renal failure and cardiomyopathy. These cats are classified based on symptom diagnosis. Concurrent diseases are not reflected in the data.

The distribution of diseases was analysed according to the diagnosis category and there was no statistical difference between the SAA non-elevated group and the SAA elevated group ($P = 0.106$). In other words, elevated SAA is not disease-specific.

b. Clinical Significance

Diagnostic Category/Diagnosis		No. of Cats
Neoplastic Diseases		65
	Lymphoma	32
	Adenocarcinoma	12
	Squamous cell carcinoma	6
	Mesothelioma	4
	Other neoplastic diseases	11
Inflammatory Diseases		64
	Gastroenteritis	13
	Feline infectious peritonitis	12
	Cystitis	7
	Cholangitis	5
	Rhinitis	4
	Feline asthma	3
	Hepatitis	3
	Dermatitis	3
	Other inflammatory diseases	14
Other Diseases		46
	Renal failure	8
	Diabetes mellitus	7
	Hyperthyroidism	7
	Cardiomyopathy	4
	Epilepsy	3
	Esophageal stricture	3
	Others	14

b. Clinical Significance

The median follow-up time for all cats was 42 days (range: 1-2, 104 days). In the SAA non-elevated group, 77 (70%) and 29 (44.6%) in the SAA elevated group were still alive at the last exposure.

The reasons for the premature stoppage of medical records are not always available. At the end of the last cat's return visit, 106 cats did a survival statistical analysis. The results are as follows:

b. Clinical Significance

The cats suffering from various diseases were collected and divided into two groups according to the SAA concentration at the time of diagnosis.

The SAA non-elevated group and the SAA elevated group had significant survival time.

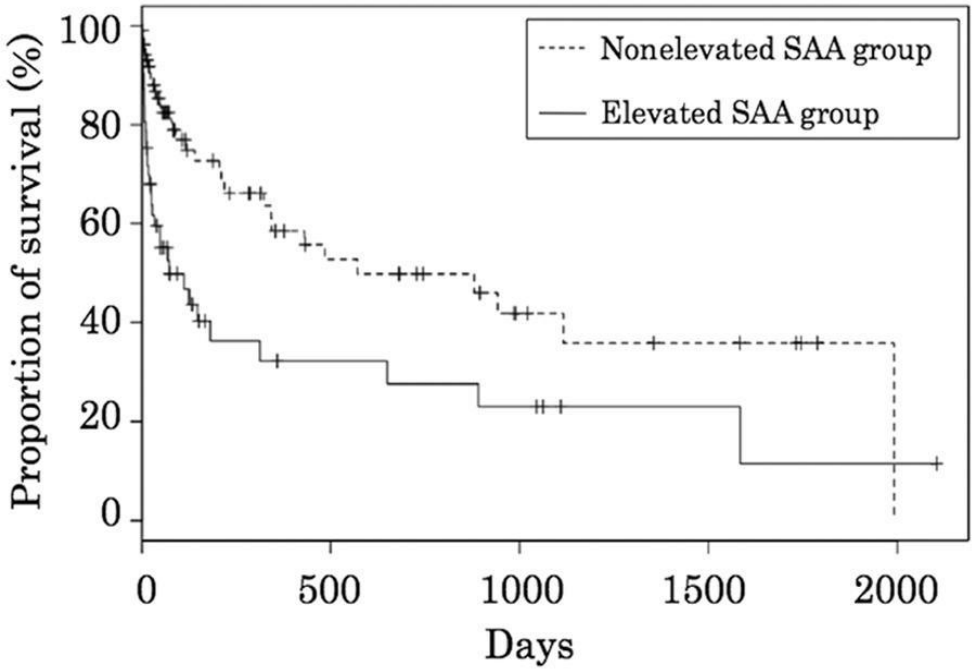


Figure 1

InSight V-IA®

b. Clinical Significance

The median survival time of the SAA non-elevated group was 571 days, while that of the SAA elevated group was 72 days (P <0.001, Figure 1).

Use the Cox proportional hazard model, age, diagnostic category, abnormal WBC, presence of anaemia and elevated white blood cells. No correlation was observed between the SAA concentration and survival time values (data not shown).

However, analysis shows that SAA concentration is a significant prognostic factor. In multivariate analysis (including the above 5 parameters), elevated SAA concentration is an independent prognostic factor. (Hazard ratio: 1.39, 95% confidence interval: 1.07-1.81, P = 0.015).

b. Clinical Significance

There are several reasons why SAA concentration can be used as a prognostic marker:

First, the increase of inflammatory markers, such as SAA, indicates poor disease control and chronic inflammation is believed to directly affect the prognosis. The relationship between SAA concentration and prognosis in patients with rheumatoid arthritis is reported. In addition, C-reactive protein (CRP) and SAA are two of the main acute phase reactants in patients and elevated CRP concentration has been found to be a prognostic factor for rheumatoid arthritis. Since both SAA and CRP are prognostic indicators for patients with rheumatoid arthritis, the theory that these markers reflect disease activity seems reasonable.

Second, SAA protein is known as the precursor of amyloid A fibrils and persistently high SAA levels may cause secondary amyloidosis, and the development of amyloid A amyloidosis is considered an important prognostic factor. Studies have shown that cats with metabolic or endocrine diseases usually show high SAA concentrations. Also, high SAA concentrations have been reported in cats with diabetes and metabolic syndrome and SAA concentrations are considered a risk factor for these diseases.

Third, the concentration of serum amyloid A seems to be related to the occurrence of cardiovascular disease and kidney disease in diabetes and these concurrent diseases are thought to affect the prognosis.

c. Application

How to Use SAA

- ❑ Determine if there is inflammation
- ❑ Feline Health check-up
- ❑ Used in conjunction with white blood cells to assess the prognosis of the disease
- ❑ Treatment (surgical) monitoring and prognostic evaluation
- ❑ Coordination of additional inspections:
  - Pancreatitis
  - Trauma
  - Renal failure (cat's lower urethra)
  - Liver disease
  - Infectious peritonitis
  - Reactive amyloidosis
  - Hyperthyroidism
  - Diabetes
  - Tumour

c. Application

How to Use SAA

The following table is for reference:

SAA Value	Interpretation of Results
0-8	Normal
>8	Inflammation, further investigations needed

InSight V-IA®

fSAA Rapid Quantitative Test

Woodley have developed a rapid, accurate and reliable, highly sensitive detection method for Feline Serum Amyloid A (fSAA).

The InSight V-IA fSAA Rapid Quantitative Test is a fluorescence immunoassay used with the InSight V-IA Veterinary Immunoassay Analyser for quantitative determination of fSAA concentration in feline serum or plasma.

fSAA is used as a general marker for inflammatory response.

It can be stored at room temperature.

References

Serum amyloid A as a prognostic marker in cats with various diseases
Takashi Tamamoto, Koichi Ohno,1 Masashi Takahashi, Ko Nakashima, Yasuhito Fujino, Hajime Tsujimoto

Evaluation of Feline Serum Amyloid A (SAA) as an Inflammatory Marker
Kimikazu SASAKI1), Zhiyong MA1), Tanvir. S. KHATLANI1), Masaru OKUDA1), Hisashi INOKUMA1) and Takafumi ONISHI1)

Giordano A1, Spagnolo V, Colombo A, Paltrinieri S : Changes in some acute phase protein and immu-noglobulin concentrations in cats affected by feline infectious peritonitis or exposed to feline coronavi-rus infection, Vet J, 167 (1), 38-44 (2004)

Kajikawa T, Furuta A, Onishi T, et al.: 1999, Changes in concentrations of serum amyloid A protein, alpha 1-acid glycoprotein, haptoglobin, and C-reactive protein in feline sera due to induced inflammation and surgery. Vet Immunol Immunopathol 68:91–98.

Thank You

WOODLEY
EQUIPMENT COMPANY LTD.

InSight V-IA®