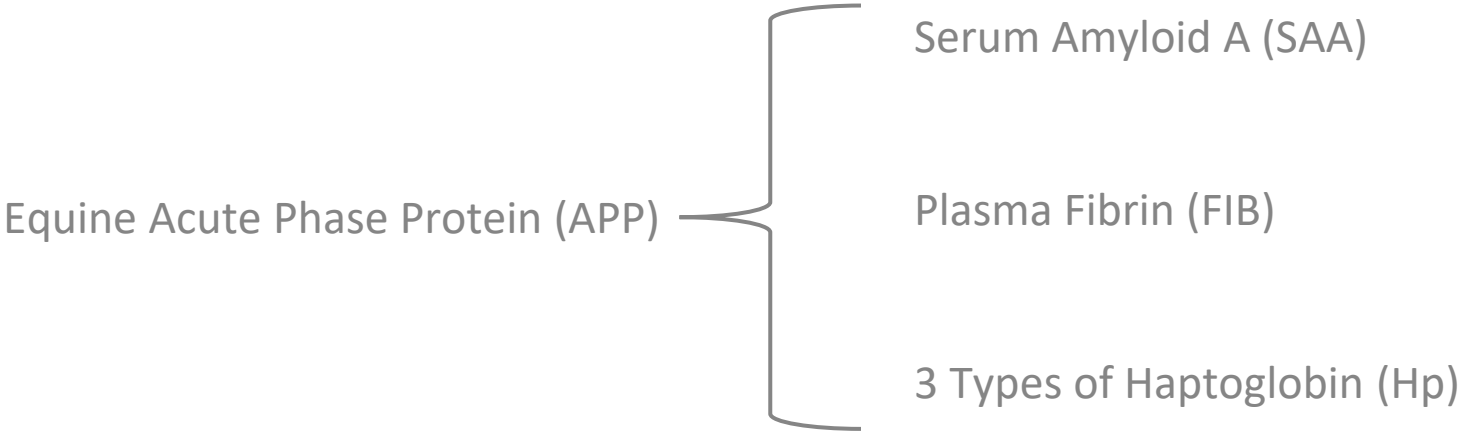
Equine Serum Amyloid A (eSAA)

WOODLEY
EQUIPMENT COMPANY LTD.

InSight® Equine-IA

Contents

a. Equine Acute Phase Protein



- Equine Acute Phase Protein (APP) – Its biological functions mainly involve removing foreign matter and necrotic tissue, promoting cell repair, inhibiting protease activation, inhibiting free radical production, promoting phagocytosis, etc.

a. Equine Acute Phase Protein

Classification of APP's	Protein Type	Normal Levels in Serum	Time (Hour)	
			Time to Start Raising or Lowering	Peak
Main APP	Serum Amyloid A (SAA)	0.2 ~ 20 mg/L^{-1}	6 ~ 12	48
	Plasma Fibrinogen (FIB)	2000 ~ 4000 mg/L^{-1}	24 ~ 72	72 ~ 144
Moderate and Minor APP	Haptoglobin (Hp)	200 ~ 1000 mg/L^{-1}	12 ~ 24	72 ~ 120
	α1-Acid Glycoprotein (AGP)	70 ~ 90 mg/L^{-1}	24	72
	C-Reactive Protein (CRP)	7.5 mg/L^{-1}	24	72 ~ 120
Negative APP	Albumin	30 g/L^{-1}	144	192 ~ 240

A study on equine influenza showed that the SAA content increased rapidly within 48 hours after the onset of clinical symptoms and returned to the original level.

Therefore, SAA can be used to diagnose subclinical inflammation, monitor the effectiveness of treatment of inflammation and infection in animals, and monitor surgical procedures in patients.

Application of acute phase proteins in equine veterinary clinical diagnosis – Luo Yuanqu

b. Serum Amyloid A (SAA)

Serum Amyloid A (SAA) is a protein produced in an inflammatory response that is released into the bloodstream to signal the presence of infection or damage to the immune system.

SAA levels in healthy horses are very low or even negligible. However, if inflammation occurs, SAA levels in the blood can increase to 1,000 times baseline levels within 6 hours. SAA is the only acute phase protein that responds so rapidly.

b. Serum Amyloid A (SAA)

Acute phase proteins (APP) are mainly produced by the liver during acute phase reactions (inflammatory processes).

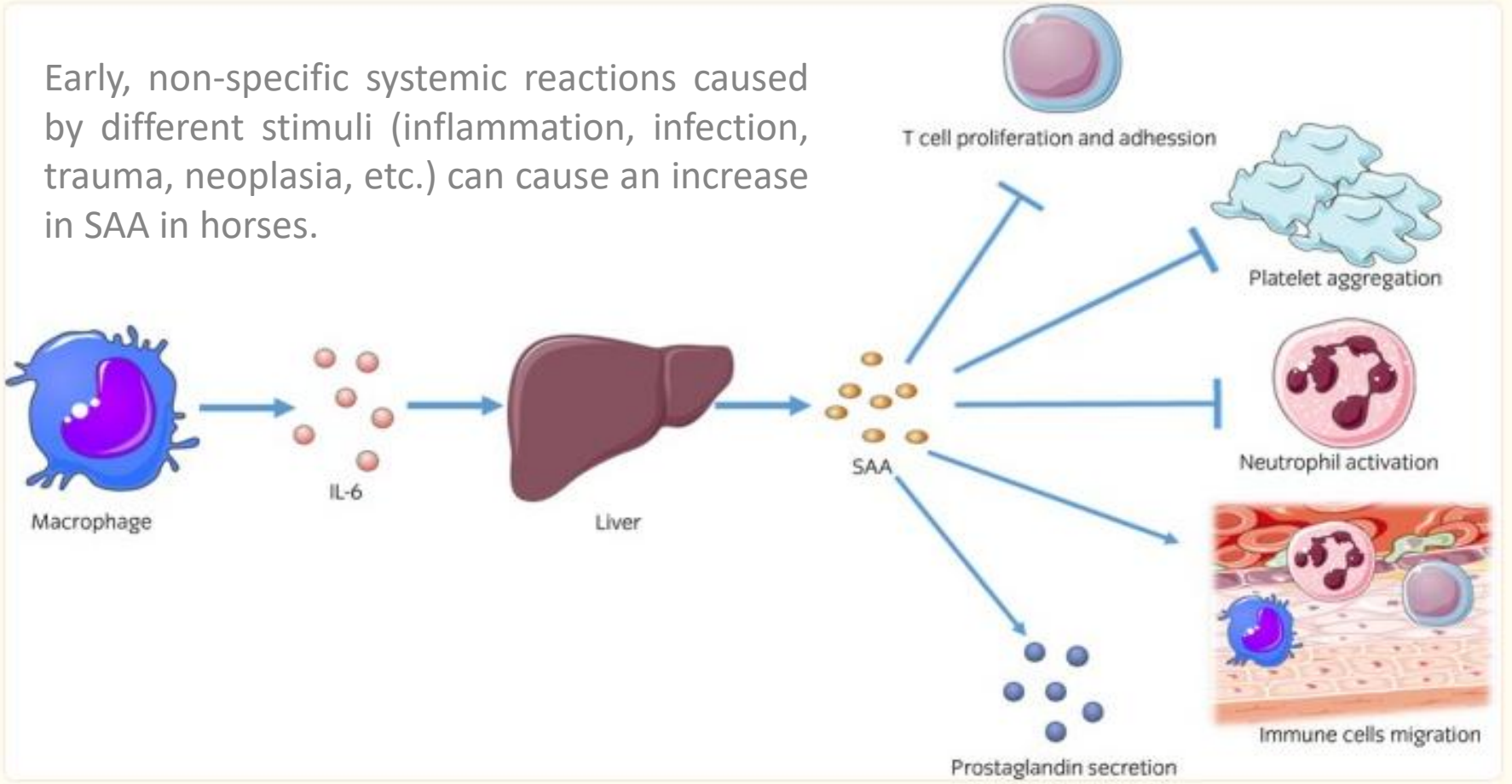
In healthy horses, SAA concentrations are very low (<0.5 – 20 mg/L).

Following trauma, infection or inflammation, a horse's SAA increases dramatically from baseline by up to 1000-fold, reflecting an inflammatory or infectious process.

Its concentration increases rapidly within 6 – 12 hours and its half-life is short (30 minutes – 2 hours).

b. Serum Amyloid A (SAA)

Early, non-specific systemic reactions caused by different stimuli (inflammation, infection, trauma, neoplasia, etc.) can cause an increase in SAA in horses.



b. Serum Amyloid A (SAA)

Serum Amyloid A (SAA) Detection

In clinical practice, SAA concentrations may aid in the early detection of infectious diseases. However, they still need to be considered in conjunction with a detailed history, physical examination, haematology, and other ancillary diagnostic tests. Increased SAA concentrations are non-specific and therefore do not indicate a specific disease but may prompt rapid treatment.

c. Application of Equine Serum Amyloid A (SAA)

SAA concentrations are elevated in these diseases.

Infection
- Bacterial: Sepsis, abscess, strangles
- Viruses: Equine Herpes Virus-1 (EHV-1), Equine Influenza Virus (EIV)

Joint Diseases: Aseptic arthritis, infectious arthritis

Gastrointestinal Disorders: Diarrhoea and enteritis (foals), colic (adult horses)

Reproduction: Childbirth, septic abortion, unexplained miscarriage

Respiratory Diseases: Common cold etc.

Serum Amyloid A (SAA), an early infection indicator in horses, provides effective information for inflammation detection, health and efficacy monitoring of horses.

c. Application of Equine Serum Amyloid A (SAA)

Viral Infection/Bacterial Infection

SAA concentration increases significantly within hours after viral infection/bacterial infection occurs and can be used as a direct indicator of diagnosis.

Virus:

- ❑ Herpes Virus Type 1 – 4 (EHV-1 – 4)
- ❑ Flu Virus

Bacteria:

- ❑ Sepsis (foal)
- ❑ Focal (abscess in foal, septic arthritis)
- ❑ Asphyxiation (Streptococcus equi)
- ❑ E. coli infection causing endometritis
- ❑ Pepsis, abscess, postoperative infection
- ❑ Unexplained miscarriage

c. Application of Equine Serum Amyloid A (SAA)

Viral Infection/Bacterial Infection

SAA measurement is a useful adjunct in the diagnosis of sepsis in neonatal foals.

SAA measurements can also be used to differentiate between communicable and non-communicable diseases.

c. Application of Equine Serum Amyloid A (SAA)

Foals with bronchopneumonia on farms with endemic Rhodococcus equi infection do not necessarily have increased SAA.

15 of 54 (28%) foals with pneumonia had SAA concentrations below 5 mg/L, making SAA less sensitive and specific for detecting pneumonia in foals between 3 weeks and 5 months of age.

In foals on a stable, SAA concentrations were not associated with either X-ray scores and lung injury severity, nor with ultrasound evidence of pneumonia; weekly testing of SAA concentrations was not an accurate marker of infection.

The reason for the failure to detect elevated SAA concentrations in individuals with pneumonia and inflammation is unknown but may be related to chronic disease. Additionally, concurrent but unrelated infections and differences between healthy and subclinical infected foals may have affected study results.

Serum amyloid A in equal health and disease
OD Witkowska-Piłaszewicz

c. Application of Equine Serum Amyloid A (SAA)

Joint Diseases: Aseptic arthritis, infectious arthritis

If treatment is delayed or inappropriate, joint infections can be devastating to a horse's athletic career.

The most common cause of septic arthritis in adult horses is traumatic wounds, which can be life-threatening to the horse due to the difficulty in clearing the infection and the development of persistent inflammation; early diagnosis is therefore crucial to quickly eliminate the infection and inflammation.

SAA concentrations in the blood and synovial fluid of healthy horses are generally less than 1 mg/L. Therefore, elevated SAA concentrations are thought to help distinguish infectious from non-infectious arthritis.

Serum amyloid A in equal health and disease
OD Witkowska-Piłaszewicz

c. Application of Equine Serum Amyloid A (SAA)

Gastrointestinal Disorders: Diarrhoea and enteritis (foals)

SAA concentrations are elevated in horses showing symptoms of diarrhoea, fever and anorexia.

Equine Inflammatory Markers in the Twenty-First Century: A Focus on Serum Amyloid A
Alicia Long

c. Application of Equine Serum Amyloid A (SAA)

Acute Abdominal Pain - Serum SAA identifies horses with acute inflammatory colic and those requiring surgery.

Cases Requiring Routine Treatment: Duodenitis-proximal jejunitis (DPJ), acute colitis, peritonitis

Cases Requiring Surgery: Asphyxiation, severe impact

SAA concentrations vary clinically to assess the possible causes of colic in horses and to minimise the risk of unnecessary or delayed surgery.

c. Application of Equine Serum Amyloid A (SAA)

Studies have proven that SAA concentrations increase significantly in the following reproductive diseases:

- ❑ Pyometra
- ❑ Endometritis
- ❑ Placentitis (in mares late in pregnancy)
- ❑ Septic abortion
- ❑ Unexplained miscarriage

Serum amyloid A in equine health and disease
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c. Application of Equine Serum Amyloid A (SAA)

Physiological Changes in SAA Concentration During Pregnancy

In pregnant mares, SAA concentrations remain stable and within the normal range for 4 months before parturition but increase during the week before parturition, and reach maximum values within one month of birth, possibly due to foetal tissue displacement during caused by damage.

SAA concentrations increased significantly at 12 hours (0.7 – 305 mg/L) and 36 hours (0 – 1615 mg/L) postpartum, and returned to base levels within 60 hours postpartum.

Placentitis can lead to miscarriage or premature birth. In experimental models of placentitis, SAA concentrations increase rapidly and remain at high levels until abortive placentitis. Therefore, the SAA concentration in pregnant horses continues to remain at a fairly high level, requiring further investigation.

Serum amyloid A in equine health and disease
OD Witkowska-Piłaszewicz

c. Application of Equine Serum Amyloid A (SAA)

Respiratory Diseases

SAA differentiates between infectious and non-infectious causes of respiratory disease, and distinguishes horses with bacterial pneumonia from those with viral infections. Several studies have shown that transportation is a major risk factor for pneumonia in horses and can lead to increased SAA concentrations.

c. Application of Equine Serum Amyloid A (SAA)

Respiratory Diseases

Surgery triggers APR (Acute Phase Response) reflected in changes in SAA concentration in the blood.

Post-operative SAA Content:

- ❑ Normal – Rise first and then fall
- ❑ Abnormality – Continuously increasing

SAA levels can indicate whether infection develops after surgery.

In castrated horses, SAA concentrations increase within 6 hours and then decrease to normal levels within 3 weeks of surgery as local inflammation resolves.

d. Advantages of InSight Equine-IA eSAA Rapid Quantitative Test

- Sample Type – Only one drop of blood, 10µl of serum sample is required.
- Test Time – Test time is short, only 5 minutes.
- Test Sensitivity – The detection range is 8 – 1500 mg/L, which can more accurately reflect the animal inflammation and determine whether the treatment plan is effective.
- The diagnostic accuracy of white blood cell count, plasma fibrinogen concentration and albumin/globulin ratio is low. Equine Serum Amyloid A is a sensitive predictor of early inflammation. Its onset is rapid, its half-life is short and the disease can be closely tracked which helps facilitate timely provision of accurate treatment plans.
- SAA is a better indicator of inflammation than white blood cell.
- Less sample usage and easy operation.

InSight® Equine-IA

Equine SAA (eSAA) Rapid Quantitative Test

Woodley have developed a rapid, accurate and reliable, highly sensitive detection method for SAA in horses.

The InSight Equine-IA eSAA Rapid Quantitative Test is a fluorescence immunoassay used with the InSight Equine-IA Veterinary Immunoassay Analyser for the quantitative determination of SAA concentration in equine serum, plasma or whole blood.

The test is used to detect and monitor inflammation in horses.

It can be stored at room temperature.

Thank You

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