vmrd Veterinary Medical Research & Development

Serum Amyloid A (SAA) Screening for General Health and Biosecurity

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Relevant Species

Routine equine health exams and biosecurity strategies utilize screening methods to detect underlying performance-limiting issues and potential infectious disease concerns. The fundamental basis of this is a good physical exam with rectal temperature screening, however subclinical issues may still exist that can become problematic. Measurement of serum amyloid A (SAA) is a highly effective tool for this purpose and can identify horses with subclinical disease that would not otherwise be detected.

Any elevation of SAA should be considered abnormal

The normal range of SAA in a healthy horse is generally considered to be less than 20 µg/mL.[1,2] It becomes elevated in acute systemic inflammation, particularly due to viral or bacterial infections, with bacteria stimulating the greatest SAA production.[3-5] SAA is highly sensitive and specific for the presence or absence of systemic inflammation, more sensitive than WBC count or fibrinogen.[1,3,6-8] For the purpose of biosecurity or health screening, any elevation of SAA should be considered abnormal and trigger further investigation.[2,7]

SAA may increase even if body temperature is normal

SAA can increase even in the absence of fever[9-10], making it exceptionally useful for screening purposes and to monitor health status. Unlike fever, it will not be significantly affected by NSAID therapy.[7] In one study, SAA was 97.1% sensitive and 97.2% specific to differentiate clinically abnormal horses (i.e. those who developed infections) from those that were normal when tested 24 hours after air transportation.[9] The presence of fever had a sensitivity of just 2.9% at the same time point, indicating that SAA could identify brewing infections earlier and allow more rapid clinical intervention.[9]

SAA testing can help prevent and manage infectious disease outbreaks

There is clear value in assessing SAA alongside rectal temperature to identify subclinical disease[2,3,9] as part of an efficacious health screening strategy. In terms of biosecurity, disease outbreaks may be prevented if horses are effectively screened prior to co-mingling at events or when introducing new horses to a resident population. If an active infectious disease outbreak is occurring, SAA can help monitor at-risk or exposed horses for development of disease. Horses that have become infected will have elevated SAA and can be handled appropriately, with additional diagnostics as indicated.[3,4] SAA can also be used to monitor populations that may be at increased risk due to age, stress, exposure, population density, or other factors.[4,8] This could include young horses in intense training[4], hospital populations[6], or horses undergoing long-distance travel[9].

SAA can identify subclinical problems in outwardly healthy horses

As a general health screening tool, SAA can be very useful to assess the health of a horse prior to surgery and to monitor for complications afterwards.[3,10-12] Testing prior to transport may identify subtle abnormalities that have the potential to develop into bigger problems with shipping. Testing horses after transport[3,9] allows early recognition of shipping-related infections. SAA screening can help detect underlying issues during any routine health examination, including pre-purchase or insurance exams. Although normal (negative) results do not rule out all concerns, a positive result indicates an active problem that should be investigated.

Normal horses should have little to no SAA

As a general rule, a truly normal horse should have virtually no circulating SAA. SAA increases minimally or not at all with stress, exercise[13,14] or anesthesia[4] alone. Barring any confounding factors (see April 2020 newsletter), elevated SAA in an outwardly healthy horse should always be a trigger to look deeper into possible causes.

REFERENCES

[1] Witkowska- Piłaszewicz OD, Żmigrodzka M, Winnicka A, et al. Serum amyloid A in equine health and disease. Equine Vet J 2019;51(3):293-298.

[2] Radcliffe RM, Buchanan BR, Cook VL, et al. The clinical value of whole blood point-of-care biomarkers in large animal emergency and critical care medicine. J Vet Emerg Crit Care 2015;25(1):138-151.

[3] Jacobsen S, Andersen PH. The acute phase protein serum amyloid A (SAA) as a marker of inflammation in horses. Equine Vet Educ 2007;19(1):38-46.

[4] Pepys MB, Baltz ML, Tennet GA. Serum amyloid A protein (SAA) in horses: objective measurement of the acute phase response. Equine Vet J 1989;21(2):106-109.

[5] Hultén C, Demmers S. Serum amyloid A (SAA) as an aid in the management of infectious disease in the foal: comparison with total leucocyte count, neutrophil count and fibrinogen. Equine Vet J 2002;34(7):693-698.

[6] Belgrave RL, Dickey MM, Arheart KL. Assessment of serum amyloid A testing of horses and its clinical application in a specialized equine practice. J Am Vet Med Assoc 2013;243(1):113-119

[7] Hooijberg EH, van der Hoven R, Tichy A, et al. Diagnostic and predictive capability of routine laboratory tests for the diagnosis and staging of equine inflammatory disease. J Vet Intern Med 2014;38:1587-1593.

[8] Anhold H, Candon R, Chan Di-Sien, et al. A comparison of elevated blood parameter values in a population of thoroughbred racehorses. J Equine Vet Sci 2014;34:651-655.

[9] Oertly M, Gerber V, Anhold H, et al. The accuracy of serum amyloid A in determining early inflammation in horses following long-distance transportation by air, in Proceedings. Am Assoc Equine Pract 2017;63:460-461.

[10] Jacobsen S, Jensen JC, Frei S, et al. Use of serum amyloid A and other acute phase reactants to monitor the inflammatory response after castration in horses: a field study. Equine Vet J 2005;37(6):552-556.

[11] De Cozar M, Sherlock C, Knowles E, et al. Serum amyloid A and plasma fibrinogen concentrations in horses following emergency exploratory celiotomy. Equine Vet J 2020;52(1):59-66.

[12] Aitken MR, Stefanovski D, Southwood LL. Serum amyloid A concentration in postoperative colic horses and its association with postoperative complications. Vet Surg 2018; 1–9. https://doi.org/10.1111/vsu.13133

[13] Kristensen L. Buhl R, Nostell K, et al. Acute exercise does not induce an acute phase response (APR) in Standardbred trotters. Can J Vet Res 2014;78(2):97-102.

[14] Cywinska A, Witkowski L, Szarska E, et al. Serum amyloid A (SAA) concentration after training sessions in Arabian race and endurance horses. BMC Vet Res 2013;9:91-97.