Sepsis and Septic Shock in the Equine Neonate

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KEYWORDS

• Antimicrobial • Hemodynamic support • Source control • Blood culture

KEY POINTS

- Equine neonatal sepsis is associated with an increased mortality rate compared with other medical conditions affecting newborn foals.
- As sepsis progresses to severe sepsis and septic shock, the prognosis becomes worse.
- Recognition of sepsis in foals is poor given current laboratory and examination parameters.
- Early and aggressive treatment of presumed cases of neonatal sepsis is warranted.

INTRODUCTION

Sepsis and specifically the development of septic shock represent one of the most significant causes of morbidity and mortality in equine neonates. Although understanding of the pathophysiology of sepsis continues to evolve, the condition remains challenging to manage and failure is common despite considerable advancements in treatment. Early recognition of sepsis is essential to successful management and requires a coordinated effort between stable managers, field veterinarians, and neonatal intensive care unit clinicians.

This article reviews the recognition of sepsis/septic shock and current treatment recommendations for this condition. The research available on equine neonatal sepsis (ENS) is limited, but new information is available each year. This article brings together equine-specific information and incorporates the most recent human Surviving Sepsis guidelines that were published in 2012.[1]

Briefly, sepsis is defined in a patient in which the systemic inflammatory response syndrome (SIRS) is caused by infection (**Box 1**). In human critical care, SIRS includes alterations in two of the following parameters: body temperature, heart rate,

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Box 1
Definitions of sepsis, severe sepsis, and septic shock

Sepsis: The presence of a probable or documented infection together with systemic manifestations of infection

Severe sepsis: Sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion

Septic shock: Sepsis-induced hypotension persisting despite adequate fluid resuscitation

respiratory function, and peripheral white cell counts. This definition has been extrapolated for use in foals. Severe sepsis is a progression to the point that sepsis is associated with organ dysfunction, hypotension, and/or hypoperfusion. Septic shock is defined as sepsis-induced hypotension despite adequate fluid resuscitation, or vasopressor-dependent sepsis.

PATIENT EVALUATION

Early recognition of ENS is critical for early initiation of treatment, improvement in outcomes, but also for determining a realistic prognosis. Neonates may present for intensive care for a variety of conditions (eg, hypoxic ischemic encephalopathy, ruptured bladder) that may have a better prognosis than sepsis. Given that the mortality rate for ENS is as high as 50%, its recognition is important when discussing prognosis with owners.[2] In general, suspicion of ENS can be divided into three categories: (1) historical information, (2) physical examination, and (3) laboratory markers.

Although the criteria for the diagnosis of sepsis do not often include historical information, sepsis should be considered in patients that have specific historical events that serve as risk factors (**Box 2**). Historical information that would increase the index of suspicion for ENS include factors that existed before foaling, specific events that occurred during foaling, and developments in the period following foaling.

Owners and veterinarians may observe abnormalities in the mare before foaling that are cause for concern. These include premature lactation, increased vaginal discharge, or early signs of parturition. Although these findings are not uniquely associated with ENS, they warrant further evaluation and more intensive fetal monitoring, such as fetoplacental ultrasound or fetal electrocardiography. When evaluating an equine neonate, these prefoaling historical findings may cause the clinician to initiate treatment of ENS sooner than for a foal without these risk factors.

Prolonged second stage of labor is an important finding during foaling that may increase the risk for the development of ENS. Other concerning abnormalities might include an abnormal appearance of the placenta or the amniotic/allantoic fluids. Similar to prefoaling events, abnormal developments during foaling do not define

Box 2
Historical factors raising suspicion for sepsis

1. Historical factors before foaling: premature lactation, increased vaginal discharge, early signs of parturition
2. Historical factors observed during foaling: prolonged second stage of labor, abnormal appearance of fetal fluids, meconium aspiration
3. Historical factors following foaling: prolonged time to stand or nurse, abnormal behavior, failure of passive transfer