Oxytocin Concentrations in Septicemia and Maladjustment Foal Syndrome

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INTRODUCTION

Sepsis, the number one cause of foal mortality, is a condition where bacteria can multiply in the blood and set up widespread infection throughout the body of young foals. Septic foals have varying levels of survival depending on the severity and duration of infection. Initial infection is often followed by further complications, including septic shock, multiple organ dysfunction syndrome, and hormonal dysregulation.

The hypothalamus releases oxytocin that is stored in the pituitary gland. Oxytocin has a number of functions, many of which are associated with giving birth and release of milk from mammary glands. This hormone also appears to be linked with social/maternal behavior in people and other species. The role of oxytocin in modulating pituitary response to sepsis associated stress is well documented in critically ill humans and other species, but limited information exists in newborn foals. Neonatal maladjustment syndrome (NMS), also known as dummy foal syndrome or hypoxic ischemic encephalopathy (HIE), occurs in foals during or shortly after parturition and is often associated with sepsis. The syndrome is characterized by abnormal neurologic behavior, loss of suckle reflex, depression, and seizures. The exact cause has not yet been determined; therefore hormones associated with behavior may provide insight into the pathogenesis of NMS.

OBJECTIVES

The goals of this study were to:

• Investigate concentrations of oxytocin in critically ill and healthy foals.
• Examine associations of oxytocin with septicemia and likelihood of survival.
• Analyze any association between NMS and oxytocin concentration.

HYPOTHESIS

We hypothesized that septic foals will have lower concentrations of oxytocin compared to healthy foals. We also proposed that foals with NMS will have higher oxytocin concentrations compared to foals without NMS.

METHODOLOGY

• Blood samples were collected from 14 healthy foals, 28 sick non-septic (SNS) foals, and 28 septic foals on admission to the hospital.
• Samples were processed immediately after collection, and plasma and serum was stored in -80°C until analysis.
• Clinical information such as history, physical examination, blood work, diagnosis, treatment and outcome was obtained from medical records.
• Foals with a sepsis score >11 were classified as septic, ≤11 were SNS, and healthy foals were clinically healthy.
• Oxytocin concentrations were measured using an oxytocin enzyme immunoassay (DETECTX®).
• A Shapiro-Wilk test was performed to assess data normality. The data sets were found to be not normally distributed.
• Mann-Whitney U tests was used for comparison between foals with and without NMS.
• Kruskal-Wallis ANOVA was used to compare variables between the healthy, SNS, and septic groups.
• Data analysis was carried out using Microsoft Excel and GraphPad Prism.
• Data is presented as median and interquartile range.

RESULTS

Sepsis Score

Plasma oxytocin concentrations were significantly higher in healthy and SNS foals compared to septic foals. There was no difference between healthy and SNS foals, * compared to sepsis = statistically different at P<0.05.

Oxytocin

Plasma oxytocin concentrations were significantly higher in healthy and SNS foals than SNS foals. ** compared to healthy, # compared to SNS = ** statistically different at P<0.01.

Foal Survival Score

Survival score was significantly lower in septic foals compared to healthy and SNS foals. There was no difference between healthy and SNS foals, * # = statistically different at P<0.05.

CONCLUSION

• This preliminary work indicates that there may be an association between sepsis, NMS, and oxytocin concentrations in neonatal foals. In septic foals, profound depression and abnormal behavior may result from decreased concentrations of oxytocin, in addition to other factors. Further studies are needed to evaluate oxytocin therapies in critically ill foals.
• This is the first study showing increased oxytocin concentrations in foals with NMS. Studies in other species indicate conflicting association between oxytocin and social and neurological abnormality. A larger number of foals will be analyzed (2015) to validate our findings.
• This information provides additional insight on the pathogenesis of sepsis and neurological function in newborn foals.

REFERENCES


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