Case Report

A Case Report of *Salmonella Septicemia* in a Foal

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ABSTRACT

One of the most important management measures in foals is colostrum feeding in the first few hours after birth. The quality and quantity of colostrum play a pivotal role in the health of the foal. Low intake or intake of low-quality colostrum is one of the most significant factors leading to septicemia. Among the leading factors in producing low-quality colostrum are induced pregnancy and the early birth of the foal. A 14-day-old foal was referred with symptoms of lethargy, severe heartburn, lateral landing, dilatation of the ventricular space, and hypothermia. In the history obtained, the mother's labour was induced by the veterinarian. One hour after referral, the foal died. Based on the laboratory and autopsy results, the cause of death was septicemia and peritonitis.

Key Words: Colostrum, Foal, Septicemia, *Salmonella*

Introduction

Foals are born with limited immune defenses. They do not receive any protection from their own immune system while in the womb. When a foal is born, it primarily relies on its mother's colostrum to protect against common diseases and develop its immune system. Colostrum is rich in various components, including hormones, growth factors, and antibodies. Many of these components support intestinal immunity and health, such as insulin-like growth factor, lysozymes, lacto peroxidase and lactoferrin [1-3].

Colostrum is also a source of oligosaccharides and essential fatty acids that have been shown to improve gut growth and thermoregulation (the ability to maintain a constant body temperature) [4-5].

In the first days of foals' life, they are exposed to various pathogens and the antigen-specific lymphocyte response system is expanded. This response is ensued by an increase in circulating lymphocytes and the growth of peripheral lymphatic organs [6].Passive transmission failure is generally defined as serum IgG>4 g/L (400 mg/dL). Partial passive transmission failure is when serum IgG is between 4 g/L and 8 g/L. Foals exposed to chronic intrauterine infection can be born with IgG concentrations greater than 8 g/L. Additionally, septic foals may catabolize immunoglobulins, resulting in lower concentrations than initially assessed. High-quality colostrum is usually yellow and very viscous, but physical properties alone do not make a significant difference in the IgG level of the foal at 24 hours of age.

In newborn babies, various causes prompt septicemia, such as Gram-negative bacteria such as *E. coli*, *Klebsiella pneumoniae*, *Pseudomonas aerogenosa*, *Salmonella spp.*, *Enterobacter spp.* and *Actinobacillus spp.* or Gram-positive organisms such as *Streptococcus spp.*, *Enterococcus spp.* or Staphylococcus [7-10].

Sepsis is the main cause of morbidity and mortality in newborn horses. The response to microbial invasion of the bloodstream comprises the Systemic Inflammatory Response Syndrome (SIRS), nonspecific inflammatory feedback responsible for the classic symptoms of sepsis rather than the infectious organism. Several studies have documented a close relationship between serum IgG concentration, disease incidence and survival. Common routes of infection after birth include remnants of the umbilical cord, the digestive tract, and the respiratory tract. The navel was traditionally considered the most important site for pathogen entry, but the role of the gastrointestinal tract as a critical portal for bacteria has been recognized [11,12].

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Case Presentation

A 14-day-old foal, born through induced labour, suffering from immunodeficiency, was referred to with symptoms of lethargy, depression, tachycardia, lateral landing, abdominal distension, colic and hyperthermia. Heart rate was 90 beats per minute, respiratory rate was 45 beats per minute, and temperature was 40.5ºC. Hematological and biochemical tests were performed to confirm the diagnosis and determine the main cause. Imaging of the abdominal region of the affected foal was done using ultrasonography. Ultrasonography confirmed the presence of large amounts of free fluids with moderate echogenicity in the abdominal area. Then, the peritoneal fluid was collected and sent to the laboratory for microbial culture and investigation of the nature of the liquid found in the abdominal area. According

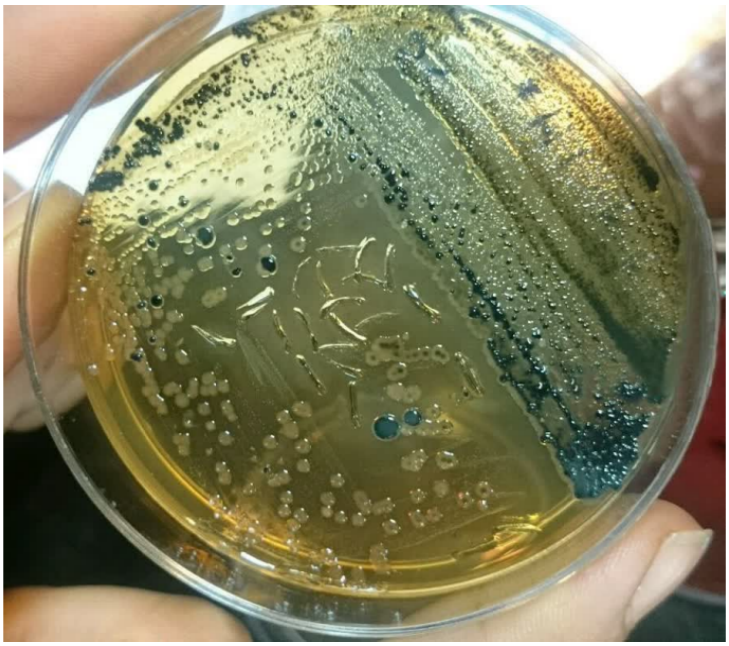

Figure 1: Salmonella grown in MacConkey agar medium.

Figure 2: Bacteria grown in blood agar medium.

to the clinical symptoms and the imaging results, a poor prognosis of the disease and a low probability of a medical response were diagnosed. Painkillers were injected intravenously into the foal, only to reduce the pain. The foal died one hour later, and an autopsy was performed for a definitive diagnosis. The spleen, kidney and bone marrow were sent to the laboratory for culture.

Results

Based on the clinical examination and the results obtained in the laboratory, the final diagnosis in this patient was septicemia caused by peritonitis (Figure 1 and 2). The autopsy examination showed plenty of purulent fluid in the ventricular area and a layer of fibrin covering the surface of the organs. The results for the aerobic peritoneal fluid culture of salmonella bacteria, and the anaerobic culture of clostridia bacteria were isolated. No bacteria were isolated from the culture of organs and bone marrow.

Discussion

The plasma or serum protein concentration is low at birth, but increases with globulin intake from colostrum. Plasma protein levels are 40 g/L to 60 g/L at birth and gradually increase to 50 g/L to 80 g/L within the first 24 hours of birth. Protein levels decrease with blood loss, gastrointestinal diseases, kidney disease or passive immune transmission failure [12]. FPT occurs upon insufficient absorption of immunoglobulins from colostrum, resulting in a serum IgG concentration of less than 4g/L (400 mg/dL) after the first 24 hours of birth. Foals with adequate immunoglobulin transfer have serum IgG concentrations greater than 8g/L (800 mg/dL). Foals with FPT are more prone to sepsis. FPT can be due to consumption of low-quality colostrum, loss of colostrum due to premature breastfeeding, lack of consumption or absorption of colostrum, or increased consumption of immunoglobulin [11-12]. The patient in this study was born through induced labor (premature birth) therefore, the weakness in the immune system and lack of sufficient immunoglobulin in the mother's colostrum, increased the infant's sensitivity to septicemia. On the other hand, improper and unhygienic conditions of the foal have not been ineffective in causing septicemia. An increase in total protein (8.7 g/dL) and fibrinogen (0.7 g/dL) and the sight of leukocytosis in this patient are clear evidence to confirm septicemia.

Conclusion

Due to the sensitivity of foals to infections in the first few days after birth, as well as insufficient colostrum antibodies in foals born from weak mares, or the presence of any difficulty in receiving colostrum in the early hours of birth and poor environmental hygiene, foals are susceptible to any disease and contamination. These cases are manageable to an acceptable extent by monitoring health issues.

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