

Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #: **156** Month: **December** Year: **2020**

Title: Methicillin-resistant *Staphylococcus aureus* septicemia and embolic abscessation in a foal

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Clinical History: 12-day-old Warmblood filly born 5 weeks premature from a mare with placentitis, and treated in the hospital from birth for lung dysmaturity. After a week in intensive care, she developed decubitus ulcers and abscesses, and 2 days later was euthanased due to worsening respiratory signs.

Necropsy Findings: There were full thickness skin wounds on the caudal antebrachia just distal to the elbows, which oozed purulent discharge (Figure 1 depicts the worst lesion on the right forelimb). The kidneys (Figure 2) and lungs (Figure 3) had multifocal, round, yellow, soft, well-demarcated nodules that range in size from 5 mm to 30 mm in diameter and that contain pale yellow opaque viscous material on cut surface. There were a few similar smaller lesions, 2-5 mm in diameter, in the myocardium, as well as mild pericardial, pleural, and abdominal effusion with yellow-tinged clear fluid.

Gross and Microscopic Images:



Figure 1: Caudal forelimb



Figure 2

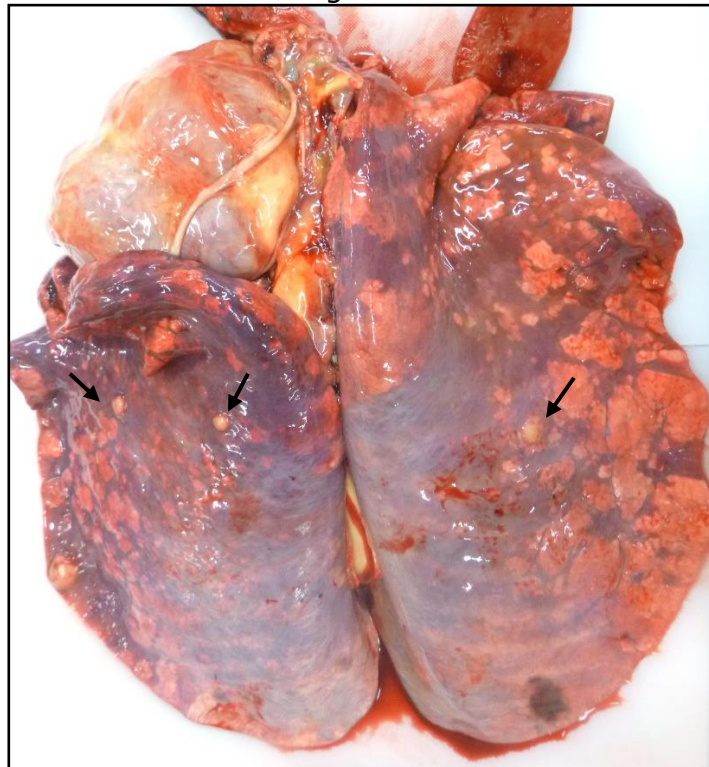


Figure 3

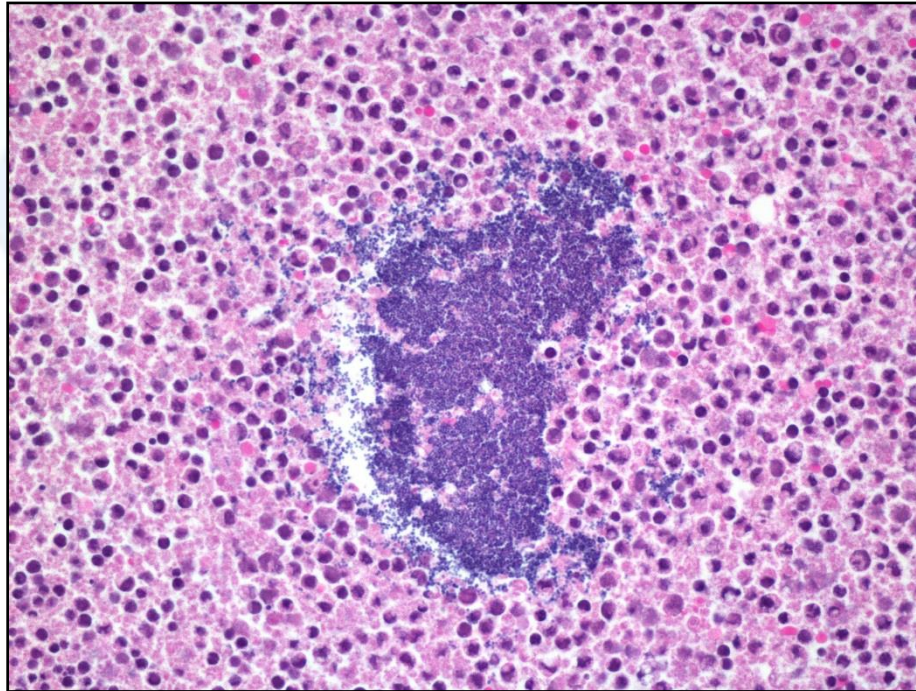


Figure 4

Follow-up questions:

- (1) Morphologic diagnoses;**
- (2) Name one potential cause.**

Microscopic findings:

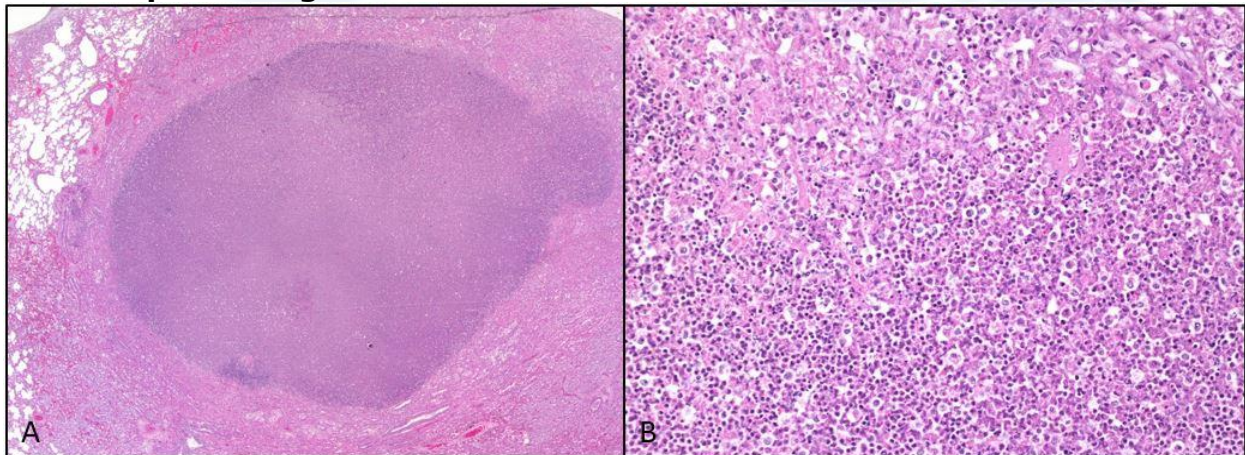


Figure 5: Lung, Hematoxylin & Eosin. A: 20x. B: 400x. There are multifocal large aggregates of degenerate neutrophils admixed with eosinophilic cellular and pyknotic debris, surrounded by multifocal hemorrhage and fibrin (abscesses).

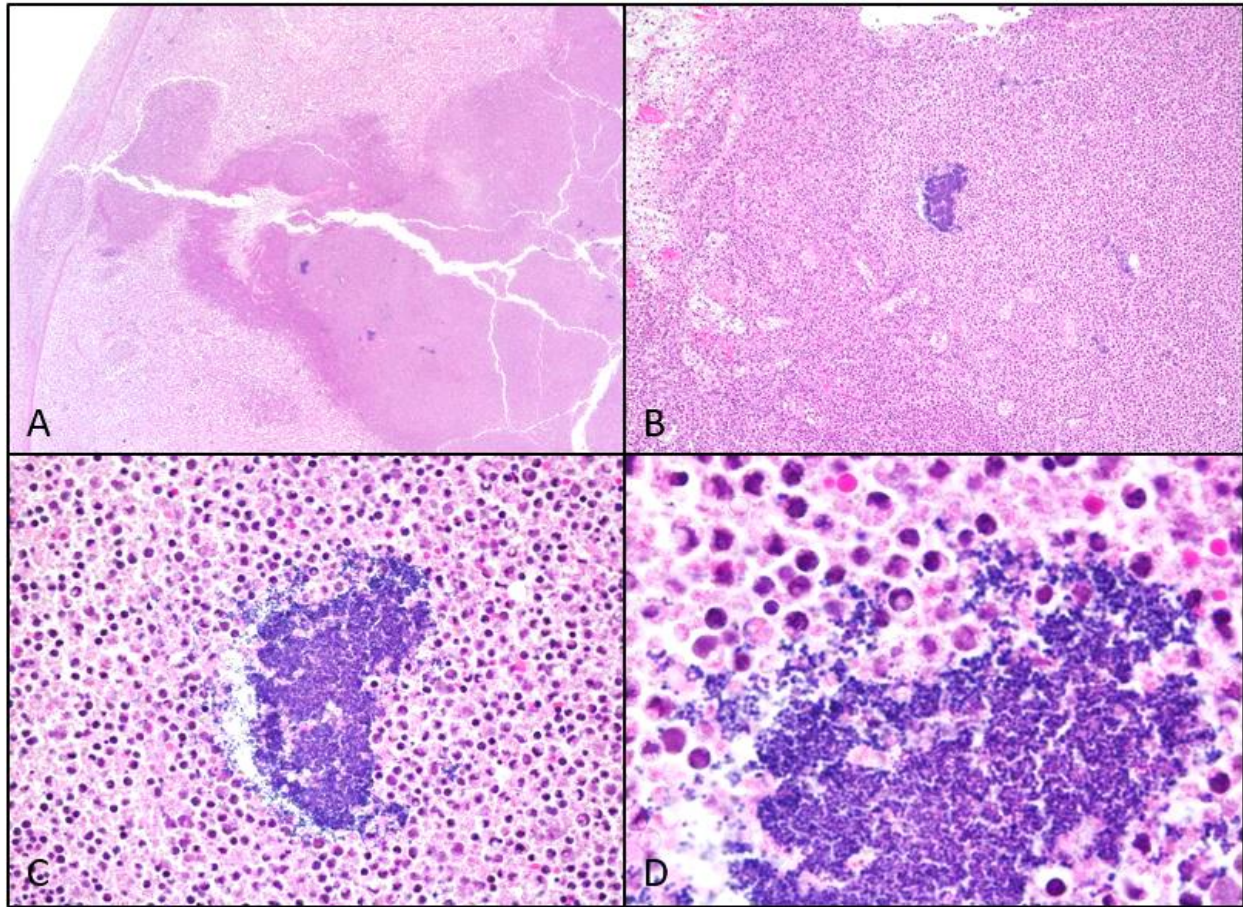


Figure 6: Kidney, Hematoxylin & Eosin. A: 20x. B: 200x. C: 400x. D: 1000x. Multifocal lesions similar to those in the lungs, composed of large aggregates of degenerate neutrophils with fibrin and necrotic cellular debris (abscesses), are effacing the parenchyma in the kidneys. Within the abscesses are prominent club-shaped large colonies of 2 µm basophilic cocci.

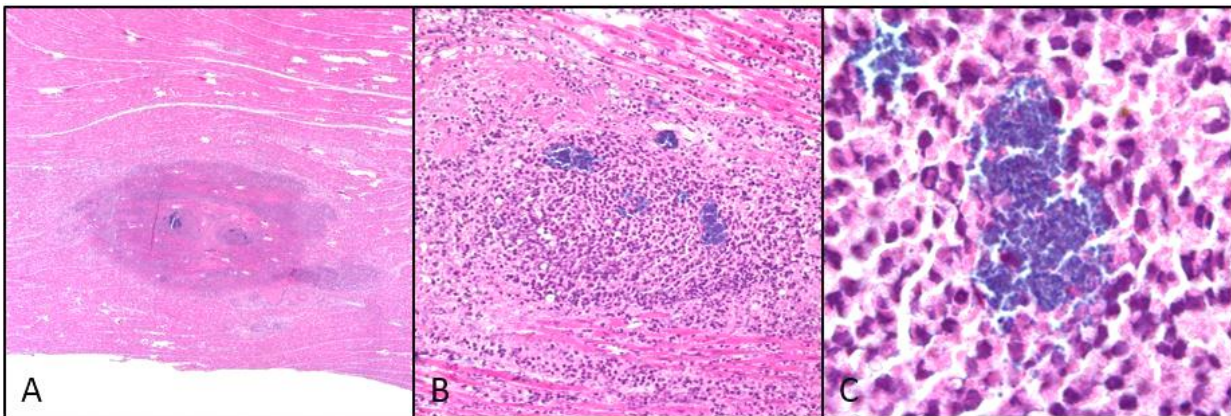


Figure 7: Heart, Hematoxylin & Eosin. A: 20x. B: 200x. C: 1000x. There are multifocal abscesses as seen in the lungs and kidneys, with similar colonies of cocci.

(1) Morphologic diagnoses:

Lungs, kidney, heart: Severe acute multifocal embolic suppurative pneumonia, nephritis, and myocarditis with intralesional *Staphylococcus aureus*

Skin, right forelimb: Severe acute focally extensive ulceration and suppurative cellulitis

(2) Aetiology: Methicillin-resistant *Staphylococcus aureus* (MRSA) cultured from skin wound and kidney

Discussion:

This case demonstrates the gross and microscopic lesions of severe embolic multi-organ abscessation resulting from methicillin-resistant *Staphylococcus aureus* (MRSA) septicemia in a premature neonatal foal. Septicemia is a major cause of morbidity and mortality in neonatal foals, and there are many predisposing factors and causative agents (Sanchez 2005). In this case, the presence of an open wound provided an opportunity for colonization by MRSA, and the prematurity of the foal, being born of a mare with placentitis and possible failure of passive transfer likely resulted in the development of septicemia. An important differential diagnosis for septicemia and embolic nephritis in foals is *Actinobacillus equuli*, which is a gram-negative rod. The presence of cocci in the abscesses as well as culture results ruled out *A. equuli* in this case.

MRSA is an important nosocomial and community-acquired pathogen of humans and animals. Since its discovery in England in 1961, it has disseminated globally to become a leading cause of infections in hospitals and in communities (Andie et al. 2018). MRSA was first documented in animals in 1974, causing mastitis in Belgian dairy cows, and has since been reported in the majority of domesticated species (Morgan 2008). In horses, MRSA has been reported to cause skin and soft tissue infections, bacteremia, septic arthritis, osteomyelitis, implant-related infections, metritis, omphalitis, catheter-related infections, and pneumonia. Some MRSA strains appear to be adapted to infection of horses, and often carry resistance to tetracycline and gentamicin (Morgan 2008).

MRSA is a zoonosis and zooanthroponosis, whereby it can be transmitted from animals to humans and vice versa. Historically, strains of MRSA in companion animals were similar to those found in human nosocomial infections, and it was assumed that spread was occurring from infected owners to animals. However, continuing research suggests there are also strains that have evolved in domestic animals and transmitted to in-contact humans (Morgan 2008). One major issue is the carriage of MRSA in non-symptomatic humans and animals, which can result in inadvertent infection of susceptible hosts. Multiple studies have shown varying rates of nasal carriage among veterinary personnel, with one study in Australia reporting the lowest prevalence occurring in government/industry veterinarians at 0.93%, and the highest in equine exclusive veterinarians at 21.35% (Jordan et al., 2011). Studies in other countries have found results between these values, with an emphasis on increased carriage rates in large animal veterinarians³.

References:

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Lee A.S., de Lencastre H., Garau J., Kluytmans J., Malhotra-Kumar S., Peschel A., Harbarth S. 2018. Methicillin-resistant *Staphylococcus aureus*. Nature Reviews Disease Primers 4:18033.

Morgan M. 2008. Methicillin-resistant *Staphylococcus aureus* and animals: zoonosis or humanosis? J. Antimicrob. Chemoth. 62: 1181–1187.

Jordan D., Simon J., Fury S., Moss S., Giffard P., Maiwald M., Southwell P, Barton M.D, Axon J.E., Morris SG, Trott, D.J. 2011. Carriage of methicillin-resistant *Staphylococcus aureus* by veterinarians in Australia. Aust. Vet. J. 89:152–159.

*The Diagnostic Exercises are an initiative of the **Latin Comparative Pathology Group (LCPG)**, the Latin American subdivision of The Davis-Thompson Foundation. These exercises are contributed by members and non-members from any country of residence. Consider submitting an exercise! A final document containing this material with answers and a brief discussion will be posted on the CL Davis website (http://www.cldavis.org/diagnostic_exercises.html).

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