SWINE
TECHNICAL
ARTICLES

General overview of **risk factors Associated with *Clostridium difficile* - Associated - Disease in Swine**

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Clostridioides difficile is a gram-positive, strict anaerobic rod, spore forming bacterium known to infect and cause clinical disease in several different species including humans and swine. The association between *C. difficile* and enteric disease became clear after the introduction and widespread use of antibiotics.

C. difficile is one of the most common causes of enteric disease in neonates' piglets. Despite the importance of *C. difficile* associated disease (CDAD) in swine medicine the risk factors have not been extensively investigated. The objective of this article is to discuss some of the known risk factors associate with CDAD.

CDAD in swine is typically observed in pigs within the first week of life. Shortly after birth, the gastrointestinal tract of the newborn piglet is colonized by mixed bacterial populations present within the environment (farrowing crate), sow vaginal canal and perineum, feces, and sow teat's surfaces and integument. The process of intestinal colonization is highly complex and influenced by numerous factors including, but not limited to, environmental bacterial load, sow's microbiota, antibiotic usage, sow diet, genetics and quantity and quality of colostrum (immunomodulation).

C. difficile is ubiquitous in the piglet environment (farrowing crates) and consequently is among the group of bacteria that colonize the pig readily after farrowing. Studies have shown that the majority of neonatal pigs within the commercial setting are colonized by *C. difficile* in the first few hours of life with nearly 100% of piglets being colonized within 48 hours of birth (Hopman NE, et al., 2011). *C. difficile* spores are resistant to oxygen and highly resistant to the most common disinfectants. Previously it was believed that *C. difficile* shed by sows in farrowing crates was the main source of environment contamination and piglets' exposure. Although, more recent studies indicated that only about 25% of sows tested were actively shedding the organisms during lactation (Norman KN, et al., 2009). Others have shown that neonatal pigs, ambient air, and the environment are likely the major sources of piglet exposure (Hopman NE, 2011; Weese JS, 2010).

Similarly to other bacterial diseases, it has been shown that bacterial load is directly associate with incidence and severity of CDAD in piglets (Arruda et al., 2013) therefore authors hypothesize that reducing the bacterial load within the environment and consequent piglet exposure within the first week of life can have a significant impact on reducing the likelihood and severity of CDAD.

Establishing and maintaining a diverse intestinal microbiota are likely important to the prevention of CDAD. Even though it has been shown that 14-day-old piglets can develop CDAD when challenged under experimental settings, disease is rarely diagnosed in pigs older than 10 days of age. The development and implementation of a detailed and effective cleaning and disinfection program on sow farms is essential for the control of CDAD. Selection of an efficacious disinfectant against *C. difficile* spores is highly recommended.

Despite antibiotic usage being the most important risk factor in humans; to date, the same pattern has not been described in swine. Antibiotic usage is known to disrupt the intestinal microbiota; however, newborn piglets do not have a stablished intestinal microbiota; therefore, in theory, the use of antibiotic would have the same impact. Although, the impact of specific antibiotics on the bacterial colonization in the first day of age and how it impacts the likelihood of CDAD have not been extensively investigated.

Infection with other enteric pathogens such as Rotavirus are suspected to increase the likelihood of CDAD. In theory, the decrease of absorption within the small intestines (atrophic enteritis) can lead to changes in the colonic microenvironment and associated microbiota. Although, the role of coinfection(s) as potential risk factors to CDAD must be further investigated.

Currently, there is not a commercially available *C. difficile* vaccine or antibiotic treatment in swine; however, non-specific management techniques and husbandry including, but not limited to, proper sanitation of farrowing crates, optimization of piglet's environment conditions (heat lamps, mats, elimination of air drafts), assistance with farrowing, and techniques that maximize colostrum intake have all shown anecdotally to be extremely effective in preventing and mitigating CDAD in piglets (Figure 1.).

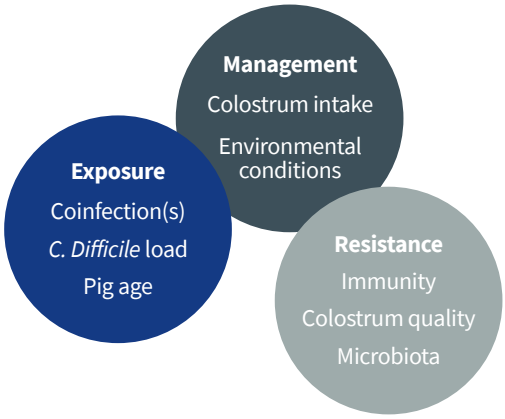

Figure 1. Although majority of pigs will be colonized with *C. difficile* in the first hours of life only a small percentage of pigs will develop clinical disease. Multiple factors including, but not limited to, appropriate management farrowing practices, delay and decrease *C. difficile* exposure through proper cleaning and disinfection procedures, and maximization of colostrum quality and intake are believed to have direct impact on the likelihood of the development of CDAD.

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