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Diarrhea in Farmed White-tailed Deer Fawns[1]

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This article is brought to you by the faculty of University of Florida's Institute of Food and Agricultural Sciences, Cervidae Health Research Initiative. Please visit the CHeRI website at https://wec.ifas.ufl.edu/cheri/ for more information about farmed deer health and management.

Introduction

Diarrheal diseases, commonly called scour, are common in newborn ruminant farm animals including deer fawns. The clinical presentation can range from mild diarrhea without systemic disease to profuse, acute diarrhea associated with rapid dehydration and death, sometimes within hours of onset. Although several different viruses can cause diarrheal disease in young fawns, bacteria in the group Enterobacteriaceae are important contributors. These bacteria are sometimes called enteropathogens and live in the intestinal tract of animals, including humans. Some of them are part of the normal flora of bacteria, and others can cause disease and diarrhea under certain conditions. Enterobacteria that can cause diarrheal disease in deer fawns include *Escherichia coli*, *Clostridium perfringens,* and *Salmonella* sp. Determining the particular agents associated with an outbreak of diarrhea is important for assigning appropriate prophylaxis and therapy. However, in this fact sheet, we focus on disease in fawns caused by pathogenic types of *Escherichia coli*.

What is *Escherichia coli*?

Escherichia coli is a Gram-negative, rod-shaped facultative anaerobic bacterium, which belongs to the Enterobacteriaceae family (Figure 1). It colonizes the gastrointestinal tract within the first hours of life and is one of several types of bacteria that normally inhabit the lower intestine of humans, mammals, and birds (Gyles et al. 2004). Most strains of the bacterium are harmless, but some strains of *E. coli* are capable of causing opportunistic infections. A few strains are of high pathogenicity and cause a variety of intestinal, septicemic, and extra-intestinal diseases (Quinn et al. 2011). Disease caused by pathogenic *E. coli* generally affects fawns during the first days of life, but systemic infection can occur in young deer up to one year, and less often in adult animals (Arthur et al. 2004).

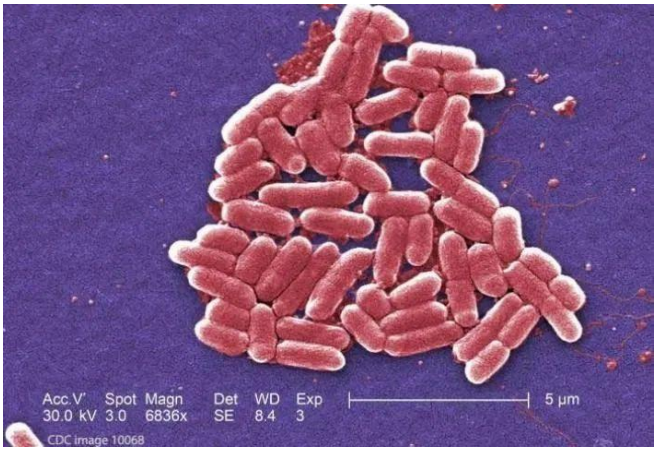


Figure 1. Electron micrograph image of a number of Gram-negative *Escherichia coli* bacteria of the strain O157:H7, which is one of hundreds of strains of this bacterium.
Credit: Janice Haney Carr (PHIL CDC image ID# 10068)

How do fawns get infected with *E. coli*?

While most *E. coli* are harmless and are naturally present in the small intestine, concentrations of the organism increase progressively towards the large intestine. *E. coli* is shed with feces and can survive for weeks and months in fecal particles and dust (Gyles et al. 2004). It is assumed that the primary source of pathogenic *E. coli* infection in fawns is ingestion of feces from infected animals. Carriers of pathogenic strains may look completely healthy but serve as a source of disease to young animals. When newborn animals develop clinical diarrheic disease, they serve as multipliers of the organisms, contributing to the spread of infection to other animals in the herd (Quinn et al. 2011).

Various factors can make fawns more susceptible to pathogenic *E. coli* infections and the subsequent development of diarrheal disease. These include a

deficiency of circulating antibodies as the result of a failure in passive transfer of colostral immunoglobulin, stress due to poor management or bad weather, overcrowding, accumulation of undigested foods in young animals, infected open wounds (navel), broken skin, or by direct nose-to-nose contact or exposure to urinary and respiratory aerosols (Mackintosh et al. 2002, Quinn et al. 2011). However, one of the most important factors is poor hygiene in the pen and enclosures with the accumulation of large amounts of feces.

What are the symptoms of infection from *E. coli*?

Deer are extremely good at hiding signs of illness. Therefore, it is imperative to detect subtle but unusual behavior and symptoms before the disease progresses. The symptoms listed below are not unique to *E. coli* but may indicate to caretakers that an animal is ill. Detection of sick animals early in the course of disease allows time for diagnostic evaluation and prompt treatment. General signs of illness, which may include *E. coli* infection, are summarized below (Gyles et al. 2010, Quinn et al. 2011, Aiello and Moses 2016).

- Lethargy (low energy) or weakness
- Decreased appetite
- Cloudy eyes
- Hair standing up with a rough appearance or a dull coat
- If pinched up, the skin tents and does not regain shape (sign of dehydration)
- Tachycardia, a weak rapid pulse
- Fever is not prominent, and the rectal temperature may even be below normal
- The feces are loose and mucoid; diarrhea may be severe and watery/aqueous or pasty white/yellow/green and foul smelling
- Tremor, hyperesthesia (abnormal increase in sensitivity to stimuli) and convulsions are seen occasionally, but stupor and coma are more common in advanced stages
- Death

How do I know that *E. coli* is affecting my herd?

A reliable etiologic diagnosis of diarrhea cannot be made solely from clinical observation. Instead, a veterinarian uses the animal's age, history, and presenting signs to arrive at a presumptive diagnosis. Fecal samples can be sent to a diagnostic laboratory, but they are often difficult to interpret. Mixed infections are common, and healthy fawns routinely shed nonpathogenic enteropathogens, which can confound results (Delgado et al. 2017).

For fawns that are acutely ill, a rapid clinic-based assessment can provide the same important information that a necropsy would, without sacrificing the animal. Fresh blood, fecal, or nasal swab specimens should be collected from untreated animals as soon as symptoms appear and then be tested by PCR, ELISA, serology, and/or culture to identify specific pathogens. Portable radiography or ultrasound can further evaluate intestinal lesions. If a necropsy is required, it must be performed promptly after death to prevent autolysis. By combining these live-animal diagnostics, farmers and veterinarians obtain actionable evidence that guides both immediate treatment and broader herd-level preventive measures.

Can *E. coli* be treated?

Pathogenic *E. coli* infections can be treated, and animals that receive early treatment have a high expectation of survival. The nature and duration of therapeutic measures are determined by the severity and duration of the disease process. Generally, the principles of *pathophysiology* and treatment apply to most newborn herbivore species (Aiello and Moses 2016), pathophysiology being a convergence of pathology with physiology. Pathology is the medical discipline that describes conditions typically observed during a disease state, whereas physiology is the biological discipline that describes processes or mechanisms operating within an organism. Pathology describes the abnormal or undesired condition, whereas pathophysiology seeks to explain the functional changes that are occurring within an individual due to a disease or pathologic state.

Treatment of pathogenic *E. coli* infections requires fluid and electrolyte therapy, aggressive use of antibiotics, and anti-inflammatory therapy as soon as possible (Aiello and Moses 2016). The correct use of antibiotics is extremely important to prevent bacterial resistance. *E coli* is increasingly becoming resistant to ampicillin, neomycin, kanamycin, spectinomycin, and tetracycline (DACA 2006). Fawns have large energy requirements and very little energy reserves, which makes them extremely vulnerable if actions are not taken quickly. Always contact your veterinarian as soon as possible for the best treatment options.

Can pathogenic *E. coli* be prevented in your herd?

Minimize exposure to pathogenic *E. coli* by isolating clinically ill animals from healthy ones. Rear fawns in a warm, clean environment and if possible separate them from the rest of the farm operations to minimize exposure and prevent infection. Practice good general hygiene, with a deep cleaning and disinfection of any contaminated fawn pens or rearing rooms. Disinfect the umbilicus or navel of the fawn at birth. Tincture of iodine with at least 7% iodine (7% iodine, potassium iodine 5%, isopropyl alcohol 85%, and water) is an excellent antiseptic and disinfectant to prevent a navel (umbilical) infection with *E. coli* that can easily become a major life-threatening systemic infection. The scientific literature on the most common bacteria causing umbilical infections in animals is very limited; however, *Streptococcus* organisms and *E. coli* are the primary pathogens that cause umbilical infections in infants. These data suggest that bacteria normally present in feces can significantly contribute to the risk of umbilical infections (Mullany et al. 2003).

Currently, the most effective way of preventing pathogenic *E. coli* from affecting fawns is through the consumption of sufficient colostrum before the first 12 hours of birth. Colostrum is the first form of milk produced by the mammary glands of mammals immediately following delivery of the newborn and contains antibodies to protect the newborn against disease (Gyles et al. 2010, Aiello and Moses 2016). Colostrum provides essential concentrations of immunoglobulin, providing fawns with resistance to *E. coli* septicemia and other diseases (Myers 1978).



Figure 2. Twin healthy white-tailed deer fawns with their mother. Licking is important not just to keep fawns clean, but to stimulate them to defecate and urinate.
Credit: UF/IFAS, Cervidae Health Research Imitative image

It is extremely important to ensure that fawns take plenty of colostrum in the first hours after they are born. Taking steps to minimize stress to does near the time of parturition—for instance, refraining from moving pregnant does to a new herd and ensuring that their pens are clean and quiet—may improve their fawns' uptake of colostrum. Similarly, it is very important to incorporate a management procedure that detects fawns that are not taking colostrum and take corrective measures within the first 12 hours after birth. After 36 hours, absorption of these very important proteins is negligible in other herbivore species (Myers 1978, Meyers et al. 1973, Yanaka et al. 2012). When natural colostrum is not available for a newborn fawn, commercial colostrum substitutes, generally composed of bovine colostrum, can provide immunoglobulin for protection against *E. coli* septicemia. Again, colostrum must be fed early in the absorptive period (i.e., within 12 hours of birth) (Gyles et al. 2010). It also may be appropriate to give fawns a commercially available colostrum paste supplement specifically formulated for the unique needs of newborn fawns. It combines bovine colostrum with essential vitamins, minerals, and probiotics to deliver immune and nutritional support (Aiello and Moses 2016). Always consult your veterinarian for professional advice on

colostrum, commercial colostrum supplement, or milk substitutes according to your farm needs.

Similarly, in other ruminant species, *E. coli* bacterin vaccines (a suspension of killed or attenuated bacteria for use as a vaccine) are commonly used in pregnant animals as a way to promote and increase antibodies in the colostrum to protect the newborn against pathogenic strains of *E. coli*. It has proven effective in cattle and goats (Myers 1978, Yanaka et al. 2012). These products have been developed for use in species other than deer, and their effectiveness in deer has not yet been fully demonstrated.

Because of the complexity of diarrheal diseases in newborn and young fawns, it is unrealistic to expect total prevention. The objectives are to reduce the clinical disease, to minimize the level of exposure to infectious agents, and to increase resistance in the fawns.



Figure 3. Group of healthy white-tailed deer fawns.
Credit: UF/IFAS, Cervidae Health Research Imitative image

It is impossible to recommend one management strategy to all deer farms because they will greatly vary according to differences in land and herd size, pen numbers and size, availability of facilities, labor, and general production objectives. However, some principles can be applied to all farms.

- Good general hygiene is fundamental to reduce disease exposure in fawns.
- If you have a diseased animal, isolate that animal in a separate area until it has recovered.
- Good nutrition and management of does is critical to promote the production of high-quality colostrum.
- Newborn fawns need to consume plenty of colostrum during the first hours after birth. A significant number of fawns do not acquire adequate amounts of immunoglobulin because of delayed sucking or feeding, inadequate volume of colostrum, or ingestion of colostrum with inferior immunoglobulin concentration.
- Monoclonal *E. coli* antibodies (ecolizers) are available commercially for oral administration to fawns immediately after birth. However, their use will depend on the type of farm and management you have.

Personal Protection

Many of the agents that produce diarrhea in fawns and young deer can also produce diarrheal disease in humans (Chapman and Ackroyd 1997, Delgado et al. 2017). To prevent any possible infection, wash and disinfect your hands after handling deer. Hand cleaning and disinfection should be a daily practice in all deer farms.

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