Clostridium difficile on U.S. Beef Cow-calf Operations

Disease caused by *Clostridium difficile* is linked most commonly to nosocomial (hospital-acquired) infections in humans, especially after antibiotics are administered that alter normal gastrointestinal flora. Humans develop a spectrum of disease when infected with some strains of *C. difficile*. Symptoms range from mild diarrhea to life-threatening toxic megacolon and pseudo-membranous colitis (Weese, 2010). Even though *C. difficile* is typically seen as a nosocomial infection, there are increasing reports of community acquired infections.

C. difficile is a spore-forming organism which can survive in the environment for long periods and can be ingested by animals or humans through contaminated foodstuffs and water (Yaeger et al., 2002). *C. difficile* has also been associated with clinical disease in young pigs and dairy calves (Yaeger et al., 2002; Hammitt et al., 2008). Shedding of *C. difficile* bacteria in animal feces can occur in the absence of clinical signs (Weese, 2010). In addition, some strains of *C. difficile* have been isolated from ground beef, ground pork, and ground veal purchased from retail markets in Canada which could serve as a source of infection in humans (Rodriguez-Palacios et al., 2007; Weese et al., 2009). To date, there has been little information available on the distribution and characteristics of *C. difficile* on various types of livestock operations across the United States.

Beef 2007–08 study

The U.S. Department of Agriculture's National Animal Health Monitoring System (NAHMS) conducted the Beef 2007–08 study, which focused on beef cow-calf health and management practices in 24 States.[1] These States represented 79.6 percent of U.S. operations with beef cows and 87.8 percent of U.S. beef cows. One objective of the Beef 2007–08 study was to determine if *C. difficile* could be found in the feces of beef cows on U.S. cow-calf operations in the United States and, if so, to determine the characteristics of the *C. difficile* isolates.

C. difficile prevalence

During the Beef 2007–08 study, testing for *C. difficile* was performed on 173 cow-calf operations across the 24 participating States.

Overall, 2,965 fecal samples from beef cows presumed to be healthy were cultured for the presence of *C. difficile.*[2] Of the 2,965 fecal samples tested, *C. difficile* was isolated from 188 (6.3 percent) [table 1]. At least 1 positive sample was found on 76 of the 173 operations tested for *C. difficile* (43.9 percent).

Table 1. Number and percentage of samples and operations tested for *C. difficile*, by test result

	Samples Tested		Operations Tested	
Test Result	No.	Pct.	No.	Pct.
Positive	188	6.3	76	43.9
Negative	2,777	93.7	97	56.1
Total	2,965	100.0	173	100.0

[1] **States/Regions:**
West: California, Colorado, Idaho, Montana, New Mexico, Oregon, Wyoming
Central: Iowa, Kansas, Missouri, Nebraska, North Dakota, South Dakota
Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Oklahoma, Tennessee, Texas, Virginia

[2] Culture methods available in Thitaram et al. (2011).

Sample-level results

Herd size and region

There was no difference by herd size in the percentage of samples positive for *C. difficile* (p=0.23) [table 2].

Table 2. Number of samples tested and number and percentage of samples positive for *C. difficile*, by herd size

	Herd Size (number of beef cows)				
	1–49	**50–99**	**100–199**	**200 or More**	**Total**
Number samples tested	570	475	794	1,126	2,965
Number samples positive	44	32	65	47	188
Percent samples positive	7.7	6.7	8.2	4.2	6.3

There was a difference in the percentage of samples positive for *C. difficile* by region (p=0.009), with a higher percentage of positive samples observed from the Southeast region than from the West or Central regions (table 3).

Table 3. Number of samples tested and number and percentage of samples positive for *C. difficile*, by region

	Region		
	West	**Central**	**Southeast**
Number samples tested	669	990	1,306
Number samples positive	17	43	128
Percent samples positive	2.5	4.3	9.8

Operation-level results

Herd size and region

There was no significant difference by herd size (p=0.50) in the percentage of operations positive for *C. difficile*-positive [table 4].

Table 4. Number of operations tested and number and percentage of operations with at least one sample positive for *C. difficile*, by herd size

	Herd Size (number of beef cows)				
	1–49	**50–99**	**100–199**	**200 or More**	**Total**
Number operations tested	49	26	42	56	173
Number operations positive	26	11	17	22	76
Percent operations positive	53.1	42.3	40.5	39.3	43.9

While the highest percentage of operations positive for *C. difficile* was in the Southeast region, the differences between regions were not statistically significant (p=0.15) [table 5].

Table 5. Number of operations tested and number and percentage of operations with at least one sample positive for *C. difficile*, by region

	Region		
	West	**Central**	**Southeast**
Number operations tested	39	54	80
Number operations positive	11	21	44
Percent operations positive	28.2	38.9	55.0

Summary

Overall, the prevalence of *C. difficile* was relatively low (6.3 percent of samples positive) but the organism was widely distributed (43.9 percent of operations had at least one positive sample).

The recovery of *C. difficile* from feces on livestock operations warrants further investigation. Not all strains of *C. difficile* appear to have the same propensity to cause disease. Therefore, isolates from this study will be further characterized to determine how related these isolates are to those causing human disease. Further characterization of *C. difficile* isolates, including molecular typing and additional epidemiological studies, is needed to ascertain if a relationship exists between food animal isolates and those from humans in order to determine the potential for foodborne disease.

References

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