



2011 Beef Industry Safety Summit

Issues Update

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Introduction

Beef industry representatives who participate in the Beef Industry Safety Summit have always been united around the goal to ensure the safest possible U.S. beef supply. Research is the foundation of this effort and most of the work focuses on direct threats to beef safety, such as *E. coli* O157:H7 and other foodborne pathogens. An addition to the Summit agenda is an Issues Update Forum focusing on emerging issues that impact the safety of beef.

This year's Issues Update Forum included several presentations, but two were of special interest to the audience. The first highlighted new concerns about *Clostridium difficile* and the second presentation focused on the latest *Emerging Infectious Diseases* report from the Centers for Disease Control and Prevention (CDC).

You Are What You Eat: *Clostridium difficile*

Erik Dubberke, MD, MSPH, Assistant Professor of Medicine, Washington University School of Medicine

Clostridium difficile is a strain of gram-positive bacteria of the genus *Clostridium* that causes severe diarrhea and other intestinal disease when competing bacteria in the gut flora are wiped out by antibiotics.

Bacillus difficilis was first identified in 1935 as part of the normal intestinal flora in newborns, however when isolated and injected into rabbits, *B. difficilis* was lethal. In the 1940s, it was determined that administration of penicillin led to lethal colitis in rodents. Through the 1970s, cases of antibiotic-associated colitis were also described in humans. *B. difficilis* was renamed *C. difficile* and; in 1978, was confirmed as the causative agent of antibiotic-associated colitis.

In 2000, a new strain of *C. difficile* emerged that was associated with an increased number of cases and more severity.

Key steps to acquiring *C. difficile* infection include the alteration of colonic flora from antibiotic administration, acquisition of *C. difficile* and subsequent growth and; according to Dubberke, potentially an additional factor that is not well understood.

"Human antibiotic exposure is considered the most important risk factor for acquiring colitis," said Dr. Erik Dubberke during his presentation at the 2011 Beef Industry Safety Summit. "That's partly why it is primarily associated with healthcare."

According to Dubberke, other factors including the virulence of the *C. difficile* strain, patients' age and the severity of their underlying disease, as well as their inherent immune response can all play a role in how *C. difficile* infection may manifest itself.

Current estimates indicate 1 to 3 million cases per year occur in the United States resulting in 20,000 deaths. "We are observing an increase in severity," said Dubberke. "More community-associated cases are occurring and more cases in what were previously considered low-risk populations have also been observed; however, we don't have any good long-term studies from the United States, so more work needs to be done."

Dubberke said evidence of an animal to human link has emerged as *C. difficile* has been isolated from domestic animals as well as a variety of food products. What is not clear, however, is whether food serves as a transmission vehicle that leads to human infection.

In conclusion, Dubberke stated that *C. difficile* is a very common bacteria in the human population. "Human exposure is common, but frequent exposures can actually be beneficial in the development of antibodies," he said. "A specific series of events needs to take place for *C. difficile* infection to occur and some additional factors are emerging that appear to influence the occurrence of the infection."

He continued, "We know colonization of animals intended for human consumption occurs and *C. difficile* is commonly found on foods destined for human consumption; what is not clear is whether that contamination is important to human health, when and how that contamination occurs and whether it can be prevented."

Estimates of Foodborne Illness Acquired in the United States

Elaine Scallan, PhD, University of Colorado Denver, School of Public Health

"Over the last 10 years, we have seen a 20 percent decline in laboratory-confirmed foodborne illnesses," said Scallan. "That change is due to the proactive efforts of the government and the food industry."

Scallan gave a summary of the latest *Emerging Infectious Diseases* report from the Centers for Disease Control and Prevention. The most current edition, published in January 2011, included two research papers discussing major pathogens and unspecified agents, as well as one editorial about the safety of the food supply.

The CDC first published comprehensive estimates of foodborne illness in 1999. According to Scallan, the revised estimates include new and improved data sources as well as new and refined testing methods. The goal of the report is to accurately estimate illnesses, hospitalizations and deaths caused by contaminated foods consumed in the United States. "More specifically, we focus on 31 pathogens transmitted through food and unspecified agents including known foodborne agents about which we have insufficient data, unrecognized foodborne agents, substances in food with unproven pathogenicity and unknown agents," said Scallan.

While the CDC includes 31 pathogens in its reporting, only 25 pathogens have actual surveillance data. For the pathogens with no surveillance data, estimates are made based on health effects or symptoms, notably acute gastroenteritis.

Four pathogens account for 88 percent of illnesses caused by known pathogens, according to Scallan. Norovirus, *Salmonella*, *C. perfringens* and *Campylobacter* top the list. Norovirus accounts for 58 percent of all illnesses caused by known pathogens.

The hospitalization and death statistics were estimated using data from surveillance and outbreaks. These data were applied to the estimated number of laboratory-confirmed illnesses and adjusted for under-diagnosis. Five pathogens account for 88 percent of the hospitalizations caused by known pathogens. *Salmonella*, norovirus, *Campylobacter*, *Toxoplasma* and *E. coli* O157. *Salmonella* accounts for 35 percent of hospitalizations and norovirus accounts for 25 percent.

Five pathogens account for 88 percent of the deaths documented in the report. *Salmonella*, *Toxoplasma*, *Listeria*, norovirus and *Campylobacter*, with *Salmonella* and *Toxoplasma* accounting for 28 and 24 percent, respectively.

The CDC reports include data from multiple sources, including FoodNet Population Survey data, National Hospital Discharge Surveys, Nationwide Inpatient Samples, National Ambulatory Medical Care Surveys, and multiple sources of cause-of-death data.

This information is compiled to calculate the number of illnesses, hospitalizations and deaths due to known pathogens, and the remaining cases are attributed to unspecified agents.

Scallan described how the methods used in the 2011 *Emerging Infectious Diseases* report have evolved to be more accurate. "In 1999, we used the best data sources available at the time," said Scallan. "The 2011 estimates use *better* data sources and methods."

Five key improvements to the 2011 estimates include:

- Increased (larger) sample size used to estimate acute gastroenteritis
- Focused on illnesses in the United States (eliminated illness reports caused by contaminated water or food encountered in other countries)
- Improved data on the fraction of norovirus that is foodborne

- Developed specific multipliers for the 31 known pathogens
- Improved accounting for uncertainty (90% confidence interval)

The CDC also measures trends in foodborne illness on a yearly basis using data from FoodNet sites. Over the past 10 years, the data show an approximate 20 percent decline in laboratory-confirmed illnesses caused by nine pathogens tracked by FoodNet. While these nine pathogens comprise only a small fraction of the illnesses measured in the estimates papers, the declines in some of the pathogens represented significant accomplishments.

In summary, Scallan noted the 2011 estimates of foodborne illness are lower than what was estimated in 1999, though the CDC cannot compare this information with the 1999 estimates due to the changes in data sources and the use of more refined methods in the current report. "However, we can say with certainty that illness due to some pathogens has decreased over this period based on the trends analyses we do annually on a smaller group of pathogens," she said.

For the known-pathogens group, the ones of most concern are *Salmonella*, norovirus, *Campylobacter*, *Toxoplasma*, *E. coli* O157, *Listeria* and *Clostridium perfringens*, as these seven cause 90 percent of illness, hospitalization, and death.

Scallan said limitations to the estimates still exist, especially as they relate to the unspecified agents. "Some of those illnesses may be caused by known agents we underestimated, but we can still draw important implications from this information," she added. "The estimates can provide a foundation for priority setting, policy development, research, education and advocacy."

“Unfortunately, we still see a high burden of foodborne illness,” concluded Scallan. “One in six people fall ill each year due to foodborne illness with a high cost associated. The good news is many of the illnesses are caused by pathogens we can control; and we will likely see major declines if we continue to implement more control measures as many of the control measures that work for known pathogens likely will work for unspecified agents.”

For more information, visit:

http://www.cdc.gov/foodborneburden/PDFs/FACTSHEET_A_FINDINGS.pdf

http://www.cdc.gov/foodborneburden/PDFs/FACTSHEET_E_2011ESTIMATES.pdf

http://www.cdc.gov/foodborneburden/PDFs/FACTSHEET_C_IMPROVEMENTS.PDF

For more information about the 2011 Beef Industry Safety Summit or to access a copy of the executive summary of this year’s meeting, visit www.bifsc.org.



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