Salmonella and Campylobacter on U.S. Dairy Operations

Background

In 2002, there were approximately 16,500 laboratory-diagnosed cases of bacterial foodborne illness in humans in the United States.\(^1\) Of these cases, 67 percent were caused by species of Salmonella and Campylobacter. Both of these pathogens cause fever, abdominal cramping, and diarrhea in humans. Severe cases can result in systemic infections and even death.

The percentage of culled dairy cows shedding Salmonella and Campylobacter is higher than in dairy cows in normal production. Culled dairy cows represent a substantial portion of the nation’s ground beef and may serve as a potential source of foodborne salmonellosis and campylobacteriosis when meat is contaminated with fecal material at slaughter.\(^2\)\(^3\)

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Clinical signs of salmonellosis in cattle include fever, diarrhea, anorexia, and decreased milk production. Infection can range from subclinical to endotoxemia and death.\(^4\) Cows can shed Salmonella in their feces due to stress incurred during transportation, lactation, and calving, without showing clinical signs typically associated with infection.\(^4\)

Although over 2,000 serotypes of Salmonella have been identified, most laboratory-confirmed Salmonella infections in cattle are due to a small number of serotypes. Recently, a drug-resistant form of Salmonella serotype (Newport) has emerged.\(^5\) These multidrug-resistant isolates have caused disease in humans, adult cattle, and less commonly in calves, and are of concern to both veterinary and public health officials.

The National Animal Health Monitoring System’s (NAHMS) Dairy ’96 study determined that 27.5 percent of dairy operations and 66.7 percent of livestock markets studied had at least one cow shedding Salmonella.\(^2\) Fecal shedding was higher in dairy cows designated for culling within 7 days and in market dairy cattle than in cows in normal production.

In 2002, the USDA’s National Animal Health Monitoring System (NAHMS) conducted Dairy 2002, NAHMS’ third national study of U.S. Dairy operations. During Dairy 2002, fecal samples were collected via rectal retrieval from approximately five operations in each of the 21 States* participating in the study. On each operation, fecal samples were collected from approximately 40 cows. From March 27 through September 25, 2002, a total of 3,669 samples were collected on 96 operations and cultured for Salmonella.

The percentage of cows where Salmonella was recovered from feces increased from 5.4 percent in the Dairy ’96 study to 7.3 percent in the Dairy 2002 study. This increase was statistically significant. The overall percentage of operations with one or more Salmonella-positive cows also increased from 27.5 percent in Dairy ’96 to 31.3 percent in Dairy 2002, although this increase was not statistically significant. Figure 1 shows the regional breakout of operations with at least one positive Salmonella sample.

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*R: California, Colorado, Idaho, New Mexico, Texas Washington
M: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin
N: New York, Pennsylvania, Vermont
S: Florida, Kentucky, Tennessee, Virginia
Figure 1. Percent of Operations in Dairy 2002 With at Least One Positive Salmonella Sample, by Region

Overall, 294 Salmonella isolates were isolated from the 269 Salmonella-positive samples collected during the Dairy 2002 study. The five most common serotypes of Salmonella recovered are summarized in Table 1. In addition, S. Newport represented 2.7 percent of the Salmonella isolates recovered, and seven of the eight S. Newport isolates were multidrug resistant.

Table 1. Percent of Isolates for the Five Most Common Salmonella Serotypes Isolated from Cattle Feces Collected During Dairy 2002:

<table>
<thead>
<tr>
<th>Salmonella serotype</th>
<th>Percent</th>
<th>Isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meleagridis</td>
<td>24.1</td>
<td></td>
</tr>
<tr>
<td>Montevideo</td>
<td>11.9</td>
<td></td>
</tr>
<tr>
<td>Typhimurium</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Kentucky</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Agona</td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

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Although Campylobacter species can be considered commensal organisms or normal flora in livestock, they also may produce diarrhea in neonatal calves, and may cause abortion, infertility, and early embryonic death in adult cattle. Foodborne transmission of Campylobacter can occur through fecal contamination of carcasses at slaughter and also through fecal contamination of milk or water. In Dairy ’96, it was determined by a multiplex polymerase chain reaction assay that 80.6 percent and 19.4 percent of dairy operations were positive for Campylobacter jejuni and Campylobacter coli, respectively. Approximately 38 percent of dairy cows had fecal samples positive for C. jejuni and 1.8 percent were positive for C. coli.

Of the 3,669 samples tested for Salmonella in the Dairy 2002 study, 1,450 also were tested for Campylobacter. Results from Dairy 2002 showed that 51.4 percent of cows were shedding Campylobacter species, as determined through fecal cultures. Overall, 97.9 percent of operations sampled had at least one cow shedding Campylobacter in their feces.

Conclusions

The percentage of cows shedding Salmonella and the percentage of dairy herds with at least one cow shedding Salmonella increased slightly between Dairy ’96 and Dairy 2002: 5.4 percent to 7.3 percent of cows, respectively; and 27.5 percent to 31.3 percent of operations, respectively. Salmonella Newport, a serotype of Salmonella of particular interest at this time, represented 2.7 percent of isolates. Campylobacter was isolated from approximately one of two (51.4 percent) cows sampled and was found in at least one cow on 97.9 percent of dairies sampled. Continued efforts by dairy producers to decrease the spread of Salmonella and Campylobacter will help limit cattle morbidity and mortality, and reduce the zoonotic spread of these organisms.

References

5. USDA, APHIS, Centers for Epidemiology and Animal Health. What veterinarians and producers should
know about multidrug-resistant *Salmonella* Newport. Fort Collins, CO, 2002.

6. Smith BP. Large animal internal medicine. Mosby, St. Louis, MO, 2002; 353, 967-968.


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