ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF SALMONELLA ISOLATES FROM BEEF CATTLE

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Two studies were conducted as part of the USDA:APHIS National Animal Health Monitoring System to characterize the prevalence of Salmonella and their resistance patterns on beef cattle operations from throughout the United States. The first study was part of a larger study to estimate the level of health and frequency of various health related management practices in feedlot operations. A convenience sample of 100 feedlots from the larger study which included 13 states (Figure 1) participated by allowing fecal samples to be collected from each of two pens. Overall 4977 fecal samples were collected (approximately 25 per pen) and cultured for Salmonella. Of those, 273 samples (5.5%) were positive for Salmonella (Fedorka-Cray et al., 1998). Antimicrobial susceptibility patterns were determined for 263 isolates that were subsequently available for testing using a semi-automated system (Trek Diagnostics, Westlake, OH). Susceptibility was determined for each isolate to a panel of 16 antimicrobials using a breakpoint configuration (Table 1).

The serotypes of Salmonella recovered from this group of feedlot cattle was not consistent with those typically seen associated with illness in cattle or humans.¹ The five most common serotypes of Salmonella identified were S. Anatum, S. Montevideo, S. Muenster, S. Kentucky, and S. Newington. Overall 75% of the isolates were sensitive to all the antimicrobials tested. Less than 5% of isolates were resistant to any antimicrobial tested with the exception of sulfamethoxazole (5.7% resistant) and tetracycline (23.5% resistant).

In a second study, 5049 fecal samples were collected on 187 operations from 22 states (Figure 2).² Samples were cultured for presence of Salmonella. All isolates were serogrouped, serotyped, and their antimicrobial susceptibility pattern was determined. The minimum inhibitory concentration (MIC) to a panel of 17 antimicrobials¹ was determined using a semi-automated system (Trek Diagnostics, Westlake, OH). Organisms were classified as sensitive, intermediate or resistant according to either the human or veterinary breakpoints available from the National Committee on Clinical

¹ Amikacin, Amoxicillin/Clavulonic Acid, Ampicillin, Apramycin, Ceftiofur, Ceftriaxone, Cephalothin, Chloramphenicol, Ciprofloxacin, Gentamicin, Kanamycin, Naladixic Acid, Streptomycin, Sulfamethoxazole, Tetracycline, Ticarcillin, and Trimethoprim/sulfamethoxazole.
Laboratory Standards (NCCLS). For the purpose of this analysis, isolates classified as intermediate were considered susceptible.

Salmonella was recovered from 70 (1.4%) of the samples collected and processed. Overall 78 isolates were available for further characterization. Less than 3% of isolates were resistant to each of the antimicrobials tested with the exception of streptomycin (11.5% resistant) and sulfamethoxazole (11.5% resistant).

The results from these two studies indicate that the occurrence of Salmonella in beef cattle populations is low (less than 6% of samples positive) and that few or the Salmonella organisms are resistant to antimicrobials with the exceptions of tetracycline, sulfamethoxazole, and streptomycin.

References:


Figure 1. States where samples were collected from feedlots for Salmonella culture and susceptibility testing.

Figure 2. States where samples were collected from cow-calf operations for Salmonella culture and susceptibility testing.
Table 1. Antimicrobials used for susceptibility testing of Salmonella isolates from samples collected in 100 feedlots.

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Concentrations (µg/ml)</th>
</tr>
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<tbody>
<tr>
<td>Amikacin</td>
<td>16-32</td>
</tr>
<tr>
<td>Amoxicillin/Clavulonic Acid</td>
<td>8/4-16/8</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>16-32</td>
</tr>
<tr>
<td>Apramycin</td>
<td>8</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>8-32</td>
</tr>
<tr>
<td>Ceftiofur</td>
<td>2-4</td>
</tr>
<tr>
<td>Cephalothin</td>
<td>8-16</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>1-2</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>4-8</td>
</tr>
<tr>
<td>Neomycin</td>
<td>8</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>16-64</td>
</tr>
<tr>
<td>Sulfamethoxazole</td>
<td>256</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>4-8</td>
</tr>
<tr>
<td>Ticarcillin</td>
<td>16-64</td>
</tr>
<tr>
<td>Ticarcillin/Clavulonic Acid</td>
<td>16/2-64/2</td>
</tr>
<tr>
<td>Trimethoprim/Sulfa</td>
<td>2/38</td>
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