A Research Note

Salmonella in the Mesenteric Lymph Nodes and Cecal Contents of Slaughtered Sows

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ABSTRACT

From August 1983 to February 1984, sampling was conducted on 200 slaughtered sows for Salmonella. The sampling was to determine the presence of Salmonella in cull sows at a Minnesota slaughtering establishment. The weight range of the sows varied from 300 to 400 lb. Two samples (mesenteric lymph nodes and cecal contents) were collected from each sow. Conventional methods, using enrichment and plating onto selective media followed by biochemical and serological analyses, were used to isolate and identify Salmonella serotypes. Salmonellae were isolated from the mesenteric lymph nodes and cecal contents of 167/200 (84%) sows. Nine Salmonella serotypes were identified. The four most frequently identified Salmonella serotypes (S. agona, S. anatum, S. derby, S. java) accounted for 71% (141/200) of the Salmonella-positive sows. Salmonella were isolated from 131/200 (66%) of the mesenteric lymph nodes examined and 60/200 (30%) of the cecal contents examined.

Salmonellosis is an important zoonotic disease of global distribution. Salmonellosis is important from an economic as well as a public health point of view (4). It is responsible for a considerable number of animal disease and economic loss, and is of immense importance as a cause of human foodborne illness (1,2,3,12).

Although the importance of pork as a vehicle of transmission is not often considered by many investigators, results of studies of outbreaks of salmonellosis in the United States and Canada (A Working Paper: Agriculture Canada Economic Study of Salmonella Poisoning and Control Measures in Canada. Nov., 1984) ranked pork as the third most important animal source from 1968 to 1977, and other studies rank pork second (14).

This study was carried out to determine the prevalence of salmonellae in slaughtered sows. Previous Salmonella studies have primarily involved slaughtered market hogs (220 lb weight; 6-8 months old) and not older swine (5,6,7,11).

MATERIALS AND METHODS

Sampling procedure and preparation. From August 1983 to February 1984, 50 mesenteric lymph nodes and 50 cecal contents were collected from slaughtered sows on each of 4 sampling days. The mesenteric lymph nodes and cecal contents from each sow were placed in numbered, disposable plastic bags. Samples were placed in a cooler with ice and then transported to the laboratory. The cecal contents were obtained through a cecal incision using packaged sterile tongue blades removed at the moment of collecting the cecal contents. The scissors were rinsed with cold water and dipped in hot water (≥ 180°F) for 15 sec after each sampling.

Upon arrival at the laboratory, fat and capsular tissues were removed from the mesenteric lymph nodes individually. Each mesenteric lymph node (approximately 10 g) was immersed in boiling water for fifteen sec and sliced into small pieces (6,10). Individual mesenteric lymph nodes and cecal contents (10 g) were cultured in 10 ml enrichment medium, tetrathionate brilliant green bile broth (Muller and Kauffmann), as well as in a 10 ml of selenite cyanide broth (Muller and Kauffmann), as well as in a 10 ml of selenite cyanide broth, for 18-24 h at 42°C.

Subcultures were made onto brilliant green agar plates by streaking and incubating for 18-24 h at 37°C. After incubation on selective media, the plates were examined for suspicious Salmonella colonies. Suspect Salmonella colonies isolated from the primary plating medium were inoculated into the primary identification media, triple sugar iron agar and lysine iron agar, by stabbing the butt and streaking the slant, and incubated at 37°C for 18 h with caps loosened. All suspected Salmonella cultures from the primary identification media were each inoculated into a set of biochemical media in the following order: TSI, Lysine, Indol, Glucose, Motility, Malonate, and Urea. The tubes were examined as a set after incubation for 18 h at 37°C. Following preliminary identification of “O” and “H” antigens by using polyvalent sera, all cultures were submitted to the National Veterinary Services Laboratory, Ames, Iowa for verification.

RESULTS

One hundred and sixty seven sows (84%) were positive to Salmonella with isolation from mesenteric lymph nodes and/or cecal contents. Nine Salmonella serotypes were identified. Salmonella were isolated from 131 mesenteric lymph nodes (66%) and 60 of the cecal contents (30%) examined (Table 1). The 4 most frequently identified Salmonella serotypes (S. agona, S. anatum, S. derby, S. java)
TABLE 1. Salmonella serotypes isolated from sow samples.

<table>
<thead>
<tr>
<th>Sero-type</th>
<th>Sero-group</th>
<th>No. of Sows Positive</th>
<th>M.L.N.</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>agona</em></td>
<td>C</td>
<td>205</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>2. <em>derby</em></td>
<td>C</td>
<td>55</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>3. <em>infantis</em></td>
<td>C1</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. <em>litchfield</em></td>
<td>C2</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>5. <em>newport</em></td>
<td>C2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6. <em>anatum</em></td>
<td>E1</td>
<td>43</td>
<td>38</td>
<td>11</td>
</tr>
<tr>
<td>7. <em>drypool</em></td>
<td></td>
<td>9</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>8. <em>java</em></td>
<td></td>
<td>19</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>9. rough &quot;O&quot;</td>
<td>1,2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>167</td>
<td>131</td>
<td>60</td>
</tr>
</tbody>
</table>

MLN = Mesenteric Lymph Nodes CC = Cecal Content.

accounted for 71% (141/200) of the Salmonella-positive samples.

**DISCUSSION**

Numerous studies have revealed a higher isolation rate of salmonellae in healthy domestic animals from mesenteric lymph nodes when compared with cecal contents, feces and rectal swabs (6,8,10). It has been reported in other studies that many salmonellae producing subclinical infections in apparently healthy pigs can usually be isolated from the mesenteric lymph nodes (7,8,9,10,13). Other studies demonstrated that examination of mesenteric lymph glands and tissues frequently reveals Salmonella of different serotypes than those found in the feces (6,7,8,10). Also, more Salmonella are found in cecal swabs than in rectal swabs and even more in cecal contents (7,8,10).

Data collected from various countries indicate wide variations in contamination of swine carcasses and retail pork products with Salmonella. Some variation is probably due to differences in post-slaughter decontamination techniques, or to methodological differences (5).

The salmonellae from lymph nodes and other tissue may represent past infection, rather than recent infection of contamination during slaughter. Cecal salmonellae are more likely related to farm exposure than to infection during transport and holding. Isolation of salmonellae from the mesenteric lymph nodes of 54% of clinically normal pigs led to the opinion that the incision of the mesenteric lymph nodes may be a source of salmonellae for pork and edible offal in the abattoir (9).

Many investigators who found high isolation rates of Salmonella from pork products concluded that since, historically, people cook pork well to avoid trichinosis, it may be effective in reducing human Salmonella outbreaks. Vaccination against salmonellosis has not proved of great value except in pigs using a specific live attenuated vaccine against S. choleraesuis. Where protection against the septicemic form of the disease may result, vaccines have not proved effective against alimentary infection and subsequent excretion (15).

Studies of Salmonella outbreaks have demonstrated that in animals and humans, contaminated food and feed-stuffs of animal origin can be the source of infection. Researchers have suggested that the impact of these agents on human foodborne Salmonella infections should be decreased by controlling the twelve serotypes most frequently associated with human infection and disease, rather than to decrease the number of all Salmonella that can contact humans (16).

The institution of efficient feed sterilization methods is necessary to prevent the introduction of salmonellosis to the farms. Gamma radiation, as alternative process of treatment of animal feed and bone meal, has been tried successfully to sterilize animal feeds and therefore merits consideration (14,16).

The education of food handlers and consumers that food of animal origin can be hazardous is also important in the prevention of salmonellosis (17).

**REFERENCES**