A SURVEY ON SALMONELLA IN RECTAL SWABS
OF CATTLE ON DAIRY FARMS
AND STEER FEED LOTS IN HOKKAIDO*1

Gihei Sato, Hiroshi Kodama, Chuhachiro Oda*2,
Koji Ichimura*2, Kenji Ishida*2,
Akira Sato*3 and Toshiaki Mito*2

Department of Epizootiology
Faculty of Veterinary Medicine
Hokkaido University, Sapporo, Japan

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In 1971, rectal swabs of 1,291 apparently healthy calves and cows on 280 dairy
farms in Hokkaido were examined for the presence of Salmonella and one of them
(0.08%) gave Salmonella johannesburg. In the same year 568 calves on 12 feed lots
were surveyed similarly and 3 calves (0.53%) on 2 feed lots gave Salmonella
typhimurium.

INTRODUCTION

Until recently, salmonellosis in cattle was not considered a serious problem in
Japan. However, in the last few years, intensive calf farming in feed lots has brought on an increase in number of incidences of Salmonella typhimurium
infection. There have been at least 9 reports of outbreaks of the infection in
this country, but source of the infection has not been satisfactorily confirmed.

The present authors guessed that newly introduced carrier calves might be
the infection source on a feed lot, on the basis of the results from biotyping study of S. typhimurium isolates and other investigations10). However there has
been no survey giving direct information on the salmonella status in dairy herds
which supply calves to feed lots. A survey indicated that 6.7~10% of slaughtered cattle had Salmonella at 2 abattoirs in Japan7), but these percentages do
not indicate Salmonella status on farms, because it is generally accepted that
an increase in infection rates occurs in animals between farm and abattoir6).

This paper deals with a survey of the Salmonella status on dairy farms and
feed lots in 1971 in Hokkaido.

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*2 Livestock Hygiene Service Center of the Hokkaido Prefectural Government (Located
in Kushiro, Tokachi, Abashiri and Nemuro respectively)
*3 Betsukai Agricultural Mutual Benefit Association, Betsukai, Hokkaido
Materials and Methods

Sampling on dairy farms  Rectal swabs were sampled from Holstein-Friesian cattle in Nov. and Dec. of 1971 in Nemuro and Kushiro as shown in Table 1. A single sample was obtained from each cattle. From each farm about 10 calves and heifers (sometimes cows) were sampled. On the other hand, in Iburi and Ishikari, only about 1-week-old male Holstein-Friesian calves on 243 dairy farms were examined. The calves were sampled once at the time of transfer from their original farms to a feed lot during Jan. to Dec. of 1971. About 4 calves per farm (range 1~51) were sampled for the period.

Sampling on feed lots  The feed lots examined reared Holstein-Friesian steers aged 1~13 months (mostly 1~6 months). Sampling was made from Sept. to Dec. of 1971.

Cultivation of rectal swabs  Sterile cotton swab was used to obtain sample from the rectum. The rectal swabs in tubes without media were transported to this laboratory and cultivated 1~10 days after having been sampled. The swab in about 15 ml of selenite brilliant green broth (Nissan) was incubated at 43°C. Subcultures onto brilliant green agar (Eiken) were made at 24 and 48 hrs after incubation and Salmonella-like colonies were examined biochemically and serologically.

Phage types\(^1\) and biotypes\(^6\) of S. typhimurium cultures isolated were examined.

Results and Discussion

As can be seen in Table 1, only one of 280 farms gave Salmonella johannenburg, while 3 samples from 2 out of 12 feed lots gave S. typhimurium. The 2 Salmonella positive feed lots had a history of clinical S. typhimurium infection.

Table 2 shows that younger calves aged less than 3 months gave Salmonella.

Salmonella isolate from a feed lot in Iburi was not sensitive to the phages and biotype 10, and those from Kushiro were not sensitive to the phages and biotype 1.

It is well known that a single fecal sample from animals with asymptomatic Salmonella infection does not give reliable information on the Salmonella status of the animals, because they excrete the organisms intermittently\(^8\). Therefore the present data showing non-isolation of S. typhimurium on dairy farms do not always mean the absence of the Salmonella there.

In this study, the isolation frequency of 0.08% on dairy farms is not so high as frequencies in other countries. For example, RANKIN et al. used single rectal swabs and found that 11 of 796 calves (1.4%) held for a few hours at a collecting center in England were Salmonella carriers (mostly Salmonella
<table>
<thead>
<tr>
<th>DISTRICTS</th>
<th>DAIRY FARMS</th>
<th></th>
<th></th>
<th>STEER FEED LOTS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO. EXAMINED</td>
<td>SIZE OF HERD</td>
<td>NO. OF CATTLE SAMPLED</td>
<td>NO. EXAMINED</td>
<td>SIZE OF HERD</td>
<td>NO. OF CATTLE SAMPLED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Av. (Range)</td>
<td></td>
<td></td>
<td>Av. (Range)</td>
<td></td>
</tr>
<tr>
<td>Iburi &amp; Ishikari</td>
<td>243*1 (1)*2</td>
<td>N. R.*3</td>
<td>966 (1)*2</td>
<td>1 (1)*2</td>
<td>954</td>
<td>109 (1)*2</td>
</tr>
<tr>
<td>Soya</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>N. R.</td>
<td>65</td>
</tr>
<tr>
<td>Kamikawa</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>N. R.</td>
<td>20</td>
</tr>
<tr>
<td>Abashiri</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>153</td>
<td>55</td>
</tr>
<tr>
<td>Nemuro</td>
<td>20</td>
<td>48.5 (21 ~ 270)</td>
<td>201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kushiro</td>
<td>17</td>
<td>49.1 (17 ~ 218)</td>
<td>124</td>
<td>1 (1)</td>
<td>150</td>
<td>81 (2)</td>
</tr>
<tr>
<td>Tokachi</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>169.5 (120 ~ 384)</td>
<td>187</td>
</tr>
<tr>
<td>Hidaka</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>N. R.</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>280 (1)</td>
<td></td>
<td>1,291 (1)*4</td>
<td>12 (2)</td>
<td></td>
<td>568 (3)*5</td>
</tr>
<tr>
<td></td>
<td>(0.36 %)</td>
<td></td>
<td>(0.08 %)</td>
<td>(16.7 %)</td>
<td></td>
<td>(0.53 %)</td>
</tr>
</tbody>
</table>

*1 Only about 1-week-old calves were sampled
*2 No. of Salmonella positives
*3 Not recorded
*4 S. johannesburg
*5 S. typhimurium
TABLE 2  *Relation of Salmonella isolation to the age of cattle examined*

<table>
<thead>
<tr>
<th>AGE (MONTHS) OF CATTLE</th>
<th>TOTAL</th>
</tr>
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<tr>
<td>&lt; 1</td>
<td>1,136</td>
</tr>
<tr>
<td>1~2</td>
<td>190</td>
</tr>
<tr>
<td>2~3</td>
<td>83</td>
</tr>
<tr>
<td>3~6</td>
<td>274</td>
</tr>
<tr>
<td>6~12</td>
<td>96</td>
</tr>
<tr>
<td>&gt;12*3</td>
<td>80</td>
</tr>
<tr>
<td>No. of cattle examined</td>
<td>1,859</td>
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</tbody>
</table>

No. of Salmonella positives:

<p>| | | | | |</p>
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</thead>
<tbody>
<tr>
<td></td>
<td>2*1</td>
<td>1*2</td>
<td>1*2</td>
<td>0</td>
</tr>
<tr>
<td>No. of</td>
<td>(0.18 %)</td>
<td>(0.53 %)</td>
<td>(1.20 %)</td>
<td>4</td>
</tr>
<tr>
<td>Salmonella positives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1  S. johannesburg and S. typhimurium
*2  S. typhimurium
*3  Including cattle aged 2~4 years or more

**dublin**). Bowmer indicated that 1.34% of dairy cattle gave Salmonella in 1952 in Florida. In New Zealand Robinson reported that 25 (0.87%) of 2,868 calves were Salmonella excretors on 8 of 78 dairy farms surveyed.

The isolation frequency (0.53%) on feed lots appears to be lower than that in the Netherlands (3.2%)\(^5\), though strict comparison cannot be made because of the difference in the detection procedure applied.

In this survey, the frequency of Salmonella isolation was higher on feed lots than on dairy farms. This indicates that the intensive calf-farming method may frequently provide different infection sources of endogenous and extraneous, as described by Anderson\(^2\).

Recently (in Feb. 1973), the present authors found 2 important extraneous sources of *S. typhimurium* infection on the feed lot in Iburi, from which *S. typhimurium* had been detected in 1971. One of the sources was carrier calves: a group of calves which were introduced following trucking for 2 days, and 2 calves purchased from a dealer in the district. Another source was a contaminated calf milk replacer (skimmed milk powder). *S. typhimurium* was found in the materials being sampled from an unopend sack (unpublished data).

**Acknowledgments**

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Survey of Salmonella in cattle on farms

REFERENCES

1) ANDERSON, E. S. (1964): "The phage typing of Salmonellae other than S. typhi"
The World problem of salmonellosis, Ed. van OYE, E. led., The Hague: Dr. W. Junk Publishers


3) BOWMER, E. J. (1964): Am. J. med. Sci., 247, 467


