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A SURVEY ON SALMONELLA IN RECTAL SWABS  
OF CATTLE ON DAIRY FARMS  
AND STEER FEED LOTS IN HOKKAIDO\*<sup>1</sup>

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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 investigations<sup>11</sup>). 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 Japan<sup>7</sup>), 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 abattoir<sup>6</sup>).

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

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\*<sup>2</sup> Livestock Hygiene Service Center of the Hokkaido Prefectural Government (Located in Kushiro, Tokachi, Abashiri and Nemuro respectively)

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## 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<sup>1)</sup> and biotypes<sup>4)</sup> of *S. typhimurium* cultures isolated were examined.

## RESULTS AND DISCUSSION

As can be seen in table 1, only one of 280 farms gave *Salmonella johannesburg*, 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<sup>8)</sup>. 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 1 *Salmonella* isolation from rectal swabs of cattle

| DISTRICTS           | DAIRY FARMS                         |                     |                                     | STEER FEED LOTS     |                 |                                   |
|---------------------|-------------------------------------|---------------------|-------------------------------------|---------------------|-----------------|-----------------------------------|
|                     | NO. EXAMINED                        | SIZE OF HERD        | NO. OF CATTLE<br>SAMPLED            | NO. EXAMINED        | SIZE OF HERD    | NO. OF CATTLE<br>SAMPLED          |
|                     |                                     | Av. (Range)         |                                     |                     | Av. (Range)     |                                   |
| Iburi &<br>Ishikari | 243* <sup>1</sup> (1)* <sup>2</sup> | N. R.* <sup>3</sup> | 966 (1)* <sup>2</sup>               | 1 (1)* <sup>2</sup> | 954             | 109 (1)* <sup>2</sup>             |
| Soya                | •                                   | •                   | •                                   | 1                   | N. R.           | 65                                |
| Kamikawa            | •                                   | •                   | •                                   | 1                   | N. R.           | 20                                |
| Abashiri            | •                                   | •                   | •                                   | 1                   | 153             | 55                                |
| Nemuro              | 20                                  | 48.5 (21~270)       | 201                                 | •                   | •               | •                                 |
| Kushiro             | 17                                  | 49.1 (17~218)       | 124                                 | 1 (1)               | 150             | 81 (2)                            |
| Tokachi             | •                                   | •                   | •                                   | 6                   | 169.5 (120~384) | 187                               |
| Hidaka              | •                                   | •                   | •                                   | 1                   | N. R.           | 51                                |
| Total               | 280 (1)<br>(0.36 %)                 | •                   | 1,291 (1)* <sup>4</sup><br>(0.08 %) | 12 (2)<br>(16.7 %)  | •               | 568 (3)* <sup>5</sup><br>(0.53 %) |

\*<sup>1</sup> Only about 1-week-old calves were sampled

\*<sup>2</sup> No. of *Salmonella* positives

\*<sup>3</sup> Not recorded

\*<sup>4</sup> *S. johannesburg*

\*<sup>5</sup> *S. typhimurium*

Survey of *Salmonella* in cattle on farms

TABLE 2 *Relation of Salmonella isolation to the age of cattle examined*

|                             | AGE (MONTHS) OF CATTLE      |                             |                             |     |      |                   | TOTAL         |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----|------|-------------------|---------------|
|                             | < 1                         | 1~2                         | 2~3                         | 3~6 | 6~12 | >12* <sup>3</sup> |               |
| No. of cattle examined      | 1,136                       | 190                         | 83                          | 274 | 96   | 80                | 1,859         |
| No. of Salmonella positives | 2* <sup>1</sup><br>(0.18 %) | 1* <sup>2</sup><br>(0.53 %) | 1* <sup>2</sup><br>(1.20 %) | 0   | 0    | 0                 | 4<br>(0.22 %) |

\*<sup>1</sup> *S. johannesburg* and *S. typhimurium*

\*<sup>2</sup> *S. typhimurium*

\*<sup>3</sup> 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 %)<sup>5</sup>, 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<sup>2</sup>).

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 unopened sack (unpublished data).

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