A SURVEY OF ABOMASAL AND DUODENAL NEMATODES IN CATTLE IN HOKKAIDO, JAPAN

Yuzaburo Oku1, Masatoshi Nakazawa1, Shigeki Hatakeyama1, Suguru Miyaji1, Tomohide Kitaguchi1, Carlos A. Cabrera-Lopez2, Munehiro Okamoto1, Masao Kamiya1, Masashi Ohbayashi1 and Hong Kean Ooi1,2

(Accepted for publication February 5, 1987)

In July and August 1984 the abomasas and duodenas of 86 Holstein-Friesian cows, 30 Holstein-Friesian steers and 34 Japanese Black cattle were collected at an abattoir in Hokkaido, Japan, and examined for nematodes. Nematodes were detected in 62 of the cows (72.1%), 3 of the steers (10%) and 19 of the Japanese Black cattle (55.9%). The prevalences of *Ostertagia ostertagi* and *Mecistocirrus digitatus* in the cattle were 47.3% and 29.3%, respectively. Other nematodes indentifiecl and their prevalences were: *Haemonchus* sp. 0.7%; *Trichostrongylus axei* 2.7%; *Cooperia oncophora* 2.7%; *C. punctata* 1.3%; *Nematodirus helvetianus* 1.3% and *Bunostomum phlebotomum* 0.7%. The intensity of infection in 93% of the cattle was low; the number of mature *M. digitatus* and *O. ostertagi* estimated was less than 210 and 850 worms per animal, respectively.

Key words: cattle, gastrointestinal nematodes, Japan, survey.

INTRODUCTION

Gastrointestinal trichostrongylosis is a cause of impaired productivity in cattle as demonstrated by inferior weight gains and milk production. There have been some surveys of gastrointestinal nematodes in cattle in Japan, but most of them were carried out using fecal examination. *Post mortem* examinations for gastrointestinal nematodes are scarce in Japan, and the results from both types of study have been published in Japanese only or reported in meeting with short Japanese abstracts.

The present investigation was carried out to clarify the prevalence and intensity of infection of the different gastrointestinal nematode species of cattle in Hokkaido, Japan.

1) Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo Japan
2) Hokkaido Veterinary Center, Sapporo, Japan
MATERIALS AND METHODS

During the period of July and August, 1984, 150 abomasa and duodena were collected from 86 five to ten years old Holstein-Friesian dairy cows, 30 one and a half years old Holstein-Friesian steers and 34 two to three years old Japanese Black cattle (a race of beef cattle) at an abattoir in the suburb of Sapporo, Hokkaido.

In a preliminary examination, the abomasal contents were diluted with saline and the mucosal surface of the abomasum was washed several times by rubbing with hands. Without sieving, samples were taken for worm counting. The adult worm burden was estimated by counting the worms collected in 1/10 of mucosal washings and also 1/10 of the diluted contents of the abomasum. When a large number of small nematodes was collected, more than a quarter of the worms were identified and the proportion of the various species present was extrapolated for the whole sample. All the large nematodes collected were identified. In the preliminary examination of 20 cases, the worm count of the mucosal washings was found to represent 3/4 of the total adult worm count for the whole sample. The worm collecting and counting of nematodes present in the abomasal contents were time consuming. Therefore, only the mucosal washings was used for the worm count in the actual survey. On the other hand, nematodes in the upper 3m of the small intestine were collected and counted in a 1/10 sample of both of the intestinal contents and mucosal washings. Larvae were not counted or identified in the present investigation. Sampling of worms from the abomasum and duodenum was carried out within 4 hours after the slaughter of the cattle.

RESULTS

Sixty-two Holstein-Friesian cows (72.1%), 3 Holstein-Friesian steers (10%) and 19 Japanese Black cattle (55.9%) were positive for nematodes in the abomasum and duodenum. Eight species were identified (Table 1). The prevalence of gastrointestinal nematodes was lowest in steers. *Ostertagia ostertagi* and *Mecistocirrus digitatus* were predominant species in the abomasum, while *Haemonchus* sp., *Trichostrongylus axei*, *Cooperia oncophora*, *C. punctata*, *Nematodirus helvetianus* and *Bunostomum phlebotomum* were also observed in the abomasum and duodenum. The spicule length of a male *Haemonchus* sp. was 560 μm and its left and right hook length were 60 μm and 32 μm, respectively. Almost all of the cattle examined harboured a small number of adult worms (Table 2). In 93% of the cattle, less than 160 *M. digitatus* and 640 *O. ostertagi* adult worms were estimated from the mucosal washings of abomasa, and the number of worms extrapolated for the whole abomasum was less than 210 and 850, respectively.
Nematodes in cattle

Table 1  Prevalence and intensity of the gastro-duodenal nematodes in 86 Holstein-Friesian cow, 30 Holstein-Friesian steers and 34 Japanese Black cattle

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of positive cattle (Percentage)</th>
<th>Maximum worm burden*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Holstein-Friesian Cow</td>
<td>Steer</td>
</tr>
<tr>
<td><em>Ostertagia ostertagi</em></td>
<td>55 (64.0%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td><em>Mecistocirrus digitatus</em></td>
<td>36 (41.8%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Trichostrongylus axei</em></td>
<td>2 (2.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Haemonchus</em> sp.</td>
<td>1 (1.1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Cooperia oncophora</em></td>
<td>2 (2.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Cooperia punctata</em></td>
<td>1 (1.1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Nematodirus helvetianus</em></td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><em>Bunostomum phlebotomum</em></td>
<td>1 (1.1%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

* The number of adult worm estimated in mucosal washings of abomasa and in duodenal contents and washings

Table 2  Distribution of the numbers of *Mecistocirrus* and *Ostertagia* in 150 abomasa

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of parasites per cattle*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td><em>M. digitatus</em></td>
<td>106</td>
</tr>
<tr>
<td><em>O. ostertagi</em></td>
<td>78</td>
</tr>
</tbody>
</table>

*Adult worm estimated in mucosal washings of abomasa

Discussion

In this study half of the cattle examined was infected with abomasal nematodes. The same conclusion was reported by NODA et al. (1964) and KUDO et al. (1986) in post mortem examination. However, NODA et al. (1964) reported that the prevalences of *Mecistocirrus, Haemonchus* and *Ostertagia* in cattle were 31.1%, 22.6% and 33.1%, respectively. The prevalence of *Haemonchus* reported by NODA et al. (1964) is higher than the one in the present investigation or in any other reports from northern Japan. NODA et al. (1964) also found that the prevalence of *Haemonchus* in western and southern Japan was higher than in any other parts of Japan. In Japan, the number of sheep and sheep farm have decreased since 1957, from about 1,000,000 sheep to only
22,200 sheep in 1984 (FUKUI, 1986). Thus, nowadays substantial contact between
cows and sheep is not observed. WANG (1979) could not find any Haemonchus spp.
from 1047 dairy cattle in Japan.

SOULSBY (1982) listed 3 species of Haemonchus in cattle and reported that their
spicule length as 398–431 \( \mu m \) for H. contortus, 454–470 \( \mu m \) for H. placei and 139–334
\( \mu m \) for H. similis. However, GIBBONS (1979) did not accept H. placei as a valid
species and regarded it as a synonym of H. contortus, with spicule length ranging from
381 to 550 \( \mu m \). NODA et al. (1966) reported the presence of H. contortus and H.
similis in cattle in Japan but they did not describe the spicule length of the parasites.
SLOCOMBE (1974) reported that a Haemonchus sp. form cattle in Ontario has spicule
length of 468–554 \( \mu m \). DAS & WHITLOCK (1960) considered H. placei to be a sub-
tropically adapted species.

At least 16 species of gastrointestinal nematodes of cattle have been recorded in
Japan: M. digitatus, H. contortus, H. similis (NODA et al., 1966), O. ostertagi O.
lyrata, Marshallagia marshalli, T. axei, C. punctata, C. onchophora, C. fieldingi, C.
macmasteri (WATANABE & UENO, 1965), C. spatulata (NODA et al. 1966), Trichostrongylus
longispicularis, B. phlebotomum, N. helvetianus (KUDO et al. 1986), Oesophagostomum
radio (NODA et al. 1966), Toxocara vitulorum (YAMASHITA & TAKAHASHI, 1952), Strongyloides sp.,
Trichuris discolor and Capillaria bovis (WATANABE & UENO, 1965). ISENSTEIN (1971) concluded that C.
onchophora is polymorphic and C. surinabada (=C. macmasteri) is a synonym; O. lyrata and C. fieldingi were also regarded as
synonym of O. ostertagi and C. punctata, respectively (LANCASTER et al. 1983; LEVINE,
1980). The prevalence of Cooperia spp. was very low in the present study. The
reason for this may be that only the first 3m of the small intestine was examined.
Cooperia spp. were the predominant nematodes in Japan in studies involving post
mortem examination of 20 Japanese cattle (NODA et al. 1965) and fecal examination of
cattle (FURUYA & IWASHIMA, 1964; NODA et al. 1965; FURUKAWA et al., 1966; NAMBA
et al., 1970). However, these studies were carried out about 2 decades ago.

Interpretation of the data from this type of survey is difficult since it is not known
if the animals had recently been treated with an anthelmintic or the level of parasitic
larval challenge to which they were subjected (BAIRD & ARMOUR, 1981). In addition
we do not know the stage of lactation, as well as the housing and grazing period. We
observed a low intensity of abomasal nematode infection in cattle as compared with
reports of similar survey in other countries (HINABDY et al., 1979; BAIRD & ARMOUR,
1981; BARTH et al., 1981; BORGESTEED & BURG, 1982). The intensity and prevalence
of the nematode infection is influenced by the system of cattle-management
(EUZEBY, 1981). In Japan, most of the Holstein-Friesian steers were raised without
grazing. BARTH et al. (1981) stated that the zero-grazing system gives rise to lower
worm burden. However, the methods used in post mortem examination are also
Nematodes in cattle

important. In this study, larvae were not counted. Besides, the adult worm count was made only on the mucosal washing and this apparently represents 3/4 of the actual number of worms present in the abomasum.

ACKNOWLEDGMENTS

We would like to thank members of the Department of Parasitology for their excellent technical assistance, and the meat inspectors and employees of the abattoir, particularly Dr. S. Kudo, who supplied the cattle organs.

REFERENCES


