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

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In July and August 1984 the abomasa and duodena 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 indentified 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 prodoction. 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.

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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.

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

Species	Number of positive cattle (Percentage)				Maximum worm burden*
	Holstein-Friesian Cow	Holstein-Friesian Steer	Japanese Black	Total	
Ostertagia ostertagi	55(64.0%)	3(10%)	13(38.2%)	71(47.3%)	3110
Mecistocirrus digitatus	36(41.8%)	0(0%)	8(23.5%)	44(29.3%)	619
Trichostrongylus axei	2(2.3%)	0(0%)	2(5.9%)	4(2.7%)	1060
Haemonchus sp.	1(1.1%)	0(0%)	0(0 %)	1(0.7%)	30
Cooperia oncophora	2(2.3%)	0(0%)	2(5.9%)	4(2.7%)	40
Cooperia punctata	1(1.1%)	0(0%)	1(2.9%)	2(1.3%)	470
Nematodirus helvetianus	0(0 %)	0(0%)	2(5.9%)	2(1.3%)	10
Bunostomum phlebotomum	1(1.1%)	0(0%)	0(0 %)	1(0.7%)	10

* The numder 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

Species	Number of parasites per cattle*						
	0	~10	~40	~160	~650	~2560	~5120
M. digitatus	106	14	12	10	8	0	0
O. ostertagi	78	6	15	18	22	8	2

*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 μm for *H. contortus*, 454–470 μm for *H. placei* and 139–334 μm 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 μm. 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 μm. DAS & WHITLOCK (1960) considered *H. placei* to be a subtropically 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. oncophora, C. fieldingi, C. macmasteri* (WATANABE & UENO, 1965), *C. spatulata* (NODA et al. 1966), *Trichostrongylus longispicularis, B. phlebotomum, N. helvetianus* (KUDO et al. 1986), *Oesophagostomum radiatum* (NODA et al. 1966), *Toxocara vitulorum* (YAMASHITA & TAKAHASHI, 1952), *Strongyloides sp., Trichuris discolor* and *Capillaria bovis* (WATANABE & UENO, 1965). ISENSTEIN (1971) concluded that *C. oncophora* is polymorphic and *C. surnabada* (=*C. mcmasteri*) 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 en al. 1965) and fecal examination of cattle (FURUYA & IWASHIMA, 1964; NODA en 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 (BAIRDEN & 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 (HINAIDY et al., 1979; BAIRDEN & ARMOUR, 1981; BARTH et al., 1981; BORGESTEEDE & 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 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.

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