

Gastrointestinal Parasites of Adult Slaughter Cattle in Guatemala

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SUMMARY

Of 740 fecal samples from adult slaughter cattle examined for gastrointestinal helminth eggs and coccidian oocysts in Guatemala, 85% were positive for eggs of one or more parasites.

The most important single infection was by coccidia (21.3%) and the most important mixed infection was by nematodes and coccidia (47.4%).

The percent of cattle with nematode infections tended to decrease with age up to 8 years, but sharply increased in the oldest cattle (10 years old), probably due to their poor general conditions. The percent of coccidian infections tended to decrease with age of cattle.

The relatively fast development of the cattle industry in Central America in the last few years has brought with it the opening of new lands for grazing, an increase in the number of animals per area, and the movement of livestock from one region to another. These changes increase the possibility of infection with internal parasites and facilitate their dissemination to new lands. In spite of this, there has not been much interest in the development of programs that would prevent and control parasitic infections. In Guatemala, the use of some anthelmintics has not lowered the incidence of parasitism, and control measures by management are virtually nonexistent.

Undoubtedly, the apathy toward this important aspect of animal production in the area is due to a lack of information regarding the nature and distribution of parasitic infections and of their unfavorable effects upon production. In addition, there is generally a lack of good or efficient management practices in all aspects of the livestock industry.

It is necessary to determine the prevalence of the most important parasites in order to design sound parasite prevention and control programs, which in turn would help to remove the burden that internal parasites place upon animal production.

Increased feed efficiency would result in an increase in the availability of products of animal origin for human consumption in an area where animal protein intake is relatively low.¹³

There are some reports dealing with internal parasites of cattle in Costa Rica,^{3,4,20,21} but there is no work published on the prevalence of parasites in cattle in Guatemala. Reports of studies of this nature carried out in other parts of the world abound in the literature.^{1,2,6,7,16,19,23} This is the first in a series of surveys carried out in Guatemala to determine the host and geographic distribution of the most important gastrointestinal parasites of livestock.

Materials and Methods

The 740 fecal samples examined were collected directly from the rectums of adult cattle at a local slaughter house during the latter part of August and early part of September, 1962. Each lot was bought 4 to 6 months prior to slaughter to insure continual supply of meat for exportation. This procedure permitted the collection of information on each lot of cattle regarding origin, approximate age, sex, breed, and anthelmintic therapy. Upon arrival at the slaughter house, cattle in each lot were weighed and marked for easy identification during processing. The cattle were graded as good, 10%; commercial, 80%; and utility, 10%, according to the United States' grades for slaughter cattle. The age range was from 3 to 10 years.

Immediately after removal of the viscera, approximately 20 Gm. of feces was taken directly from the rectum and placed in waxed cups marked for identification. Samples were stored at 4 C until processing, within 30 days of collection. Five grams of feces was thoroughly mixed with 15 cc. of tap water and strained to remove the

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coarse material. After centrifugation at 1,000 r.p.m. for 5 minutes, the supernatant fluid was discarded. The sediment was mixed with Sheather's²² sugar solution and centrifuged for 5 additional minutes. The centrifuge tubes were covered with No. 1, 22- by 22-mm. cover slips over the convex meniscus. Removed to glass slides, the cover slip preparations were observed microscopically for nematode and cestode eggs and for coccidian oocysts. The eggs of the *Haemonchus-Oesophagostomum* group and of the *Trichostrongylus-Ostertagia-Cooperia* group were differentiated according to the method of Dewhirst and Hansen.¹⁰ The eggs of other helminths were easily identified. The coccidian oocysts were identified according to Christensen's classification.⁵

Results

Of the 740 samples examined, 85.0% were positive for eggs of one or more parasites, including the coccidia (Tables 1-3).

TABLE 1—Helminth and Coccidia Infecting Adult Cattle in Guatemala

Parasites	% Infected
Helminths alone	12.9
Nematodes	12.7
Cestodes	0.1
Nematodes and cestodes	0.1
Coccidia alone	21.3
Helminths and coccidia	50.8
Nematodes and coccidia	47.4
Cestodes and coccidia	1.2
Nematodes, cestodes and coccidia	2.2
Total positive	85.0
Total negative	15.0

The mixed infections of coccidia and helminths were the most prevalent (50.8%), the nematode-coccidia infection being the most common combination (47.4%). Single infections with coccidia were the third most important kind of gastrointestinal parasites (Table 1).

It is believed that differences in sensi-

TABLE 2—Mixed Infections with Nematodes and Coccidia in Adult Cattle in Guatemala

Parasites	% Infected
Nematodes alone	12.7
1 species	9.2
2 species	2.9
3 species	0.5
4 species	0.1
Nematodes and coccidia	47.4
1 species and coccidia	25.8
2 species and coccidia	15.9
3 species and coccidia	4.6
4 species and coccidia	1.0
5 species and coccidia	0.1

TABLE 3—Eggs of Gastrointestinal Parasites Found in Adult Cattle in Guatemala

Parasite	Positive samples (%)	Eggs/5 Gm. (range)
<i>Capillaria</i>	29.1	0-120
<i>Trichostrongylus</i>	27.4	0-408
<i>Cooperia</i>	9.5	0-684
<i>Ostertagia</i>	8.5	0-1,200
<i>Haemonchus</i>	7.0	0-65
<i>Bunostomum</i>	4.4	0-99
<i>Trichuris</i>	3.1	0-66
<i>Strongyloides</i>	2.1	0-312
<i>Ascaris</i>	1.2	0-12
<i>Nematodirus</i>	0.9	0-83
<i>Oesophagostomum</i>	0.4	0-6
<i>Dictyocaulus</i>	0.4	0-48
<i>Moniezia</i>	0.1	0-3,840
Coccidia	72.5	0-18,800

tivity to anthelmintics of the various nematode species in cattle, and in the ability of the nematodes to unfavorably affect the host with single or mixed infections with coccidia,^{8,9} warrant investigation.

In single infections with nematodes (12.7%), the 1-species infection was the most prevalent (9.2%). In infections with both nematodes and coccidia, the 1- and 2-species infections represented 41.7% of the total 47.4%. The prevalence of the various species of *Eimeria* and the nature of the coccidian infections in this group will be reported elsewhere.

Most of the nematodes and coccidia reported in cattle are found in Guatemala (Table 3). Among nematodes, *Capillaria* sp. and *Trichostrongylus* sp. were the most common of all parasites found. The number of helminth eggs and coccidian oocysts (range) in 5 Gm. of feces is also given in this table.

Age and Infection.—The frequency of infection by age group is given (Table 4).

TABLE 4—Frequency of Infection in the Various Age Groups

Age group (yr.)	No. of cattle *	Nema-todes (%)	Ces-todes (%)	Coc-cidia (%)
3-4	212	66.5	3.8	78.3
4-6	187	56.6	2.1	63.1
6-8	217	58.5	1.8	72.8
8-10	102	76.4	2.9	63.7

* A total of 718 cattle.

Compared to the percent of 3- to 4-year-old cattle infected with nematodes and cestodes, the percentage decreased in 6- to 8-year-old

cattle, but sharply increased in 8- to 10-year-old cattle. Apparently, the percent of cattle infected with coccidia markedly decreased with increasing age, except for a rise in the 6- to 8-year-old cattle.

When the same grouping is made, taking into account not only age but also body weight, there is a tendency for the incidence of infections by helminths to increase in cattle more than 4 or 5-years old, and the tendency for the incidence of coccidian infections to decrease after the same age is more marked in the lighter cattle.

Rainfall and Infection.—According to a study made by Holdridge,¹⁷ there are 3 rainfall zones in Guatemala: (1) from less than 500 to 1,000 mm., (2) from 1,000 to 2,000 mm., and (3) from 2,000 to 4,000 mm. per year. The temperature range in the first 2 zones varies from 18 to 24 C., and the average temperature in the 3rd is of 24 C.

For beef cattle, generally, the forage availability increases as the annual rainfall increases. During the dry season, the amount of forage markedly decreases in the first 2 rainfall zones, while it remains more or less abundant in the 3rd zone.

The classification of the data according to annual rainfall was made in an attempt to evaluate the relative importance of humidity and of forage availability in relation to the development and establishment of parasitic infections (Table 5). The in-

studies are being made in order to obtain enough data to understand better the epizootiology of gastrointestinal parasites in Guatemalan cattle.

No significant differences in the percent of cattle infected nor in the degree of infection by nematodes, were found between 100 cattle treated 4 months before slaughter with phenothiazine and 113 that had not been treated. They were from the same rainfall zone and were approximately the same age and weight.

The average dressed weight percent of cattle in the lots examined varied from 48.0 to 52.1%, but a correlation between this percentage and the percent of cattle infected or the degree of parasitism was not found.

Discussion

The importance of gastrointestinal parasitism in cattle is recognized in most parts of the world; however, control measures are not always instituted. In Guatemala, the few attempts to control parasitism by anthelmintic therapy were done without reference to the parasite population and without previous establishment of control methods by management and sanitation. Under these circumstances, the administration of drugs is wasteful and ineffective. Anthelmintic therapy should complement but never replace sanitation, rotation, and good management.¹¹ In the present survey, it was found that cattle treated with phenothiazine were infected to the same degree as were those not treated.

Comparison of the incidence of the various parasites in beef and dairy cattle in other parts of the world is not practical, because ecologic factors vary so widely within the areas surveyed. Comparisons are valid in the same area where the ecologic factors remain more or less constant, and when changes (management) are known.

The incidence of the various parasites found in the samples examined is reported (Table 5). Most of these parasites are considered harmful for cattle, including the coccidia. Although the frequency of occurrence and the number of eggs per 5 Gm. of feces are relatively low, it should be mentioned that all cattle studied were adult and probably only chronic carriers and sources of infections for young stock, and that the method of fecal egg counts does not always reflect the degree of parasitism.

TABLE 5—Annual Rainfall and Infection with Gastrointestinal Parasites in Guatemala

Rainfall (mm./year)	% infected *		
	Nematodes	Cestodes	Coccidia
500–1,000	56.2	3.0	67.6
1,000–2,000	64.2	2.7	68.4
2,000–4,000	41.5	1.2	54.5

* A total of 428 cattle in the 3 zones.

fections by nematodes increased from 56.2% in the 500- to 1,000-mm. zone to 64.2% in the 1,000- to 2,000-mm. zone, then decreased to 41.5% in the 2,000- to 4,000-mm. zone. Infections by coccidia had the same tendency, but the differences between the 3 zones were not as marked as those for the nematode infections. The percentage cestode infections gradually decreased from the 500- to 1,000-mm. zone to the 2,000- to 4,000-mm. zone. Careful field

The nature of the infections found (Tables 1, 2) gives an idea of the problem that the gastrointestinal parasites represent in adult cattle in Guatemala. From the practical point of view, the veterinarian should give attention to coccidian and helminthic infections, separately or combined. The nematodes are, obviously, the most important helminths. It is believed that the determination of the exact frequency of occurrence of each species of nematodes and coccidia will be required more often in the future, since drugs are being developed which are selective in their action. This selectivity in the drugs used is necessary due to the development of resistant strains of parasites to the wide-spectrum anthelmintics.

Although the cattle studied were over 3 years of age and presumably had been exposed at an earlier age to most of the parasites found, the development of resistance with increasing age was observed (Table 4). In the case of the nematodes, the susceptibility to infection gradually decreased from 3 to 8 years of age. The development of this resistance due to age per se has been reported.¹⁵ However, the phenomenon is probably due to both factors, age and resistance resulting from previous exposure. The increase in the percentage of nematode-infected cattle in the oldest group might be explained by the fact that in this group were included those in poor condition, such as culled dairy and beef cows, discarded oxen and other salvage animals. It is logical to assume that cattle of this kind are on a low plane of nutrition or under other stress before being slaughtered.

Rainfall is a fairly accurate guide to the degree of larval abundance on pasture¹² and, therefore, to the opportunities for infection. Therefore, the highest percentage of cattle infected should be expected in the 2,000- to 4,000 mm. per year rainfall zone; however, in this study it happened to be the lowest. It seems that rainfall, although favoring the development of larvae on pastures and increasing the opportunities for infection, not always produces the highest proportion of animals infected, probably because moisture increases the quantity and quality of the herbage, thus improving the condition of the animals and increasing their resistance.¹⁸ The opposite, i.e., heavy rate of infection when grazing is inadequate, has also been reported.¹⁴

The increase in the percentage of in-

fecting cattle from the 500- to 1,000-mm. per year to the 1,000- to 2,000-mm. per year zone is apparently due to the condition of soil and pasture (moisture) being more favorable for larval development and survival in the 2nd zone than in the 1st. The ages of the cattle in these 2 groups probably did not influence this increase, since distribution by age was uniform.

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SUMMARIO IN INTERLINGUA

Parasitos Gastrointestinal de Adulte Bestial de Consumo in Guatemala

De 740 specimens de fece ab adulte bestial de carne examinate pro le presentia gastrointestinal de ovos helminthic e oocystes coccidian in Guatemala, 85 pro cento esseva positive pro ovos de un o plure parasitos.

Le plus importante infection solitari esseva illo per coccidios (21,3 pro cento). Le plus importante infection mixte esseva illo per nematodos e coccidios (47,4 pro cento).

Le procentage del bestial con infection nematodic tendeva a declinar con le avantiamento del etate usque ad 8 annos. Illo montava acutemente in le bestial del plus alte etates (10 annos), probabilemente in consequentia del povre conditiones general de iste animales. Le procentage del infectiones coccidian tendeva a declinar con le avantiamento del etates.

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