

## **FASCIOLIASIS IN DAIRY CATTLE IN THE RIO PLATA BASIN OF THE DORADO AREA, PUERTO RICO<sup>1, 2</sup>**

*Fasciola hepatica* is the most widespread species of liverfluke of cattle, sheep and goats. This parasite was officially recorded as occurring in Puerto Rico by van Volkenberg in 1939,<sup>3</sup> but observations and collections of it may have been made as early as 1924.

An accurate estimate of loss to the livestock industry in Puerto Rico due to fascioliasis is not easy to make. However, direct loss due to condemnation of infested livers at time of slaughter are available. Recent examination of Department of Health records reveal that fluke-infested livers were condemned from 12 percent of the cattle killed at the slaughterhouses in the entire Island from January to June 1969. This represents a direct loss to the livestock industry of at least \$600,000. The value of other direct losses, such as deaths from fascioliasis, cost of treatment, etc., are difficult to estimate. Losses due to indirect causes such as reduction of milk production, poor feed conversion, low meat quality and others are even more difficult to evaluate.

The extent of liverfluke infestation of cattle in Puerto Rico, based on a slaughterhouse survey, has been reported by Rivera-Anaya and Martínez-de Jesús.<sup>4</sup> These authors tabulated percentages of infected animals by municipalities, by districts, and for the entire Island. However, they did not indicate the origin of the farm where the infected animals came from. Such information is necessary for the determination of most heavily infected areas, degree of infection, or the snail intermediate hosts, all essential for instituting adequate and proper control measures against the parasite.<sup>5</sup>

The present investigation was designed for the purpose of establishing some of this essential information.

A total of 19 class A dairy farms on the Río Plata basin of the Dorado, Toa Baja, and Toa Alta municipalities were selected for this study con-

<sup>1</sup> Manuscript submitted to Editorial Board 9 July 1971.

<sup>2</sup> This note presents partial results of a cooperative project between the Department of Agriculture of Puerto Rico, the Agricultural Experiment Station, and the Puerto Rico Nuclear Center, University of Puerto Rico, on the control of *Fasciola hepatica* in Puerto Rico. Thanks are expressed to Mr. Félix Liard, Jr. and Miss Mercedes Vargas, Puerto Rico Nuclear Center, for the photograph and the dissection of the snails, respectively.

<sup>3</sup> Van Volkenberg, H. L., An annotated checklist of the parasites of animals in Puerto Rico, P. R. Exp. Sta. Circ. 22, 1939.

<sup>4</sup> Rivera-Anaya, J. D. and Martínez-de Jesús, J., The extent of liver-fluke infestation of cattle in Puerto Rico (A slaughterhouse survey), Agr. Exp. Sta. Univ. P. R., Bull. 107, 1952.

<sup>5</sup> Bell, R. R., A study of *Fasciola hepatica*, report to the Secretary of P. R. Department of Agriculture, 1968.

ducted from January 1970 to March 1971. Eleven of the farms are situated in Dorado, 5 in Toa Baja, and 3 in Toa Alta. There were 5,315 cows on these farms, of which 1,229 were examined, representing an overall 20-percent sample.

Stool specimens were collected after morning milking. Defecation usually follows when cows are released from milking stanchions. The fecal samples were collected from the floor, kept in paper cups, properly identified per cow, and brought to the laboratory for diagnostic examination.

Two g. of feces were concentrated by means of the ether-sedimentation technique using a buffered alcoholic medium<sup>6</sup> with adaptations for cow feces. Microscopic slide preparations were made with a methyl green solution that stained the debris but left the eggs unstained. This staining procedure was recommended to us by Ueno<sup>7</sup> to help distinguish the eggs of *F. hepatica* from those of a commonly occurring paramphistomid. The respective distinguishing features used for differential identification of liverfluke eggs from paramphistomid eggs were amber vs. silver color, fine vs. coarse yolk granules, anterior vs. middle location of embryo in the egg, less conspicuous vs. more conspicuous lid, and elliptical shape vs. a tendency towards an urn shape. All eggs were counted on a systematic basis.

A search was made for snail intermediate-host species on all the farms during February and March 1970 and February and March 1971. The collected snails were identified as to species, subsequently dissected, and examined under a stereoscopic microscope for the different stages of *Fasciola*. Immature and mature infections of *Fasciola* and the paramphistomid parasite were carefully distinguished.

Table 1 shows the prevalence of *F. hepatica* in 1970 among dairy cows studied. In Dorado, nine of the 11 farms have fascioliasis with 11 to 56 percent of the animals positive for the infection. All five farms in Toa Baja were positive for liverfluke, with infection rates of 18 to 80 percent. The three farms in Toa Alta also were positive, with infection rates of 5 to 79 percent. The overall infection rate for the 1,229 cows was 37 percent.

Actual prevalence of *Fasciola*-infection probably is higher in the study area than shown in table 1; sedimentation techniques for diagnosis although reliable are not perfect. Happich and Boray<sup>8</sup> have shown that only one-

<sup>6</sup> Ritchie, L. S., Lin, S., Moon, A. P., Frick, L. P., Williams, J. E., Asakura, S., and Hishnuma, Y., The possible effects of pH and specific gravity on the ether-sedimentation procedure in concentrating eggs and cysts, *Am. J. Trop. Med. and Hyg.* 4: 444-9, 1960.

<sup>7</sup> Ueno, H., private communication, 1970.

<sup>8</sup> Happich, F. A. and Boray, J. C., Quantitative Diagnosis of Chronic Fascioliasis, 1 Comparative Studies on Quantitative Faecal Examinations for Chronic *Fasciola hepatica* Infection in Sheep, *The Austral. Vet. J.*, 45 (7): 326-28, 1969.

TABLE 1.—*The prevalence of Fasciola hepatica (L. 1758) among dairy cows in the Dorado Area, 1970*

Farm number and location	Cows in herd	Cows examined	<i>F. hepatica</i> infection
	Number	Number	Percent
1. Barrio Mameyal, Dorado	413	70	51
2. Barrio Higuillar, Dorado	134	47	51
3. Barrio Higuillar, Dorado	180	50	26
4. Barrio Higuillar, Dorado	483	70	11
5. Barrio Higuillar, Dorado	300	59	56
6. Barrio Higuillar, Dorado	125	50	52
7. Barrio Maguayo, Dorado	420	68	34
8. Barrio Río Nuevo, Dorado	324	54	33
9. Barrio Espinosa, Dorado	60	30	0
10. Barrio Río Lajas, Dorado	260	66	38
11. Barrio Los Puertos, Dorado	531	74	0
12. Barrio Media Luna, Toa Baja	125	75	35
13. Barrio Media Luna, Toa Baja	560	75	36
14. Barrio Media Luna, Toa Baja	125	50	18
15. Barrio Campanilla, Toa Baja	250	50	28
16. Barrio San José, Toa Baja	550	75	80
17. Barrio Bucarabones, Toa Alta	195	129	79
18. Barrio Vega Grande, Toa Alta	180	98	25
19. Barrio Ortiz, Toa Alta	100	35	5
Total	5,315	1,229	37 <sup>1</sup>

<sup>1</sup>Percent (average) infestation of total cows under surveillance.

third of liverfluke eggs are recoverable from cattle containing 100 eggs per g. of feces by the sedimentation technique. Further, Dorsman, as cited by Pantelouris,<sup>9</sup> demonstrated that diurnal fluctuation occurs in the number of eggs in the feces of cattle infected with *F. hepatica*; that the egg count increases progressively during the morning to a peak near mid-day and declines thereafter to a low during the night. Correspondingly, the number of eggs in the stools examined during this investigation may have been relatively low because all stools were collected early in the morning.

It is interesting that concurrent with fascioliasis, 18 of the 19 farms also have paramphistomid infection ranging from 4 to 95 percent. The adult form of paramphistomids<sup>10</sup> are located in the rumen (forestomach) and are said to be essentially non-pathogenic although large numbers may be present.

Four species of fresh-water snails, *Lymnaea cubensis*, *Lymnaea columella*,

<sup>9</sup> Pantelouris, E. M., *The Common Liverfluke, Fasciola hepatica L.*, Pergamon Press, New York, N.Y. 259 pp., 1965.

<sup>10</sup> Soulsby, E. J. L., *Helminths, Arthropods and Protozoa of Domesticated Animals*, Williams and Wilkins, Baltimore, Md. 824 pp., 1968.



FIG. 1—*Lymnaea cubensis* (above), *Lymnaea columella* (below).

*Physa cubensis*, and *Aplexa marmorata* were collected on the farms surveyed. *P. cubensis* and *A. marmorata* were counted and discarded because they are not intermediate hosts of *F. hepatica* in Puerto Rico.<sup>11</sup>

The intermediate snail hosts, *L. cubensis* and *L. columella*, are shown in fig. 1. The rates of infection of *F. hepatica* in the snail vectors during February and March 1971 in the Dorado-Toa Baja-Toa Alta municipalities are shown in table 2. The data collected during February and March 1970 are not included in this report because small numbers of snails were collected and most of these were negative for liverfluke. Either one or both lymnaeid species were found on 14 of the 19 farms. Only *L. cubensis* was found on 11 farms, only *L. columella* on one farm, both species on two farms. Infected

<sup>11</sup> De León, D., Ritchie, L. S., and Chiriboga, J., Refractiveness of *Physa cubensis* (Pfeiffer) and *Aplexa marmorata* (Guilding) to *Fasciola hepatica* (Lin.), J. Agr. Univ. P. R. 55 (2): 267-70, 1971.

TABLE 2.—*The snail intermediate hosts and rate of infection of Fasciola hepatica (L. 1758), February–March, 1971, Dorado Area*

Farm number and location	Snail intermediate hosts	Snails examined	
		Number	Percent
1. Barrio Mameyal, Dorado	<i>Lymnaea cubensis</i>	200	4
2. Barrio Higuillar, Dorado	<i>L. cubensis</i>	175	5
	<i>Lymnaea columella</i>	25	0
3. Barrio Higuillar, Dorado	<i>L. cubensis</i>	100	4
	<i>L. columella</i>	12	0
4. Barrio Higuillar, Dorado	<i>L. columella</i>	38	0
5. Barrio Higuillar, Dorado	<i>L. cubensis</i>	200	26
6. Barrio Higuillar, Dorado	<i>L. cubensis</i>	182	0
7. Barrio Maguayo, Dorado	<i>L. cubensis</i>	200	6
8. Barrio Río Nuevo, Dorado	<i>L. cubensis</i>	157	4
9. Barrio Espinosa, Dorado	0	0	0
10. Barrio Río Lajas, Dorado	<i>L. cubensis</i>	140	4
11. Barrio Los Puertos, Dorado	<i>L. cubensis</i>	70	0
12. Barrio Media Luna, Toa Baja	0	0	0
13. Barrio Media Luna, Toa Baja	0	0	0
14. Barrio Media Luna, Toa Baja	<i>L. cubensis</i>	182	0.5
15. Barrio Campanilla, Toa Baja	<i>L. cubensis</i>	120	4
16. Barrio San José, Toa Baja	<i>L. cubensis</i>	239	17
17. Barrio Bucarabones, Toa Alta	<i>L. cubensis</i>	100	27
18. Barrio Vega Grande, Toa Alta	0	0	0
19. Barrio Ortiz, Toa Alta	0	0	0

snails occurred in the collections of 11 of 14 farms where snails were found. The highest rate of infection was 27 percent, while this figure was 6 percent or less on eight farms.

On the basis of occurrence alone, *L. cubensis* can be considered the primary intermediate host of *F. hepatica* in the Dorado Area; positive specimens were not encountered in the collections of *L. columella*. However, the latter species occurs naturally infected in other parts of the Island and is readily susceptible to experimental exposure.<sup>12</sup>

It is surmised that heavy rainfalls and floods during the late months of 1970 helped increase population densities of the snails; areas negative for snails in 1970 were densely populated in February and March 1971.

Delfín de León  
 Department of Animal Husbandry  
 L. S. Ritchie and J. Chiriboga  
 Puerto Rico Nuclear Center  
 University of Puerto Rico

<sup>12</sup> De León, D. D., Life history of *Lymnaea columella* (Say) and its experimental infection with *Fasciola hepatica* (Lin.), J. Agr. Univ. P. R. 54 (2): 297–305, 1970.