Bull. Inst. Zool., Academia Sinica **5**: 87-91 (1966)

STUDIES ON *TAENIA* SPECIES PREVALENT AMONG THE ABORIGINES IN WULAI DISTRICT, TAIWAN

Part I

ON THE PARASITOLOGICAL FAUNA OF THE ABORIGINES IN WULAI DISTRICT[1]

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Received for Publication December 1, 1966

ABSTRACT

Four hundred and twenty-two (96.13%) out of 439 aborigines examined were found to be infected with intestinal parasites. Totally 8 species of helminths and 7 species of protozoa were detected. The incidence of *Ascaris lumbricoides* was 88.83%; *Trichuris trichiura*, 82.99%; *Hookworm*, 58.77%; *Enterobius vericularis*, 4.78%; *Strongyloides stercoralis*, 0.92%; *Metagonimus yokogawai*, 0.46%; *Hymenolepis nana*, 0.69% and *Taenia* sp., 28.24%. The incidence of *Endamoeba histolytica* was 10.02%; *Endamoeba coli*, 21.18%; *Giardia lamblia*, 12.07%; *Endolimax nana*, 1.36%; *Trichomonas hominis*, 1.59%; *Chilomastix mesnili*, 0.46% and *Isospora hominis*, 0.23%. Sixty-four specimens of tapeworms examined were morphologically identical to *Taenia saginata*. There was one specimen of monstrosity.

The aborigines of Wulai district belong to the Atyal tribe —the largest of the nine aboriginal tribes in Taiwan. There are 5 villages namely: Tampeya, Wulai, Lahau, Limogan and Hapung, located from 30 to 45 kilometers southeast of Taipei City, 200 to 460 meters above sea level, with a total population of 1194.

The parasitological fauna and their incidence among aborigines have been relatively unexplored for many years because of the difficulties of transportation and communication with the lowlands. Bergner *et al.* (1) and Huang and Hsu (2) made investigations, but their survey were confined to one village only. The result of the painstaking work done by Huang *et al.* (3) was the only available data covering the whole district up to the present.

MATERIALS AND METHODS

One hundred stool samples were collected respectively from the inhabitants (with

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equal numbers from males and females) of 4 villages: Wulai, Tampeya, Lahau and Limogan. Samples were also taken from all of the villagers of Hapung (18 males and 21 females). In all, 439 specimens were collected from 36.8% of the whole population of 1194. The specimens were fixed by MIF method of Sapero and Lawless (4), and then examined at NDMC laboratory later. Three smears of 24 × 24 mm slides were examined from each sample.

RESULTS AND DISCUSSION

The aborigines in Wulai district except those of Wulai villagers are notoriously different in their mode of living from those of the Han race. Though improvement in their daily life has been noticed recently, most of them are still leading a primitive life. Their essential foods consist of millet, taros, sweet potatoes or rice. Wild animals captured by hunting and fish caught from the stream are their main sources of animal proteins. When excessive number of animals and fishes are caught, they are usually salted and kept for feast days. The aborigines buy some vegetables, rice, salt, lard and wine from the lowlands as supplemental foods. They are in the habit of eating raw flesh and internal organs, including the liver, stomach and intestines of wild game. The flesh, if cooked, is usually under-done, because they believe that well cooked meats are less nutritive. The majority of the aborigines walk bare-footed. The streams near the villages are their only source of drinking water. There are only one or two toilets in each village, and feces are found everywhere in the bushes, along the banks of streams, around their shelters, or even in front of their homes. On account of their peculiar living habits and poor sanitary conditions, they frequently acquired infection from rare as well as common parasites.

I. *Protozoa*

One hundred and sixty-seven out of 439 (38.04%) were found to be infected with intestinal protozoa (TABLE I). Totally, 7 species of protozoan parasites were detected. *Endamoeba coli* was detected in 93 out of 439 (21.18%) of cases examined. The positive rate was found to increase proportionally with the increase of age. High incidene of *E. coli* indicated that their food is heavily contaminated by fecal discharges and also suggested the prevalence of other protozoan parasites. The positive rate for *Giardia lamblia* was reported to be 2.21% by Huang *et al.* in 1952 (3), but was found to be as high as 12.07% in this study. The parastites were found to be more prevalent in children from 6 to 12 years old. The incidence of *G. lamblia* was said to be uniformly high in both temperate and tropical countries, and the average incidence of 10 surveys done in U.S.A. was reported to be 10.2% (5). The incidence of *Endamoeba histolytica* was 10.02%. It was found in all ages and slightly more predominant in females than in males. *Endolimax nana* was found to be only 1.36% and *Trichomonas hominis*, 1.59%. Two cases of *Chilomastix mesnili* were detected. *Chilomastix* is said to be cosmopolitan in its distribution, but it has not yet been reported in Taiwan. The finding of one positive case of *Isospora hominis* was also interesting. *Balantidium coli* and *Iodamoeba butschulii*, the parasites found in close association with hogs, were not detected.

Wulai district is located geographically at 24°40" to 24°52" N and 121°33" to 121°40" E. The total rain fall of the year is around 2100 mm and the average yearly temperature is around 19.5 C. The high prevalence of protozoan parasites reflected the poor sanitary conditions in this district which has suitable environments for the propagation of the parasites.

TABLE I.

Incidence of intestinal parasites among the aborigines in Wulai district, Taiwan (1966)

	Wulai	Tampeya	Lahau	Limogan	Hapung	Total	%
No. examined	100	100	100	100	39	439	
PROTOZOA							
Endamoeba histolytica	11	9	7	14	3	44	10.02
Endamoeba coli	18	23	16	27	9	93	21.18
Endolimax nana	0	1	3	2	0	6	1.36
Giardia lamblia	14	8	11	16	4	53	12.07
Trichomonas hominis	0	1	1	5	0	7	1.59
Chilomastix mesnili	0	0	0	2	0	2	0.46
Isospora hominis	0	0	0	1	0	1	0.23
HELMINTHS							
Ascaris lumbricoides	82	87	86	91	34	390	88.83
Trichuris trichiura	79	86	78	87	34	364	82.99
Hookworm	46	63	59	61	29	258	58.77
Enterobius vermicuralis	6	6	5	4	0	21	4.78
Strongyloides stercoralis	0	0	0	4	0	4	0.92
Metagonimus yokogawai	0	0	0	1	1	2	0.46
Hymenolepis nana	0	0	0	0	3	3	0.69
Taenia saginata (?)	21	34	26	33	10	124	28.24

TABLE II.

Comparison of incidence of intestinal parasites among the aborigines in Wulai since 1952

	Huang *et al.* (1952)	The present author (1966)
Method employed	Direct smear, 4 cover slips	MIF and Graham's method
Number examined	634 (G. P.)	439 (G. P.)
PROTOZA	183 (32.02%)	167 (38.04%)
Endamoeba histolytica	36 (5.68%)	44 (10.02%)
Endamoeba coli	123 (19.40%)	93 (21.18%)
Endolimax nana	26 (4.10%)	6 (1.36%)
Giardia lamblia	14 (2.21%)	53 (12.07%)
Iodamoeba butschulii	3 (0.47%)	0
Trichomonas hominis	54 (8.52%)	7 (1.59%)
Isospora hominis	—	1 (0.23%)
Chilomastix mesnili	—	2 (0.46%)
Balantidium coli	5 (0.79%)	0
HELMINTHS	608 (95.89%)	422 (96.13%)
Ascaris lumbricoides	518 (81.70%)	390 (88.83%)
Trichuris trichiura	402 (63.41%)	364 (82.99%)
Hookworm	419 (66.69%)	258 (58.77%)
Strongyloides stercoralis	4 (0.63%)	4 (0.92%)
Enterobius vermicuralis	2 (0.32%)	21 (4.78%)
Trichostrongyloides orientalis	4 (0.63%)	0
Metagonimus yokogawai	—	2 (0.46%)
Hymenolepis nana	—	3 (0.69%)
Taenia species	130 (20.50%)	124 (28.24%)

G. P. = General population.

II. *Helminths*

Four hundred and twenty-two out of 439 (96.13%) aborigines examined were found to be infected with intestinal parasites. The 5 villages have similar parasitological fauna. Totally 8 species of helminths were detected in the present survey. Incidence for *Ascaris lumbricoides* was 88.83% and *Trichuris trichiura* was 82.99%. The two worms were usually found to be closely associated in most of the survey due to the similarity of their mode of infection and required propagative environments. This fact was also true in this study. The incidence of *Hookworm* was 58.77%, while *Strongyloides* was only 0.92%. *Nacator americanus* was found to be more prevalent than *Ancylostoma duodenale* and *Ancylostoma ceylanicum* was also discovered in this district. All 4 cases of strongyloidiasis were found to be associated with diarrhea, and 3 out of 4 cases were found in the same family. *Enterobius vermicularis* was found to be 4.78% of the examined samples. Higher incidence could be expected if NIH scotch tape method was employed. *Hymenolepis nana* was detected in 3 cases. All 3 cases belonged to the same family and were repeatedly negative in follow-up examination. They all admitted having eaten rats, including the intestines, the day before the evacuation of positive specimens. The ova of parasite of animal were not infrequently found in the feces of aborigines. Thus repeated examination seemed to be necessary to ascertain the original site of the discovered ova. Two cases of metagonimiasis were detected. One from Limogan and the other from Hapung villagers. The cases were treated with tetrachlorethylene and the evacuated worms were collected for identification of species. In 1964, Bergner *et al.* (1) had reported a case of heterophyasis from Hapung villagers but no *Heterophyes* ova were detected in the present study. The ova of *Metagonimus* might be mistaken for those of latter trematode. *Taenia* species was found to be considerably prevalent. Out of 439 aborigines examined, 124 (28.24%) were infected. Sixty-four tapeworms, 28 with and 36 without scolices, obtained by treating infected aborigines were examined. They were all, except one peculiar abnormality, found to be morphologically identical to *Taenia saginata*. Huang *et al.* identified the *Taenia* species found in Ami aborigine tribe on Lan-yu Island also to be *Taenia saginata* (6).

The infection of *Taenia saginata* is known to be due to ingestion of infected beef. However, beef is hardly available to them because of the difficulties of transportation. Moreover, the high cost of beef and their poor finanical condition prevent many of the aborigines from eating beef. This is confirmed by a careful tracing of 60 cases of taeniasis in this area by the authors. Twenty-eight out of 60 denied having eaten beef. Therfore, some other wild herbivorous animal may act as the intermediate host of *Taenia* species in Wulai district if what the inhabitants stated was correct.

Acknowledgements Sincere thanks are given to Dr. W.T. Wung, the former health officer of Wulai district, for his enthusiastic help which contributed much to the present investigation.

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