Intestinal Parasitism in a Group of University Students

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Introduction

During the past few years the writer has initiated studies concerning human parasite infections in Indiana, giving especial attention to the incidence of intestinal parasites as determined by laboratory diagnosis. A survey of the available literature was made (Headlee, 1937) which indicated that there were random case reports of parasite infections but that there were no valid data concerning the incidence of these infections in the general population of the state.

Subsequent to that time, laboratory examinations were made of over 1,300 persons residing in Indiana to determine the incidence of intestinal parasites, including both protozoa and helminths. The largest group examined, 1,200 persons, were patients of Longcliff State Hospital (Kmecza, 1939). Other examinations of persons included students of Purdue University and random examinations of persons in the locality of Lafayette, Indiana. A summary of the results of all these examinations of persons residing in Indiana was made by the writer (Headlee, 1939), but the group of out-of-state Purdue students was not included in that particular report. The present paper deals with the results of examinations of Purdue students as a group, including both residents of Indiana and non-resident students.

Materials and Methods

The data presented in this paper were obtained primarily by microscopic examination of fecal specimens, by which examinations both the cysts and trophozoites and the eggs of helminths could be detected. The stool specimens were collected in cardboard containers and examined within 24 hours after collection. Both unconcentrated and centrifugalized, concentrated preparations were examined from each fecal specimen, following the procedure outlined in a previous report (Headlee, 1939). In a few instances, the data were obtained by the identification of adult helminths that had been eliminated from the bowel, subsequent stool examinations indicating that no other worms were present.

Presentation of Data

Stools were examined from 213 students of Purdue University to determine the incidence of intestinal parasites. The stools were collected primarily through the cooperation of the Purdue University Student Health Service, but only relatively few students had visited the Health Service because of digestive complaints. Of the 213 students examined, 168 were males and 43 were females, 206 or 96.9% being between the ages 17 to 30 years, inclusive. The ages of the males ranged from 17 to 36 years; those of the females ranged from 17 to 60 years, inclusive. Of these students, 209 were from 17 states of the United States, 162 or 76.5% of the total number examined being from

Indiana and 47 or 22% of the total examined being from the 16 other states. Of the four remaining students, one was from the District of Columbia, one from Mexico, and two from Venezuela. The 162 students who were residents of Indiana were from 59 of the 92 counties of the state. Thirty-nine of these students were from Tippecanoe County, this being the largest number from any single county. Sixty-two of the 213 persons examined or 29.1% were residents of rural areas.

The species of parasites encountered and the percentage incidence of each were as follows: *Endamoeba histolytica*, 2.8; *Endamoeba coli*, 19.7; *Endolimax nana*, 30.5; *Iodamoeba bütschlii*, 1.4; *Giardia lamblia*, 2.3; *Chilomastix mesnili*, 0.5; *Ascaris lumbricoides*, 0.9; *Trichuris trichiura*, 0.9; *Necator americanus*, 0.5; *Enterobius vermicularis*, 1.9; *Hymenolepis nana*, 0.5. Further examination of the data showed that 91 individuals or 42.7% were infected with protozoa; 10 individuals or 4.7% were infected with helminths, and 4 persons or 1.9% harbored infections of both protozoa and helminths. Of the 213 students examined, 97 or 45.5% were infected with one or more species of protozoa, helminths, or both protozoa and helminths. These data are presented in detail in Table I.

Discussion and Conclusions

Among the six students harboring infections of *Endamoeba histolytica*, only one person is recorded as having symptoms of amebic dysentery. It may be considered that the others found infected with this organism were carriers. It must not be overlooked that these individuals are a source of material for the spread of infections with this organism and that the particular strain might prove to be pathogenic for other persons infected.

Wenrich, Stabler, and Arnett (1935) reported their findings from the examination of 1,060 students of a professional school of Philadelphia, Pennsylvania, for infections with intestinal protozoa. A comparison of the data from that survey with that of the present survey is given in Table II.

These two sets of data can not readily be compared because of a difference in methods used. In the Philadelphia survey wet smears were examined as in the present survey, but concentrated preparations were not examined. In addition to the wet preparations these workers examined smears stained with iron alum-haematoxylin. This method gave results 17.7% higher for total infections than the wet preparations alone. By this method the incidence of *Endamoeba histolytica*, based on the examination of 700 persons, was raised 1.4%. Taking this into consideration, the incidence would be 2.7% for the wet smears. This compares favorably with the 2.8% obtained in the present survey. The total incidence of protozoal infections and the incidences of *Endamoeba coli*, *Endolimax nana*, and *Iodamoeba bütschlii* were higher in the present survey than those of the Philadelphia survey; the incidences of *Endamoeba histolytica*, *Dientamoeba*, *Giardia* and *Chilomastix* were lower.

The incidence of helminths was low, but we would hardly expect to find a high incidence of these parasites in a population group of the type examined. The species most frequently encountered was *Enterobius*

TABLE I.—The Incidence of Intestinal Parasites Among Students of Purdue University

Age	17-20 Years						21-30 Years						31- Years						Total					
Sex	M		F		M & F		M		F		M & F		M		F		M & F		M		F		M & F	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
End. hist.	2	2.8	1	5.9	3	3.4	2	2.2	1	3.8	3	2.6	....	....	....	....	....	....	4	2.4	2	4.4	6	2.8
End. coli	9	12.5	2	11.8	11	12.4	23	25.3	6	23.1	29	24.8	1	20.0	1	50.0	2	28.6	33	19.6	9	20.0	42	19.7
Endolimax nana	26	36.1	5	29.4	31	34.8	27	29.7	5	19.2	32	27.4	1	20.0	1	50.0	2	28.6	54	32.1	11	24.4	65	30.5
Iodamoeba	1	1.4	....	....	1	1.1	1	1.1	1	3.8	2	1.7	....	....	....	....	....	....	2	1.1	1	2.2	3	1.4
Giardia	2	2.8	1	5.9	3	3.4	2	2.2	....	....	2	1.7	....	....	....	....	....	....	4	2.4	1	2.2	5	2.3
Chilomastix	....	....	1	5.9	1	1.1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2.2	1	0.5
Ascaris	1	1.4	....	....	1	1.1	1	1.1	....	....	1	0.9	....	....	....	....	....	....	2	1.1	....	....	2	0.9
Trichuris	1	1.4	....	....	1	1.1	....	....	1	3.8	1	0.9	....	....	....	....	....	....	1	0.6	1	2.2	2	0.9
Necator	....	....	....	....	....	....	1	1.1	....	....	1	0.9	....	....	....	....	....	....	1	0.6	....	....	1	0.5
Enterobius	....	....	2	11.8	2	2.2	2	2.2	....	....	2	1.7	....	....	....	....	....	....	2	1.1	2	4.4	4	1.9
Hymenolepis	....	....	....	....	....	....	1	1.1	....	....	1	0.9	....	....	....	....	....	....	1	0.6	....	....	1	0.5
Total infected with protozoa	30	41.7	6	35.3	36	40.4	42	46.1	10	38.5	52	44.4	2	40.0	1	50.0	3	42.9	74	44.0	17	37.8	91	42.7
Total infected with helminths	2	2.8	2	11.8	4	4.5	5	5.5	1	3.8	6	5.1	....	....	....	....	....	....	7	4.2	3	6.7	10	4.7
Total infected with both protozoa and helminths	1	1.4	....	....	1	1.1	3	3.3	....	....	3	2.6	....	....	....	....	....	....	4	2.4	....	....	4	1.9
Total infected	31	43.1	8	47.1	39	43.8	44	48.4	11	42.3	55	47.0	2	40.0	1	50.0	3	42.9	77	45.8	20	44.4	97	45.5
Total examined	72		17		89		91		26		117		5		2		7		168		45		213	

TABLE II.—Comparison of the Incidence of Protozoal Infections Among College Students of Two Institutions in the Temperate Region

	Philadelphia Professional School		Purdue University	
	Number	Per cent	Number	Per cent
Endamoeba histolytica	43	4.1	6	2.8
Endamoeba coli	154	14.5	42	19.7
Endolimax nana	121	11.4	65	30.5
Iodamoeba bütschlii	11	1.0	3	1.4
Dientamoeba fragilis	45	4.3	0	0.0
Giardia lamblia	79	7.5	5	2.3
Chilomastix mesnili	10	0.94	1	0.5
Total infected with protozoa	366	34.5	91	42.7
Number examined	1,060		213	

vermicularis. No doubt the incidence of this parasite would have been considerably higher if perianal scrapings had been examined.

Although the incidence of pathogenic species was relatively low, it is the opinion of the writer that it would be very much worth while to give more attention to parasite infections and to recognize the fact that these infections may often be the cause of an illness attributed to other etiological agents.

Literature Cited

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