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## PARASITES OF INDOCHINESE REFUGEES ENTERING UTAH COUNTY, UTAH: A TWO-YEAR SURVEY

Richard A. Heckmann<sup>1</sup> and Bruce A. Coleman<sup>1</sup>

**ABSTRACT.**— A survey of parasites from 39 stool specimens taken from 36 Indochinese refugees who are now living in Utah County, Utah, indicated representative intestinal helminths (worms), and protozoans upon clinical examination. Approximately 75% of the stools contained nematodes, and 55.5% had protozoans. Parasites found were *Entamoeba coli*, *Chilomastix mesnili*, *Endolimax nana*, *Giardia lamblia*, *Iodamoeba buetschlii*, *Clonorchis sinensis*, *Trichuris trichiura*, *Ascaris lumbricoides*, and *Plasmodium vivax*. The most common protozoan observed was *Entamoeba coli* (1979 and 1980) while the most common helminths were *Ascaris lumbricoides* (1979) and *Clonorchis sinensis* (1980). These data were comparable to studies of refugees at two other laboratories in Utah and one at Washington, D.C.

Since May 1975, approximately 150,000 Indochinese refugees have entered the United States, a small percent of whom now live in Utah. More are expected. A majority of the refugees arrive directly from camps in Malaysia, Indonesia, Thailand, etc., with only preliminary screening for tuberculosis, leprosy, venereal disease, and mental defects and disorders, which is done by the Center for Disease Control (CDC) of the United States Public Health Service [Morbidity and Mortality Weekly Report (MMWR) 1979]. According to the cited article, the CDC does not consider it necessary to routinely screen all Indochinese refugees for intestinal or blood parasites. This is not regarded by the CDC as being critical because adequate sewage disposal and improved hygienic practices maintained in the USA will decrease the risk posed by intestinal helminths and protozoa by interrupting life cycles and minimizing direct fecal contamination. The possibility of malaria transmission is small, especially in the winter months, due to the limited number of anopheline mosquitoes in Utah.

In 1979 President Carter announced that 14,000 Indochinese refugees would be accepted monthly for resettlement in the United States. The CDC at Atlanta, Georgia, is responsible for the medical screening of refugees while they are still abroad and for the inspection of refugees upon arrival at USA ports of entry.

United States Public Health Service teams have recently visited areas in California, Oregon, Washington, and Hawaii that have already received large numbers of refugees, as well as refugee camps and embarkation areas in Southeast Asian countries. From these visits, as well as from limited surveillance data and the experience gained in the resettlement of over 150,000 Vietnamese refugees in the United States since May 1975, the following may be expected:

1. "The majority of refugees will be free of major contagious diseases;
2. Where an illness is present, it will likely represent a personal rather than a public health problem; and
3. The main health problems, perhaps exceeded only by the stress of resettlement itself, will include tuberculosis and parasitic diseases" (MMWR 1979).

The CDC continues to survey resettlement areas in the U.S. for parasitic diseases. One survey in Illinois (February 1979) found hookworms to be the most common intestinal parasite in the group (64 percent), followed by *Giardia lamblia* (18 percent), *Trichuris* (12 percent), and *Ascaris* (9 percent) (MMWR 1979). The purpose of our investigation was to determine the presence of intestinal and blood parasite infections of refugees in Utah County, Utah, by performing direct examinations of blood and fecal samples and to

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compare these data with results for other areas in Utah and for Washington, D.C.

#### MATERIALS AND METHODS

During 1979, a series of fecal samples taken three times weekly were obtained from each patient in plastic specimen cups into which 60 ml of 10 percent formalin was added for preservation. The sampling was varied in 1980 in that specimens were obtained from the Utah County Public Health Office following visits by refugees. Samples were then stored in a refrigerator at 5 C for 1 to 36 hours until concentration and staining procedures were performed. Samples were concentrated by the formalin-ether concentration technique (Richie 1948), and preliminary examinations were made by mixing one drop of fecal concentrate with one drop iodine, covering with a coverslip and examining under various powers with a microscope. Permanent slides were prepared with the trichrome stain technique (Garcia and Ash 1979) and iron hematoxylin stain technique (Spencer and Monroe 1975). The zinc flotation helminth egg isolation technique (Spencer and Monroe 1975) was also used on several samples.

Blood samples were drawn from a median cubital puncture into heparinized vacutubes from the majority of the patients. A finger prick was used for some, with the blood being collected in a heparinized capillary tube, care being taken not to "milk" the tissue to avoid diluting the blood with interstitial tissue fluid. From these blood samples, thick and thin smears were prepared from the Giemsa stain technique (Shute 1966, Shute and Maryon 1966) and examined microscopically.

#### RESULTS

Examination of fecal samples from 6 refugees in 1979 (Table 1a) and 30 refugees in 1980 (Table 1b) revealed the presence of five protozoan parasites (*Entamoeba coli*, *Chilomastix mesnili*, *Endolimax nana*, *Iodamoeba buetschlii*, and *Giardia lamblia*) and five helminth parasites (*Ascaris lumbricoides*, *Trichuris trichiura*, hookworms, *Clonorchis sinensis*, *Strongyloides stercoralis*) (larvae) (Tables 2a and 2b). Of the helminths observed four were roundworms and one (*C. sinensis*) was a fluke. Thick and thin blood smears from 66 percent (2/3) of the 1979 refugees and 48 percent (11/23) of the 1980 group were positive for malaria (*Plasmodium vivax*) (Table 3).

For the 1979 sample, one of the two refugees from whom both blood and fecal samples were taken was found to be free of pathogenic parasites, but the other had both blood and intestinal infections. One of the three refugees who gave stool samples was found to have a multiple infection, another an infection by a single pathogenic species, and the third was found to be pathogen-free. One Indochinese refugee, who submitted blood only, was found to harbor malarial parasites.

Data from the stool and blood samples examined during 1980 included individuals with no parasite infections and those with intestinal parasites, blood parasites, or both. Four refugees had four different species of intestinal parasites. The combined results of 1979 and 1980 show a high incidence of parasitism among the refugees entering Utah County. There were variations in percent infections for the two years, which would be expected due to the limited number of

TABLE 1a. Status for 6 of the 9 refugees checked in Utah County, Utah, for parasites, 1979.

Patient No.	Age	Sex	Height	Weight	Time in U.S.	Place of origin	Refugee camp	Time in camp
1	19	M	5'5"	102 lbs.	6½ months	Saigon	Malaysia	7 months
2	11	M	4'6"	70 lbs.	3 weeks	Saigon	Indonesia	8 months
3	54	M	5'5"	100 lbs.	3 weeks	Saigon	Indonesia	8 months
4	14	M	5'2"	90 lbs.	6½ months	Saigon	Malaysia	7 months
5	20	M	5'9"	110 lbs.	5 months	Saigon	Malaysia	8 months
6	17	F	5'2"	110 lbs.	6½ months	Saigon	Malaysia	7 months

TABLE 1b. Status for 28 of the 30 refugees checked in Utah County, Utah, for parasites, 1980.

Patient No.	Age	Sex	Arrival date, Utah Day/Month/Year	Refugee camp	Origin	Blood sample	Fecal sample
1	37	M	28-II-80	Chieng Khong, Thailand	Laos	1	0
2	16	M	28-II-80	Chieng Khong, Thailand	Laos	1	0
3	14	M	28-II-80	Chieng Khong, Thailand	Laos	1	0
4	7	F	28-II-80	Chieng Khong, Thailand	Laos	1	0
5	10	M	28-II-80	Chieng Khong, Thailand	Laos	1	0
6	5	M	28-II-80	Chieng Khong, Thailand	Laos	1	0
7	34	F	28-II-80	Chieng Khong, Thailand	Laos	1	0
8	55	M	1-III-80	Ubon, Thailand	Laos	1	1
9	50	F	1-III-80	Ubon, Thailand	Laos	1	1
10	29	M	1-III-80	Ubon, Thailand	Laos	1	1
11	19	M	1-III-80	Ubon, Thailand	Laos	1	1
12	12	M	1-III-80	Ubon, Thailand	Laos	1	1
13	21	M	1-III-80	Ubon, Thailand	Laos	1	1
14	9	M	1-III-80	Ubon, Thailand	Laos	1	1
15	13	M	1-III-80	Ubon, Thailand	Laos	1	1
16	17	F	1-III-80	Ubon, Thailand	Laos	1	1
17	26	F	1-III-80	Ubon, Thailand	Laos	1	1
18	28	M	1-III-80	Ubon, Thailand	Laos	1	1
19	71	F	1-III-80	Ubon, Thailand	Laos	1	1
20	42	F	14-III-80	Nong Khai, Thailand	Laos	1	1
21	47	M	14-III-80	Nong Khai, Thailand	Laos	1	1
22	4	F	14-III-80	Nong Khai, Thailand	Laos	1	1
23	20	M	14-III-80	Nong Khai, Thailand	Laos	0	1
24	7	M	14-III-80	Nong Khai, Thailand	Laos	0	1
25	18	M	14-III-80	Nong Khai, Thailand	Laos	0	1
26	12	M	14-III-80	Nong Khai, Thailand	Laos	0	1
27	9	M	14-III-80	Nong Khai, Thailand	Laos	0	1
28	28	M	12-VIII-80	Nong Khai, Thailand	Laos	1	0

TABLE 2a. Results of 9 stool specimens examined from 6 refugees entering Utah County (1979).

Parasite	No. of infected stools	% Infected stools
<i>Entamoeba coli</i>	2	22
<i>Chilomastix mesnili</i>	1	11
<i>Endolimax nana</i>	1	11
<i>Giardia lamblia</i>	1	11
<i>Entamoeba histolytica</i>	0	0
Hookworms	0	0
<i>Ascaris lumbricoides</i>	5	56
<i>Trichuris trichiura</i>	2	22

TABLE 2b. Results of 30 stool specimens examined from 30 refugees entering Utah County (1980).

Parasite	No. of infected stools	% Infected stools
<i>Entamoeba coli</i>	11	37
<i>Chilomastix mesnili</i>	1	3
<i>Endolimax nana</i>	0	0
<i>Giardia lamblia</i>	3	10
<i>Entamoeba histolytica</i>	0	0
<i>Iodamoeba buetschlii</i>	4	13
Hookworms	6	20
<i>Clonorchis sinensis</i>	12	40
<i>Trichuris trichiura</i>	7	23
<i>Ascaris lumbricoides</i>	4	13
<i>Strongyloides stercoralis</i> (larvae)	1	3

samples in 1979. For both years *Entamoeba coli*, a commensal, was the common protozoan parasite (22 percent, 37 percent) followed by *Giardia lamblia*, an intestinal parasite (11 percent, 10 percent) Table 2a, 2b. The most common intestinal parasite for 1979 was *Ascaris lumbricoides* (60 percent) followed by *Trichuris trichiura* (20 percent). For 1980 the fluke *Clonorchis sinensis* was first (40 percent), followed by *Trichuris trichiura* (23 percent), hookworms (*Necator americanus*

or *Ancylostoma duodenale*) (27 percent), and *Ascaris lumbricoides* (14 percent). For both years the only blood parasite encountered was *Plasmodium vivax* (malaria).

Fertilized helminth eggs of *Ascaris lumbricoides* and *Trichuris trichiura* were present both years, as well as unfertilized *Ascaris lumbricoides* eggs. There were no cestode

TABLE 3. Blood parasites (*Plasmodium vivax*) observed from refugees entering Utah County, 1979 and 1980.

Year	No. of samples	No. with parasites	% Infected
1979	4	3	75
1980	23	11	48

eggs in any of the fecal specimens. The nematodes or roundworms were the most common group of endoparasites.

The protozoan parasites were found in both cyst and trophozoite stages. *Entamoeba*

*coli* was only found in the trophozoite stage, and *Chilomaxtis mesnili*, *Endolimax nana*, and *Giardia lamblia* were observed only in the cyst stage. *Plasmodium vivax* was the blood parasite found in some of the blood samples (Table 3).

Data from the samples we checked were compared with results from concurrent parasite studies of refugees in Salt Lake and Utah Counties, Utah, and Washington, D.C. (Tables 4,5,6).

#### DISCUSSION

Although more than 100,000 Indochinese refugees have been admitted to the United

TABLE 4a. Intestinal parasitism in Indochinese refugees, by age group, Salt Lake County, Utah, July-December 1979 (MMWR 1979).

	Age 0-4	Age 5-15	Age 16-24	Age 25-44	Age 45	All ages
Number examined	38	98	93	98	29	356
<b>Helminths</b>						
<i>Ascaris lumbricoides</i>	4 (11) <sup>o</sup>	7 (7)	7 (8)	5 (5)	1 (3)	44 (12)
<i>Clonorchis sinensis</i>	0	0	5 (5)	1 (1)	0	6 (2)
Hookworms	1 (3)	4 (4)	10 (11)	8 (8)	2 (7)	25 (7)
<i>Strongyloides stercoralis</i>	2 (5)	0	0	0	0	2 (1)
<i>Trichuris trichiura</i>	0	6 (6)	8 (9)	16 (16)	1 (3)	31 (9)
<b>Protozoans</b>						
<i>Endolimax nana</i>	0	5 (5)	5 (5)	1 (1)	2 (7)	13 (4)
<i>Entamoeba coli</i>	0	4 (4)	2 (2)	7 (7)	0	13 (4)
<i>Entamoeba histolytica</i>	0	0	2 (2)	0	1 (3)	3 (1)
<i>Giardia lamblia</i>	3 (8)	6 (6)	6 (6)	1 (1)	0	16 (4)

<sup>o</sup>Number of persons infected (percent infected).

TABLE 4b. Intestinal parasites in Indochinese refugees, by age group, Utah County, Utah, 1980.

	Age 0-4	Age 5-15	Age 16-24	Age 25-44	Age 45	All ages <sup>o</sup>
Number examined	53	120	102	170	49	494
<b>Helminths</b>						
<i>Ascaris lumbricoides</i>	6 (12) <sup>o</sup>	26 (22)	17 (17)	19 (11)	6 (12)	74 (15)
<i>Clonorchis sinensis</i>	7 (13)	38 (32)	31 (31)	42 (25)	6 (12)	124 (25)
Hookworms	11 (21)	40 (34)	25 (25)	40 (24)	18 (37)	134 (27)
<i>Strongyloides stercoralis</i> (larvae)	1 (2)	5 (4)	3 (3)	3 (2)	2 (4)	14 (3)
<i>Trichuris trichiura</i>	7 (13)	34 (28)	16 (16)	20 (12)	9 (18)	86 (18)
<i>Taenia</i> sp.	0	3 (3)	3 (3)	1 (1)	0	7 (1)
<b>Protozoans</b>						
<i>Endolimax nana</i>	1 (2)	6 (5)	4 (4)	6 (4)	3 (6)	19 (4)
<i>Entamoeba coli</i>	8 (15)	17 (14)	12 (12)	13 (8)	6 (12)	56 (11)
<i>Entamoeba histolytica</i>	1 (2)	7 (6)	2 (2)	6 (4)	2 (4)	18 (4)
<i>Giardia lamblia</i>	7 (13)	18 (15)	15 (15)	12 (7)	2 (4)	54 (11)
<i>Entamoeba hartmani</i>	1 (2)	2 (2)	2 (2)	1 (1)	1 (2)	7 (2)

<sup>o</sup>Percent infection in parentheses

<sup>oo</sup>254 males; 35 percent infected

240 females; 30 percent infected

States in the past year, very few population-based data have been published on their health conditions other than intestinal parasitism and tuberculosis (MMWR 1979). Representative data are essential for realistic planning of initial health-care delivery for this population. Health departments, clinics, or other agencies that have collected or are collecting data on the health status of representative samples of the arriving refugee population (not simply clinic samples of the ill) are encouraged to share their findings with local and state health departments and CDC (MMWR 1979).

Investigations of parasite incidence among incoming refugees show generally the same organisms being encountered, but not necessarily in the same proportion. This is evident with malaria. A CDC report concerning the health status of Vietnamese refugees arriving in the U.S. (MMWR 1975:158) reported that, of 77,526 refugees seen, only two cases of malaria were reported. More recent reports indicate a higher incidence of malaria, however, with malaria being the number one cause of death among the Cambodian

refugees in Thailand, followed by malnutrition (MMWR 28:545-546, 1979; MMWR 28:388-398, 1979). A random survey of one camp revealed *P. falciparum* malaria in 30 of 80 people (38 percent) screened (MMWR 28:545-546, 1979).

Malaria (*Plasmodium*) can be definitively diagnosed only through the careful microscopic examination of blood films. For our study, both thick and thin blood films were made and the slides were stained with the Giemsa stain.

The films were carefully dried, then examined with oil immersion for any malarial stage. The number of malarial stages per 100 red blood cells (RBC) was noted on all thick film slides.

A national comparison from CDC states that, as of 18 August 1979, there were 19 new cases of malaria reported, with a cumulative total of 408. In September of 1979, 10 new cases were reported, with a cumulative total of 519 (MMRW 1979).

TABLE 5b. Parasites of 494 refugees checked by the Utah County Public Health Department, 1980.

Parasite	No. infected refugees	% Infected
<i>Entamoeba coli</i>	48	8
<i>Entamoeba histolytica</i>	18	4
<i>Entamoeba hartmani</i>	9	2
<i>Endolimax nana</i>	21	5
<i>Chilomastix mesnili</i>	0	0
<i>Giardia lamblia</i>	52	11
Hookworms	132	27
<i>Strongyloides stercoralis</i> (larvae)	12	3
<i>Ascaris lumbricoides</i>	68	14
<i>Trichuris trichiura</i>	88	18
<i>Clonorchis sinensis</i>	125	26
<i>Taenia</i> sp.	5	1

TABLE 5a. Parasites of 13 refugees checked by the Utah County Public Health Department, 1979.

Parasite	No. infected refugees	% Infected
<i>Entamoeba coli</i>	4	31
<i>Entamoeba histolytica</i>	1	7
<i>Endolimax nana</i>	1	7
<i>Chilomastix mesnili</i>	1	7
<i>Giardia lamblia</i>	2	15
Hookworms	11	85
<i>Strongyloides stercoralis</i> (larvae)	2	23
<i>Ascaris lumbricoides</i>	4	31
<i>Trichuris trichiura</i>	1	7

TABLE 6. Intestinal parasitism in Indochinese refugee children, by age group, Washington, D.C., September-November 1979 (MMWR 1979).

	Age 0-4	Age 5-9	Age 10-18	All ages
Number examined	6	16	9	31
<i>Ascaris lumbricoides</i>	2 (33)*	9 (56)	3 (33)	14 (45)
<i>Clonorchis sinensis</i>	0	0	1 (11)	1 (3)
<i>Giardia lamblia</i>	1 (17)	4 (25)	1 (11)	6 (19)
<i>Hymenolepis nana</i>	0	1 (6)	1 (11)	2 (6)
<i>Strongyloides stercoralis</i>	0	2 (13)	3 (33)	6 (16)
<i>Trichuris trichiura</i>	0	3 (19)	0	3 (10)

\*Number positive (percent positive).

All *Strongyloides* infections were in children from one family.

In a typical three-month period in Utah (1979), the Utah Bureau of Laboratories examined approximately 800 stool specimens, of which 76 (9.5 percent) were positive, with *Giardia lamblia* being the most commonly identified organism (4.8 percent), followed by *Trichuris* (0.5 percent), *Entamoeba histolytica* (0.13 percent), *Ascaris* (0.13 percent), and hookworms (0.13 percent) (Olsen and Fukushima 1977). Refugee screening is an efficient means of gaining information about parasites.

*Giardia lamblia*, *Chilomastix mesnili*, *Entamoeba coli*, and *Endolimax nana* are relatively nonpathogenic intestinal protozoans with a worldwide geographic distribution. They occupy different locations in the intestinal tract of humans, being asymptomatic or causing mild diarrhea (Spencer and Monroe 1977). The infective stage is the cyst that is passed out of the intestine with fecal material. Studies of these protozoans have shown that water can be contaminated with host fecal material.

Refugees infected with intestinal helminths and protozoa should not create a problem to the public. Adequate sewage disposal interrupts the transmission of the helminths, which require several days of incubation in soil to become infective.

In conclusion, because of present sanitary conditions in Utah County, no serious problems should occur due to refugees in this area. Further investigation, as well as host treatment and follow up of diagnosed cases, would be appropriate.

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