

Health Status of Indo-China Refugees in Japan: Prevalence of Intestinal Parasites and Eosinophilia

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Since the Japanese Government started to accept immigration of Indo-China refugees in 1980, more than 600 people have entered Japan. These immigrants have been first accommodated at refugee centers in Yamato City, Kanagawa Pref., and in Himeji City, Hyogo Pref., Japan. During their stay at the centers for three months, they have learned Japanese. Several groups of immigrants have already finished their stay at the centers and started settlement in this country.

When we examined health status of the first group of immigrants at the refugee center in Yamato City immediately after the center was opened, we found that the immigrants had been heavily infected with intestinal parasites. Other diseases such as tuberculosis and venereal diseases were also observed. On the basis of this observation, the Japanese Government decided to carry out a comprehensive medical examination of these Southeast Asian refugees in collaboration with Yamato City Hospital.

The present communication describes incidence of parasitic infections among the immigrants accommodated at the refugee center, Yamato City, in 1980-1981, and therapeutic effects of flubendazole on some intestinal helminthiases.

Methods

Since March, 1980, the refugee center in Yamato City has accommodated 293 immigrants. Nationalities, sexes and ages of these people were indicated in Table 1 together with prevalence of intestinal protozoa. Most of these immigrants constituted families. More than half of the families had 3-6 children of close ages.

Approximately one week after their arrival at the refugee center, a general medical examination of the immigrants was conducted at Yamato City Hospital. On this occasion, blood, sera and stools were collected, and following parasitological examinations were carried out immediately at Department of Parasitology, School of Medicine, Keio University, Tokyo, i.e., 1) thin blood smear by Giemsa staining for diagnosis of malaria; 2) stool examination by direct smear and formalin-ether centrifugation technique (MGL method); 3) test tube cultivation by the method of Harada and Mori (1951), when hookworm eggs and/or rhabditiform larvae were found by stool examination; 4) gel diffusion precipitation test (GDP test) (Maddison, 1965) and indirect immunofluorescent antibody test (IFA test) (Boonpucknavig and Nairn, 1967) for diagnosis of amoebiasis. The combined use of these two tests increased the diagnostic efficiency (Boonpucknavig and Nairn,

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Table 1 Prevalence of intestinal protozoa as examined by stool examination

	No. Examined	Prevalence* (%)	No. Positive			
			<i>E. histolytica</i>	<i>E. coli</i>	<i>E. nana</i>	<i>G. lamblia</i>
Nationality						
Laos	133	78.9	1	12	10	30
Vietnam	42	66.7	0	2	6	4
Cambodia	118	90.7	6	8	18	18
Sex						
Male	160	83.1	1	8	14	34
Female	133	80.5	6	14	20	18
Age						
0-9	64	73.4	2	4	4	19
10-19	82	85.4	2	7	8	18
20-29	82	81.7	2	6	11	9
30-39	43	95.3	1	5	9	5
40-	20	68.2	0	0	2	1
Total	293	81.9	7 (2.4)	22 (7.5)	34 (11.6)	52 (17.7)

* Prevalence stands for percentages of immigrants infected with intestinal protozoa and helminths. Values in parentheses mean the prevalence rate (%) of each parasite found by stool examination.

1967). Values of EPG of several parasites were determined by Stoll's dilution method.

Although many other clinical tests were carried out, only prevalence of eosinophilia will be described in this communication, because it appears deeply relevant to helminthic infections. Eosinophiles were counted on blood films stained with Hinkelmann's solution.

On the basis of these parasitological examinations, the immigrants were treated with metronidazole and/or flubendazole. The doses of these drugs for adult were 750 mg/day for 7 days and 1.5 g/day for 5 days respectively. These drugs were usually given thrice a day.

Results

Malaria parasite, which was identified *Plasmodium vivax*, was found in one immigrant from Vietnam. The immigrant was treated with sulfamonomethoxine and pyrimethamine.

Prevalence of intestinal protozoa was summarized in Table 1. Of noteworthy was that cyst of *Giardia lamblia* was frequently

found. The prevalence rate was 17.7%. It was more prevalent in male ($\chi^2=5.37$, $.02 < P < .05$) and in children of age 0-9 as compared with those of age 10-19 ($\chi^2=1.15$, $.2 < P < .3$) who also exhibited the high

Table 2 Prevalence of amoebiasis as examined by stool examination, GDP and IFA tests

Patient No.	Cyst in stool	GDP test	IFA test
1	-	+	×256
2	-	+	×256
3	+	+	×256
4	-	+	×256
5	-	+	×1,024
6	-	+	×1,024
7	-	+	×4,096
8	+	+	×64
9	-	+	×256
10	+	-	×256
11	+	-	×4
12	-	-	×16
13	+	-	×64
14-120: Negative for all examinations			

The titer of ×16 or higher was judged to be diagnostic in IFA test². GDP test was evaluated after 72 hour-incubation at 30 C with an appropriate moisture.

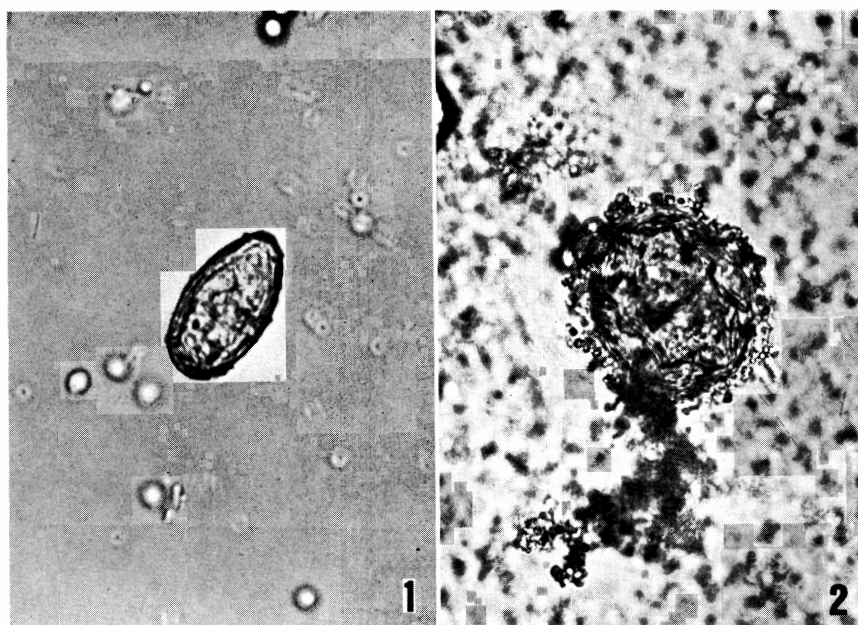


Fig. 1 Egg of the liver fluke, which seemed to be *Opisthorchis viverrini*. ($\times 400$)

Fig. 2 Schistosome egg found in the immigrant from Laos. ($\times 400$)

prevalence rate of *G. lamblia*. Cyst of *Entamoeba histolytica* was found in 5% of the immigrants from Cambodia and 0.8% of those from Laos; thus, stool examination revealed that the overall prevalence rate was 2.4%. However, GDP test indicated that 9 out of 120 immigrants examined were positive. Moreover, IFA test was positive with 12 out of 120 immigrants (Table 2). Among 9 immigrants who were judged positive on GDP test, only 2 had cysts of *E. histolytica* in stools. In addition, only 4 of 12 immigrants who were positive on IFA test were found to excrete cysts of this parasite. *Entamoeba coli* and *Endolimax nana* were also found in these immigrants (Table 1).

Prevalence of intestinal helminths was summarized in Table 3. It was noteworthy that the immigrants from Laos were heavily infected with *Trichuris trichiura* and a liver fluke, which seemed to be *Opisthorchis viverrini*. The egg of this fluke (Fig. 1) was detected only in a few immigrants from Cambodia and Vietnam. Because there is

a large endemic area of *O. viverrini* in Laos (Ito and Janatasen, 1961), we suggest that most of the eggs like one demonstrated in Fig. 1 were not those of *Clonorchis sinensis*, which is mainly found in Japan, Korea, China and Taiwan. This egg, however, is still being further identified in our laboratory. In contrast to these two parasites, hookworms were more prevalent in the Cambodian immigrants as compared with those from Laos ($\chi^2=80.84$, $P<.001$) and from Vietnam ($\chi^2=25.31$, $P<.001$). Although both *Ancylostoma duodenale* and *Necator americanus* are endemic in Southeast Asia (Hunter *et al.*, 1976), our test tube cultivation indicated that the immigrants were more frequently infected with *N. americanus* than with *A. duodenale* ($\chi^2=73.49$, $P<.001$). *Ascaris lumbricoides* was more prevalent in the immigrants from Vietnam than in those from Laos ($\chi^2=14.34$, $P<.001$) and from Cambodia ($\chi^2=10.66$, $.001<P<.01$). *Strongyloides stercoralis* and cestodes were much less prevalent than those mentioned above. Although found

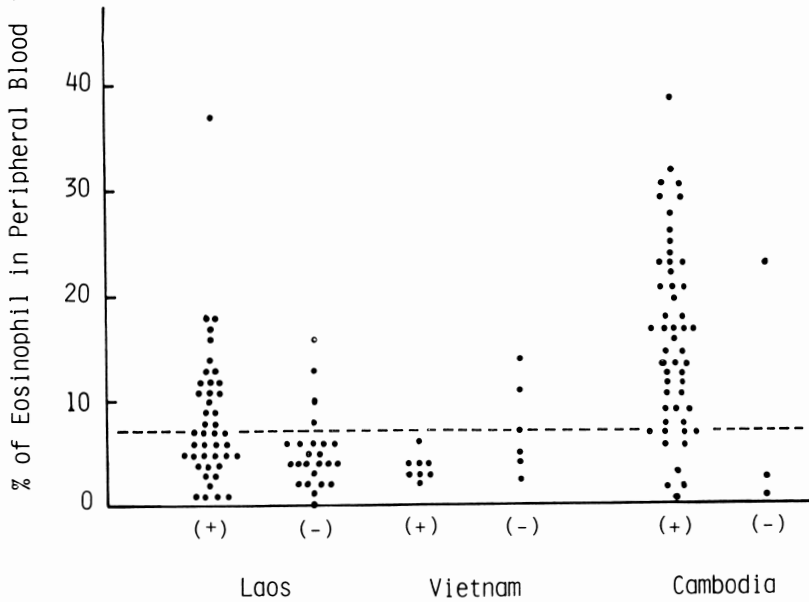


Fig. 3 Prevalence of eosinophilia in immigrants who are infected (+) and not infected (-) with intestinal helminths. The dotted line stands for the upper normal limit of eosinophilic leucocyte in blood, i.e., 8%.

Table 3 Prevalence of intestinal helminths as examined by stool examination

No. Examined	No. Positive					
	<i>A. lumbricoides</i>	<i>N. americanus</i>	<i>A. duodenale</i>	<i>S. stercoralis</i>	<i>T. trichiura</i>	<i>O. viverrini</i>
Nationality						
Laos 133	20	20	2	3	59	69
Vietnam 42	18	12	0	1	2	1
Cambodia 118	21	70	16	8	15	3
Sex						
Male 160	37	56	13	7	41	47
Female 133	22	46	5	5	35	26
Age						
0-9 64	16	13	1	2	10	8
10-19 82	16	33	4	4	28	21
20-29 82	20	29	5	6	27	23
30-39 43	7	18	4	0	9	16
40- 22	0	9	4	0	2	5
Total 293	59	102	18	12	76	73
	(20.1)	(34.8)	(6.1)	(4.1)	(25.9)	(24.9)

Values in parentheses stand for the prevalence rate (%) of each parasite as examined by stool examination.

only in one immigrant from Laos, schistosome egg was demonstrated by stool examination (Fig. 2). The egg was not found by rectal biopsy, whereas both ELISA and COP

test conducted with *S. japonicum* antigen were positive (data not shown).

Prevalence of eosinophilia was shown in Fig. 3. It was highly prevalent in the

Table 4 Therapeutic effects of flubendazole on *T. trichiura* and the liver fluke, probably *O. viverrini*

Patient No.	EPG (mean±standard deviation)			
	<i>T. trichiura</i>		<i>O. viverrini</i>	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
1	1,200±1,058	0	83,467±8,162	300+150
2	1,200± 260	0	950± 527	150± 15
3	750± 450	0	1,200± 450	267±115
4	133± 58	0	67± 58	0
5	350± 312	0	2,950± 527	500±173
6	1,467± 231	100±73		
7	7,500±1,566	0		
8	200± 173	0		
9	533± 306	0		
10	133± 116	0		
11	500± 229	0		
12	133± 105	0		
13			2,000± 312	0
14			667± 231	0
15			4,967± 814	750±397
16			5,350± 964	1,200±397

To examine the therapeutic effect of flubendazole, stools were collected one week after the completion of treatment with this drug.

Cambodian immigrants, when 8% was set as the upper normal limit. Prevalence of eosinophilia was higher in the immigrants with intestinal helminthiases ($\chi^2=20.13$, $P<.001$). Although one may consider that the high prevalence of eosinophilia in the Cambodian immigrants is due to hookworm infection (see Table 3), there was no statistical difference of the prevalence of eosinophilia between hookworm-positive and negative groups.

On the basis of these results, the immigrants were treated with metronidazole and/or flubendazole. Because therapeutic effects of metronidazole on anaerobic protozoa like *E. histolytica* had been well evaluated, effects of flubendazole were investigated (Table 4). In one week after treatment with this drug, EPG values of *T. trichiura* became zero in most cases. EPG values of the liver fluke, which seemed to be *O. viverrini*, also considerably dropped. EPG values of *A. lumbricoides*, *N. americanus*, *A. duodenale* and cestodes

also became zero after treatment with flubendazole (data not shown). Evaluation of side effects of flubendazole indicated that blood pictures and liver function tests were within normal limits after treatment (data not shown). Moreover, the immigrants treated with this drug barely exhibited serious clinical symptoms which could be attributable to its side effects.

Discussion

Our present examination indicated that Indo-China refugees, who wished to settle in Japan, were heavily infected with intestinal parasites. The overall prevalence rate was 81.9%. Wiesenthal *et al.* (1980) also reported a high prevalence of intestinal parasites in Southeast Asian immigrants in Illinois, USA. They suggested that *G. lamblia* would be a potential public health risk particularly in child-care settings. *G. lamblia* may also be important in public health in Japan. Moreover, we suggest that

amoebiasis is of an important significance, because *E. histolytica* may also be transmitted from person to person as reported with *G. lamblia* (Black *et al.*, 1977). The prevalence rate of amoebiasis as revealed by serological methods in our screening was higher than that reported by Wiesenthal *et al.* (1980). This difference may result from the facts that they employed only stool examination for diagnosis of amoebiasis, and that they examined only Laotians. Patterson *et al.* (1980) reported that stool examination was less reliable for diagnosis of amoebiasis than serological methods like GDP test and indirect hemagglutination test.

In contrast to these protozoan diseases, soil-transmitted helminths may be little hazardous for public health in present Japan as judged from its environments. Wiesenthal *et al.* (1980) also reached similar conclusions in regard to soil-transmitted helminths among the Laotian immigrants in the well-developed area, Illinois, USA.

Although we found a high prevalence of the liver fluke, most of which were probably *O. viverrini*, in the Laotian immigrants (Table 3), Wiesenthal *et al.* (1980) detected a liver fluke in only one of 165 immigrants from Laos. They identified it *C. sinensis*. The reason of this difference is not known at present.

Our investigation suggests that flubendazole would be useful as a therapeutic agent for many parasitic diseases except for protozoan infections. Since numerous immigrants from Southeast Asia were infected with more than two species of helminths (data not shown), drugs of broad spectra like flubendazole are of primary importance in our procedure of treatment. Because of this reason, pyrantel pamoate and bithionol, which we used for treatment of several groups of immigrants at first, are no more employed.

Although some of the parasites found in these immigrants may not constitute a

major public health hazard in Japan as noted above, treatment with metronidazole and/or flubendazole much improved health status of these people. For instance, anemia among these immigrants was much improved by our treatment. Therefore, our screening and treatment will be continued so that these people can easily adapt themselves to life in Japan.

Summary

Parasitological examinations were carried out with 293 Indo-China refugees who were accommodated at the refugee center in Yamato City, Kanagawa Pref., Japan in 1980–1981. Approximately 82% of these immigrants were infected with at least one species of intestinal parasite. In particular, *Trichuris trichiura*, *Giardia lamblia* and a liver fluke, which seemed to be *Opisthorchis viverrini*, were highly prevalent among the immigrants from Laos, while more than 70% of the Cambodian immigrants were infected with hookworms. Test tube cultivation, conducted according to the method of Harada and Mori, revealed that the immigrants were more frequently infected with *Necator americanus* than with *Ancylostoma duodenale*. Twelve of 120 immigrants examined were judged to be infected with *Entamoeba histolytica* by serological methods. Eosinophilia was most prevalent in the Cambodian immigrants. These people were treated with metronidazole and/or flubendazole according to parasites identified. Flubendazole had a therapeutic effect on *T. trichiura* and the liver fluke, probably *O. viverrini*.

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我が国におけるインドシナ難民の健康調査：寄生虫感染状況、及び好酸球増多症について

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1980～1981年において神奈川県大和市の難民定住促進センターに入所した293名のインドシナ難民の健康調査を実施し、特に寄生虫の高度の感染を認めた。これらの難民の82%は何らかの寄生虫に感染し、鞭虫、ランブル鞭毛虫、及びタイ肝吸虫と思われる吸虫はラオス難民に高頻度に見出された。一方、鉤虫感染はカンボジア難民に多く、又、培養した結果、アメリカ鉤虫の方がより多く見出された。ゲル内沈降反応、及び

蛍光抗体法で赤痢アメーバの感染の有無を検索した120名中ではその10%にあたる12名が陽性と判定された。又、好酸球増多症はカンボジア難民に多くみられた。これらの難民はフルベンダゾールとメトロニダゾールによって治療されたが、フルベンダゾールは鞭虫、及びタイ肝吸虫と思われる吸虫に対し治療効果を示した。