2. 地 方 病 科

1) Epidemiological study on schistosomiasis japonica among schoolchildren in an endemic area of Yamanashi Prefecture

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Introduction

It is generally believed that a considerable reduction of human schistosomiasis in Japan has been brought about by the use of molluscicides, modification of snail habitat by cementing ditches, rapid development in agricultural method, and industrization of the endemic areas. According to reports of prefectural governments, 39 patients of schistosomiasis were found in Hiroshima Prefecture in 1963, one of the notorious endemic areas in Japan and 0.23% of 39,832 inhabitants in endemic areas of Yamanashi Prefecture were positive for *Schissosoma japonicum* eggs in 1961. These reports were based on data mostly the direct fecal smear technique which is not highly reliable in egg detection. It is, therefore, likely that these positive rates do not show the true prevalence of the infection.

Iijima *et al.* (1962) reported the results of comparison between direct smear and MIFC (merthiolate-iodine-formaldehyde concentration (Blagg *et al.*, 1955) methods and came to the conclusion that MIFC method by which five specimens collected seperately from a person are examined, is more reliable to detect *Schistosoma* eggs. Present paper deals with the results of survey for human schistosome infection by the MIFC method and skin test on the primary and junior high schoolchildren in Futaba-cho of Yamanashi prefecture and with relation between the prevalence of the infection and geographical disribution of *Oncomelania nosophora* in the town.

Materils and Methods

Surveys were carried out in 1962 and 1964 on a total of 1,515 school children in Futaba-cho, a small town in northwest part of Yamanashi prefecture with a population of 4,911. The schoolchildren examined were consisted of junior hgih schoolchildren (JHS) aged 13-15 years and 392 primary schoolchildren (PS) aged 7-12 years in 1962, and 351 and 371 respectively in 1964. Skin test, fecal examination, and snail survey were conducted in the manner described below.

Skin test : Antigen used is an acid-soluble fraction of adult schistosomes containing 30 μg of protein nitrogen per ml, prepared according to Melcher's method (1943) and kindly supplied by the 406th Medical General Laboratory of the U. S. Army in Japan. On the forearm of a child 0.02 ml of the antigen was intradermally injected by means of Tuberculin syringe (0.5 ml) with 27-gauge needle. The reaction was recorded 15 minutes after injection as each average of two rectangulary crossed diameters of both erythema and wheal. The case showing 9 mm or more in wheal diameter and/or 20 mm or more in erythema was regarded as the positive (Ishizaki *et at.*, 1964).

Fecal examination : Based on Ota's observation (1958) that nearly all (95%) of the cases with eggs in feces were positive for skin test, fecal examinations were carried out on each 1.0 g of fecal specimens collected from skin test positive cases, by modified

MIFC method (Ota *et al.*, 1957). Based on the preceding paper (Iijima *et al.*, 1962), five successive fecal examinations were performed on individuals at intervals of 7 to 10 days.

Egg-positive cases surveyed in 1962 were treated with sodium antimony tartarate (Stibnal), 1.2 g in total by intravenous injections starting just after the survey.

Snail survey : Data on snail distribution indicated in the present paper are a part of those from the work done by co-operation with the 406 th Medical General Laboratory in 1963. Survey was made in every farming and housing lot, covering 4,757 acres in total. One square meter in farming lots near the inlet of irrigation of ditches, low dykes between the lots, and adjacent irrigation ditches were carefully observed for the detection of snails.

Results and Discussions

1. Prevalence of *Schistosoma japonicum* infection among schoolchildren

The results obtained by the skin test and fecal examination for *Schistosoma* infection among schoolchildren in 1962 and 1964 are shown in Table 1. JHS were those from families scattering all over the town while PS were from those located in the western half of the town. Therefore the data obtained in each school of children in the same year should be analysed separately. As seen in the table in 1962, 37% of 401 JHS and 13% of 392 PS were positive for skin test while 15% of the former and 8% of the latter were positive for *Schistosoma* eggs. In 1964, 28% of 351 JHS and 9% of 371 PS were positive for the skin test while 9% and 3% were positive for the eggs, respectively. The positive rates in 1962 are significantly (P=0.05) higher than those in 1964 in both of the skin test and fecal examination.

In order to know possible occurrence of new *Schistosoma* infection during the years 1962-1964 in this area, skin test-positive (STP) or egg-positive (EP) cases in 1964 survey who were also examined in 1962 survey were selected and shown in Table 2. As shown in the Table, 15 of 79 STP-and 7 of 19 EP-cases of JHS in 1964 were negative for the skin test and for the eggs respectively in 1962 while 12 of 26 and 3 of 7 cases of PS, respectively. This fact

Table 1 Prevalence of *Schistosoma japonicum* infection by skin test and fecal examination in the primary and junior high school children in Futaba-cho, Yamanashi Prefecture.

Name of school	Survey in 1962						Survey in 1964					
	Total	No.	Skin test		Fecal exam.		Total	No.	Skin test		Fecal exam.	
	No. of children	examined	No. positive	Per cent positive	No. positive	Per cent positive	No. of children	examined	No. positive	per cent positive	No. positive	Per cent positive
Junior High School (JHS)	404	401*	148	37	61	15	354	351	97	38	30	9
Primary School (PS)	399	392	52	13	30	8	371	371	33	9	10	3

* Ten examinations at 10-day intervals were craried out on one case.

Table 2 Skin test and fecal examination in 1962 of the children positive for the test and examination in 1964.

Name of school	Skin test			Fecal examination		
	No. positive in 1964 (a)	No. positive in 1962 (b)	(a)-(b)	No. positive in 1964 (A)	No. positive in 1962 (B)	(A)-(B)
Junior High School (JHS)	79	64	15	19	12	7
Primary School (PS)	26	14	12	7	4	3

suggests possible occurrence of new infection of *Schistosoma* among the children 1962-1964 in this area.

a) Age-distribution : Age distributions of STP and EP cases of the PS and those of the JHS are shown in Table 3 and Fig. 1. JHS in the table and figure were selected from those who graduated from the primary school which was located in the western half area of the town. The result from the skin test in 1962 shows an increase of the positive rate with age. An increase of egg positive rate with age is not clearly observed as seen in the case of skin test. In an attempt to elucidate epidemiological implication, analyses were made principally on the results obtained in 1962. The 1964 survey results were not employed for the present analytical study since the data do not indicate the natural state of the infection due to some derangement by the presence of treated persons who were found as positive for *Schistosoma* eggs in 1962 surveyed. All of the 61 children aged 7 years except

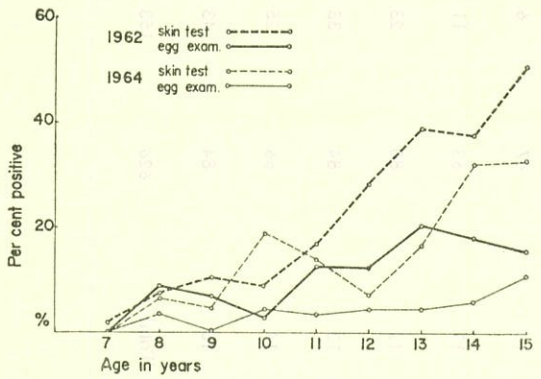

Fig. 1 Age distribution of skin test-positive and egg-positive cases in 1962 and 1964 on the same subject.

a child, were negative for skin test. This fact may suggest that *Schistosoma* infection scarcely occur among the children with pre-school age. A certain similarity between EP and STP rates in younger age groups may suggest that the sensitization (positive reaction by skin test) reflect the establishment of the infection. On the contrary, marked dissimilarity between both rates in higher age group may be also explained that STP reaction is due to past infections as well as present infections.

b) Sex-distribution : Sex distribution of STP and EP cases in 1962 and 1964 is shown in Table 4. Both STP and EP rates in 1962 and STP rate in 1964 were significantly ($P=0.05$) higher in males than those in females. This fact may be caused by the difference in frequency to contact with the parasite between both sexes through their behaviors.

3. Snail distribution and prevalence of *Schistosoma* infection by community.

a) Geographical distribution of snails : Fig. 2 shows the sites where the snails were found by the survey. The subjected town is geographically divided into 3 subareas ; the inclined north area where hills descend rather sharply toward the south, the hilly east area where hills desend slowly toward the south-west, and the plane south area which is drained by the Kamanashi River and its feeder streams. A small stream for irrigation called Tatenashi-segi runs from the west to east through the northern part of the north area where the most of the rice fields are drained by it. Those in the south area are drained by the Bozawa River, Shiokawa River and the Rokutan River. In the east area there are many mulberry fields among which rice fields scatters and no note-worthly waters are seen.

Table 3 Age distribution of skin test- and fecal examination-positive cases in 1962 and that in 1964 on the subjects of the same area.

Age group (year)	Survey in 1962					Survey in 1964				
	No. examined	Skin test		Fecal exam.		No. examined	Skin test		Fecel exam.	
		No. positive	Per cent positive	No. positive	Per cent positive		No. positive	Per cent positive	No. positive	Per cent positive
7	61	1	2	0	0	61	0	0	0	0
8	65	5	8	6	9	56	4	7	2	4
9	56	6	11	4	7	62	3	5	0	0
10	67	6	9	2	3	67	13	19	3	5
11	63	11	18	8	13	57	8	14	2	4
12	80	23	29	10	13	68	5	7	3	4
13	84	33	39	18	21	64	11	17	3	5
14	66	25	38	12	18	80	26	33	5	6
15	84	43	51	14	17	81	27	33	9	11
Total	626	153	24	74	12	596	97	16	30	5

Table 4 Sex distribution of skin test- and egg-positive cases in 1962 and that in 1964 on the subjects of the same area.

Sex	Survey in 1962					Survey in 1964				
	No. examined	Skin test		Fecal exam.		No. examined	Skin test		Fecal exam.	
		No. positive	Per cent positive	No. positive	Per sent positive		No. positive	Per cent positive	No. positive	Per cent positive
Male	305	94	31	48	16	294	60	21	13	4
Female	321	59	18	26	8	302	37	12	14	5

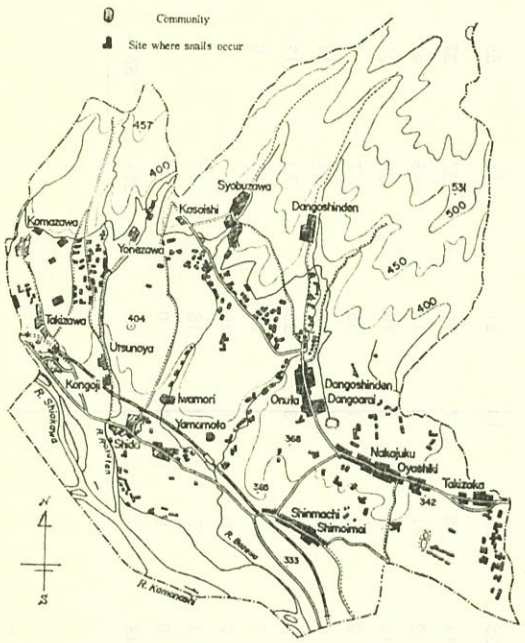

Fig. 2 Distribution of *Oncomelania nosophora* in Futaba-cho, Yamanashi Prefecture (1963).

Snils were found densely along the tributary waters of Tatenashi-segi in the north area. In the plane south area snails were found scarcely except the sites near the junction of the Rivers Rokutan and the Kamanashi where fairly many snails were found. The distribution of snails in the hilly east area was limited to the rice fields but few in number.

b) Prevalence of *Schistosoma japonicum* infection among JHS : Table 5 represents the results of the skin test and fecal examinations on JHS in each community in 1962 and 1964. As shown in the table, STP rates of 30% or more were observed in com munities such as Yamamoto, Komazawa, Kongoji, Iwamori, Shobuzawa, Dangoarai-Dangoshinden; Shimoimai, Shinmachi and Utsunoya. EP rates were also high, in general, in communities where STP rates were high.

c) Relation between the prevalence of *Schistosoma* infection and snail distribution : A close correlation between human *Schistosoma* infection and snail distribution was demonstrated as shown in Fig. 2 and Table 5. A much higher incidence of the infection was shown among inhabitants in the north area than those in hilly east area. In addition, the intermediate snails were found more densely distributed in the former area than in the latter. These evidences may suggest that the snail control measure should be made principally on the areas where higher infection rates of the residents were indicated.

d) Comarison of data on 1964 surveys : Results by the skin test and fecal examination in each of the two surveys are represented by the histogram in Fig. 3. It shows higher STP rate in 1964 than in 1962 in communities of the northernmost part (Komazawa, Takizawa and Shobuzawa) where the farmers are working in the fields lying on slope. This may be, in part, indicative of the difficulty in snail control with molluscicides under such a geographical conditions and in part, of the possible occurrence of new infection with *Schistosoma*. An exceptional case in this area is observed in Kasaishi where the STP rate in 1964 is lower than that in 1962 but *vice versa* in the EP rate.

Unlike the communities above mentioned, in those

Table 5 Prevalence of *Schistosoma japonicum* infection among junior high school children in each community.

Name of community	Survey in 1962						Survey in 1964					
	Total No. of children	No. examined	Skin test		Fecal exam.		Total No. of children	No. examined	Skin test		Fecal exam.	
			No. positive	Per cent positive	No. positive	Per cent positive			No. positive	Per cent positive	No. positive	Per cent positive
Takizaka	7	7	1	14	0	0	8	8	2	25	0	0
Oyashiki	10	10	1	10	0	0	6	6	1	17	0	0
Nakajuku	19	19	6	32	0	0	21	21	2	10	1	5
Tatsumachi	48	47	17	36	2	4	27	27	3	11	1	4
Onuta	27	27	6	22	2	7	18	18	1	6	0	0
Dangoarai-Dangoshinden	31	30	9	30	2	6	20	19	7	37	5	26
Shobuzawa	26	26	12	46	11	42	25	24	12	50	9	38
Schimoimai-Shinmachi	67	67	25	37	14	21	58	58	16	28	5	9
Shida	35	35	14	40	7	20	37	37	7	19	0	0
Utsunoya	55	54	22	41	8	15	48	47	9	19	2	4
Kongoji	21	21	10	48	3	14	27	27	9	33	0	0
Yamamoto	3	3	2	67	1	33	7	7	4	57	0	0
Iwamori	13	13	6	46	2	15	14	14	5	36	1	7
Takizawa	13	13	5	38	3	23	13	13	8	62	2	15
Komazawa	11	11	7	64	3	27	8	8	7	88	3	38
Kasaishi	5	5	2	40	1	20	7	7	1	14	1	14
Yonezawa	11	11	3	27	2	18	7	7	2	29	1	14
Others	2	2	0	0	0	0	3	3	0	0	0	0
Total	404	401	148	37	61	15	354	351	96	27	31	9

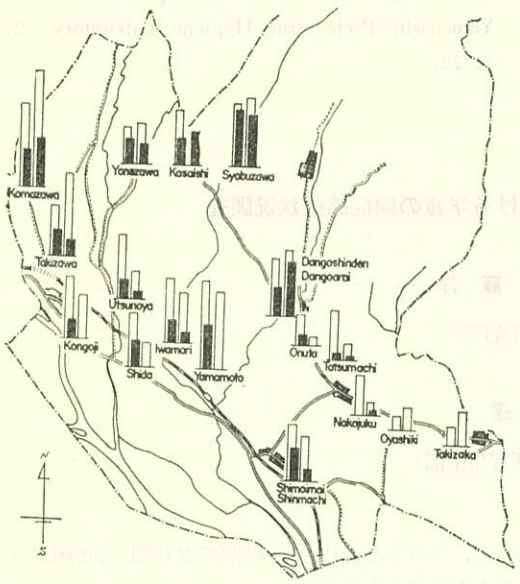

Fig. 3 Prevalence of *Schistosoma japonicum* infection among junior high school children in communities in Futabacho. White and black bars indicate the tskin test-positive and egg-positive rates (%), respectively. The left and right bars in each community represent rates in 1962 and in 1964 respectively.

with farming fields in the southern part of the inclined north area, in the plane south area, and in the hilly east area both STP and EP rates are, in general, lower in 1964 than in 1962 with a few exceptions. From these data it is assumed that *Schistosoma* infection less frequently occurs in these communities than in those located in the northern part of the north area.

Summary

In 1962 and 1964 the skin test with Melcher's *Schistosoma japonicum* antigen and fecal examination by modified MIFC technique were conducted on the primary and junior high school children (1,515 in total) in Fataba-cho, an endemic area for schistosomiasis in Yamanashi Prefecture. In 1963 a survey for the distribution of *Oncomelania nosophora*, the schistosometransmitting snail was made all over the town. Results obtained are as follows.

1) In 1962, 37% of 401 junior high school children and 13% of 392 primary school children were positive for the skin test while 15% of the former and 8% of the latter were positive for *Schistosoma* eggs. In 1964 28% of 451 junior high school children and 9% of 371 primary school children were positive for skin test while 9% of the former and 3% of the latter were positive for eggs. The both rates in 1964 are significantly lower than those in 1962.

2) Analysis of the results from 1964 survey gives a conclusive evidence for the occurrence of new *Schistosoma* infection among the children in the area during the years 1962-1964.

3) Inspection for age-distribution in both skin test and egg positive rates on the children in the same area revealed an increase in skin test positive rate with age but not in egg positive rate in higher age groups. There are very few children infected with schistosomes in 7-year-old group, suggesting no occurrence of the infection in pre-school children.

4) A close correlation between the incidence of infection with schistosomes among children in community and the distribution of *O. nosophora* in the town was observed. Higher incidences were observed among children in the inclined north area where the snails were densely found and lower in the plane south area and in the hilly east area where the snails are sparely found.

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山梨県下日本住血吸虫症一流行地における学童の同症感染状況調査

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山梨県における日本住血吸虫症の浸淫状況を知るため，山梨県双葉町小・中学校児童生徒を対象にMelcher抗原による皮内反応及びMIFによる繰返し5回の糞便検査を実施した．検査は1962年，1964年の2回行なった．また，1963年に同町内のミヤイリガイ棲息状況を全域にわたり調査し，ミヤイリガイの分布と生徒の感染率の関係につき比較した．その結果は次の如くである．

1．1962年における皮内反応陽性率は小学校13%，中学校39%，虫卵陽性率はそれぞれ8%及び15%であった．また1964年は皮内反応陽性率小学校9%，中学校28%，虫卵陽性率はそれぞれ3%及び9%であった．

2．1964年に皮内反応陽性であった者79名中15名及び虫卵陽性であった者19名中7名は1962年の検査で陰性であった．このことより，この地区で2年間に新感染のあったことが認められる．

3．小学校1年の学童では皮内反応陽性者が1名であったことより7才以前の者では同症の感染を受ける機会のほとんどないことが推定される．

4．ミヤイリガイの棲息は北部傾斜地に多く，南部平坦地は一部を除いて棲息が認められなかった．また，東部丘陵地にはその棲息密度が非常に低かった．

5．貝の分布と小・中学生における感染率の関係に強い相関が認められた．すなわち，ミヤイリガイが広く分布し，棲息密度の高い北部傾斜地では感染率が高く，また2年間に感染率の減少が認められなかった．

2）日本住血吸虫病の尿沈降反応の検討

飯島利彦，薬袋勝

山梨県下の有病地においては，最近日本住血吸虫病の衰退に伴ない寄生虫体数の減少および単性寄生などのため，糞便検査による虫卵の検出は困難の度を増しつつある．又一方，治療効果の判定にもこれと同じ理由により，更には駆虫薬投与にともなう一時的な産卵の停止等も考えられ，したがって的確な同病の診断のためには虫卵検出以外何らかの補助的手段の併用を必要とする場合が多くなった．

岡部ら（1958）は，日本住血吸虫が血管内に寄生した場合，その代謝物質は，尿中に移行するとの相定にもとずき，尿中に出現する物質を抗原として，抗日本住血吸虫体家兎血清との沈降反応をこころみたところ良好な成績を得たことから同沈降反応は，日本住血吸虫症の診断に役立つであろうと述べている．さらに田中（1960）も尿沈降反応をこころみ良好な成績を得たと報告している．しかし加藤（1960）は，この追試を行い，供試検体尿の濃縮度を原尿の1/2にした場合は，全例（5例）すべて陰性を示し，この濃縮度を1/10に迄高めて始めて陽性反応を示したと述べている．

これらの報告にもとづき，筆者らは尿沈降反応におけ