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Control of Schistosomiasis Japonica in Japan
A Review —1950-1978—

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Introduction

We report here a unique experience in schistosomiasis control based almost entirely on snail control by means of molluscicides. Following World War II efforts were initiated throughout Japan at both national and local levels to reduce parasitism. This was stimulated, in part at least, by the series of epidemilogic surverys that were carried out by the staff of the Department of Medical Zoology, 406th Medical General Laboratory, U.S. Army, from 1947-1951, with the cooperation of the local authorities together with the cooperation of a representative of an established Japanese research group, such as: The National Institute of Health, Institute for Infectious Deseases, Kitasato Institute, Yamanashi Prefectural Medical Research Institute and others. These surveys covered some 29 prefectures (or their equivalent) and 18,788 persons of whom 93.2 % harbored intestinal parasites; 90.6 % with helminths and 49.9 % protozoa (Table 1). These surveys furnished a basis for comparison of one area with another since the same teams of scientists, physicians and technicians worked all of the surveys; furthermore the same techniques were employed throughout.

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Snail Control

Molluscicides

Beginning in 1918 and continuing until the 1940's a limited control program for schistosomiasis was undertaken by the Japanese in the Katayama district and the Kofu areas of Japan using lime (Narabayashi, 1915; Fujinami and Sueyasu, 1919; Okinami, 1956). By 1931 the Japanese goverment passed a Parasite Disease Control Law under which molluscicides might be applied, but it did not share the costs with the local governments. Later during 1940 calcium cyanimide was introduced and used (Miyagawa, 1913, 1916).

In 1947 there were five well-recognized endemic areas of schistosomiasis japonica in Japan which were: (A) the Tone river basin of Chiba, Saitama and Ibaraki prefectures as well as the beds of the Arakawa and Edogawa in Tokyo; (B) the Kofu valley in Yamanashi prefecture; (C) the Numazu region of Shizuoka prefecture; (D) the Katayama district of Hiroshima and Okayama prefectures, and (E) the basin of the Chikugo river in Saga and Fukuoka prefectures (Fig. 1).

Beginning in 1947 the screening of molluscicides for the control of schistosomiasis became one of the major enterprises of the Medical Zoology Department of the U. S. Army's 406th Medical General Laboratory. The demonstrated effectiveness of NaPCP

Table 1 Summary of parasitic infections in Japan by epidemiologic surveys* (1947–1951)

Area Examined	No. of Communities	Total No. Examined	No. (%) of Parasitized	No. (%) with Helminths	No. (%) with Protozoa
Hokkaido	19	2,211	1,910(86.4)	1,754(79.3)	1,063(48.1)
Honshu					
Aomori	5	1,548	1,468(94.8)	1,425(92.1)	701(45.3)
Chiba	6	840	729(86.8)	699(83.2)	262(31.2)
Ibaraki	8	1,065	994(93.3)	967(90.8)	343(32.2)
Saitama	5	620	566(91.3)	556(89.7)	199(32.1)
Yamanashi	6	3,055	3,041(99.5)	3,038(99.4)	1,647(53.9)
Shizuoka	22	2,278	2,132(93.6)	2,091(91.8)	764(33.5)
Fukui	5	1,296	1,213(93.6)	1,164(89.8)	826(48.3)
Okayama	3	1,260	1,126(89.4)	1,079(85.6)	481(38.2)
Hiroshima	4	813	743(91.4)	728(89.5)	299(36.8)
Shikoku					
Kagawa	4	450	424(94.2)	411(91.3)	213(47.3)
Tokushima	4	452	444(98.2)	444(98.2)	136(30.1)
Kochi	4	415	386(93.0)	376(90.6)	168(40.5)
Ehime	4	412	385(93.4)	383(93.0)	108(26.2)
Kyushu					
Oita	2	429	405(94.4)	397(92.5)	196(45.7)
Kagoshima	2	405	402(99.3)	401(99.0)	164(40.5)
Saga-Fukuoka	4	716	674(94.1)	667(93.2)	138(19.3)
Kumamoto	3	523	472(90.2)	455(87.0)	190(36.3)
Total	109	18,788	17,514(93.2)	17,035(90.6)	7,698(40.9)

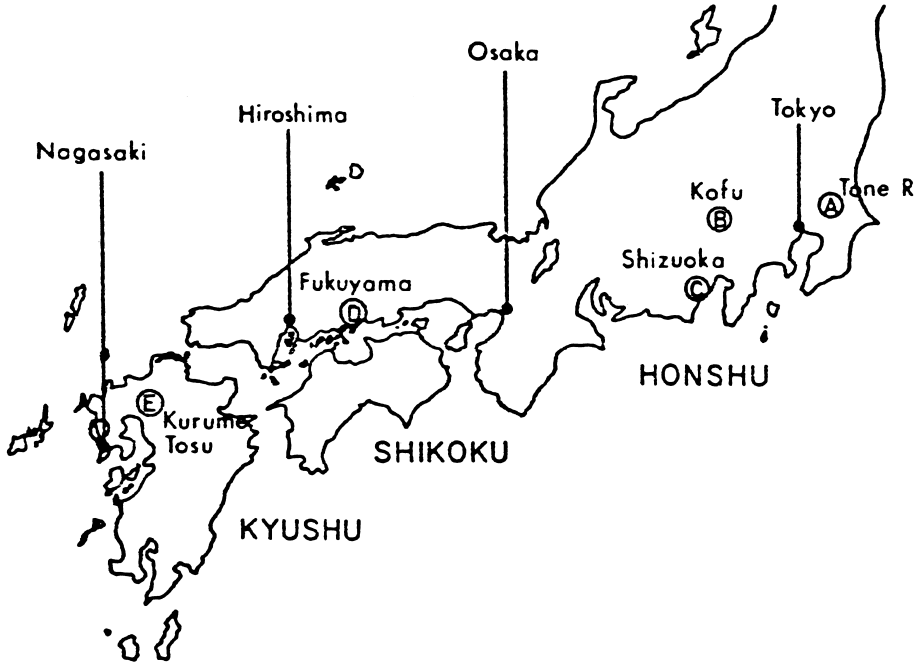
* Based upon a single stool examination using the MGL and AMS III concentration techniques on each stool.

(sodium pentachlorophenate) in the preliminary studies, followed by the cooperative pilot study in Nagatoishi, Kurume city, Fukuka prefecture, Kyushu, (1950–1951) subsequently helped to encourage its generalized use in the five main endemic regions of schistosomiasis throughout Japan.

Lining the Irrigation Ditches with Concrete

Shortly after the national molluscicide program was initiated came the concreting of irrigation ditches in infected areas thereby making the habitat of the amphibious snail host, *Oncomelania hupensis nosphora*, less compatible and the attempts at snail control more effective.

Although the lining of irrigation ditches was a very expensive project it had several advantages: (1) such ditches made it difficult for the snails to obtain food; (2) existence in a concrete-lined ditch presumably interfered with reproduction and ovipostion; (3) the relatively high water velocities possibly tended to create unfavorable conditions for this species of amphibious snail; (4) the application of molluscicides was more effective and less expensive in lined ditches (Sasaki, 1958). In this connection it must be remembered that it was essential to maintain such ditches free of muddy soil, pebbles, rocks, algae as was noted by Komiya (1959). These measures together with education, improvement in agricultural techniques, the mechanization of farming, all helped to bring about a real decrease in *Schistosoma japonicum* infections



A : Tone river area in Chiba, Saitama and Ibaraki
B : Kofu area in Yamanashi
C : Numazu area in Shizuoka
D : Fukuyama area in Hiroshima and Okayama
E : Kurume and Tosu area in Saga and Fukuoka

Fig. 1 Map of Japan showing former endemic areas of schistosomiasis in Japan.

as well as other infections throughout Japan.

Methods

The 1947-1951 *Surveys*

Sampling

During these surveys each person was given a physical examination plus a detailed questionnaire. At the suggestion of the statisticians it was agreed that, with the exception of a large city (usually the prefectural capital), the remaining communities should be selected at random within such categories as fishing, farming, etc. Within each of these areas the households and individuals examined would also be selected at random.

Techniques

Stool Examinations On these early series of epidemiologic surveys two techniques were used on a single stool sample : the MGL (formalin-ether, Ritchie, 1948) and the AMS III (acid-sodium sulfate-tritonNE-ether, Hunter *et al.*, 1948). The first was primarily used for the detection of protozoan cysts and some helminth eggs while the AMSIII recovered helminth eggs and larvae. When loose stools were encountered direct smears were run routinely (Tigertt *et al.*, 1952).

The Parasite Density Index This was designed to furnish information on the *intensity* of the infection, to make comparisons between different areas and communities possible. As the microscopic preparations were examined a careful estimate of the number of various eggs and cysts was made, and " plus " symbols used to designate the intensity of the infection.

The total number of cases found in each category is multiplied by the corresponding

index figure, these several products are added, and in turn the sum is divided by the total number of positive cases involved. The resulting figure (actually the average number of eggs per microscopic preparation for the entire group) is used as an arbitrary numerical, or *index factor*, for the *parasite density* of a certain population sample. These indices furnish statistically valid differences which may be utilized in comparing different population groups (Tigertt *et al.*, 1952).

The 1973 *and* 1978 *Surveys*

Techniques

The best method of making a positive diagnosis lies in the demonstration of the schistosome egg from the stool, or by biopsy of the intestinal wall. However, in chronic, long-standing infections of schistosomiasis the demonstration of eggs is not always easy. In such cases immunological tests may be useful (Kagan and Pellegrino, 1961).

The Intradermal Test (IDT) The usefulness of the intradermal test is known to be somewhat controversial as to the amount of antigen that it is necessary to inject. For example, Pellegrino (1958) considered a wheal less than 0.9 cm^2 as negative and 1.0 to 1.2 cm^2 as doutful while 1.2 cm^2 or greater as a positive reaction in the skin test where 0.05 ml of 20 μgN/ml antigen was used. On the other hand Yokogawa *et al.* (1957) and Yokogawa (1969) considers " any reaction positive in which the diameter of the wheal after 15 minutes exceeds by 5 mm the diameter of the wheal raised immediately after injection with 0.02 ml of VBS antigen (50 μg protein/ml) ".

The Circumoval Precipitin Test (COPT) All of those positive for the IDT were given a circumoval precipitin test as described by Yokogawa (1969). In Japan Yokogawa has found that when properly performed this test has a high diagnostic value for schistosomiasis japonica and that it can be used for epidemiological studies (Yokogawa *et al.*, 1967; Yokogawa, 1969).

In Japan it appears that the COPT remains positive for long periods after active infection has ceased (Yokogawa, 1969).

Stool Examinations All of those positive for the IDT were given a COPT as described by Yokogawa *et al.* (1967). Individuals who showed a positive reaction on the COPT were then examined by five consecutive stools using the AMSIII technique or the MIFC (merthiolate-iodine-formalin-concentration technique, Blagg *et al.*, 1955).

Survey Results

The 1947-1951 *Surveys*

Individuals from 8 prefectures and 55 communities that constituted the known endemic areas of schistosomiasis japonica were examin

Table 2 Summary of areas examined in 1947~1951 for schistosomiasis japonica in Japan using a single stool specimen

Area examined	Communities examined		Persons examined		
	Total No.	No. positive	Total No.	No. from infected area	No. (%) positive
Tone river*	19	12	2,525	1,403	104(7.4)
Yamanashi	6	6	3,055	3,055	979(32.0)
Hiroshima	4	3	813	613	172(2.8)
Okayama	3	0	1,260	0	0
Shizuoka	22	6	2,278	607	40(1.8)
Fukuoka-Saga†	4	4	2,073	716	373(47.1)
Total	58	31	12,004	6,394	1,632(25.5)

* Chiba, Ibaraki and Saitama prefectures in part.
† Chikugo river basin.

ed between 1947 and 1951 by members of the 406th Medical General Laboratory and their Japanese associates. Of the 6,394 persons who were examined from these schistosomiasis areas 1,632, or 25.5%, were positive for schistosome eggs on a single stool examination using the AMSIII and MGL concentration techniques. The most heavily infected area was found in Fukuoka-Saga prefectures where 47.1% of those examined passed eggs of *S. japonicum* (Table 2).

Few people were heavily parasitized, a conclusion substantiated by a low parasite density index (PDI) of only 11 compared with a PDI of 20, and 32% of the 3,055 persons examined who were positive in Yamanashi prefecture and a 28, or 47.1% of the 2,073 who were checked in the Fukuoka-Saga region. The prevalence of schistosomiasis was 7.4% or less in the remaining prefectures that were examined.

The 1973 *Surveys*

In 1973 the Ministry of Health and Welfare of Japan appointed a committee to run a series of epidemiologic surveys in the endemic areas

Table 3 Results of epidemiologic surveys of inhabitants of the endemic areas of schistosomiasis japonica in 1973*

Prefecture	IDT		COPT		Stools†	
	No. examined	No. (%) Positive	No. examined	No. (%) positive	No. examined	No. (%) positive
Chiba	409	96(23.5)	96	17(17.7)	17	1(5.9)
Yamanashi	12,318	3,792(30.8)	3,792	1,002(26.3)	1,002	111(11.1)
Hiroshima	2,648	106(4.0)	106	44(41.5)	44	0
Okayama	626	35(5.6)	35	0	0	0
Fukuoka	1,627	447(26.7)	447	150(33.6)	139	0
Saga	1,250	308(24.6)	308	108(35.0)	106	12(11.3)
Total	18,923	4,784(25.3)	4,784	1,321(27.6)	1,308	124(9.6)

* Performed by the Committee of Ministry of Health and Welfate (Mimeographed Report).
† 5 stools were examined from each person using the MFIC or AMS III techniques.

Table 4 Results of epidemiologic surveys of inhabitants of the endemic areas of schistosomiasis japonica in 1978*

Prefecture	IDT		COPT		Stools†	
	No. examined	No. (%) positive	No. examined	No. (%) positive	No. examined	No. (%) positive
Yamanashi	2,960	641(21.7)	564	91(16.1)	91	0
Hiroshima	2,470	72(2.9)	72	18(25.0)	18	0
Fukuoka	2,421	597(24.7)	602	108(17.9)	96	0
Saga	1,428	309(21.6)	309	64(20.7)	56	0
Total	9,279	1,619(17.4)	1,547	281(18.2)	261	0

* Performed by the Committee of Ministry of Health and Welfare (Mimeographed Report). Because we do not know the number of persons in the 1973 sample who are included in the 1978 sample, a formal statistical test is difficult to construct. However, the differences are so striking that there is no doubt that the prevalence of schistosomiasis is much lower in Yamanashi and Fukuoka prefectures in 1978 when compared with 1973 and would be of statistical significance.
† 5 stools were examined from each person.

of schissosomiasis in order to evaluate the results of the various control measures utilized since the 1947-1951 base line studies. Members of this committee in 1973 were : S. Hayashi (NIH), Chairman : M. Yokogawa (Chiba University) ; T. Ishizaki (Dokkyo University); S. Tsutsumi (Kurume University) ; M. Tsuji (Hiroshima University); T. Sasaki (Yamanashi Health Center) and the officials of the government. The results in Table 3 show little evidence of schistosomiasis among the 18,923 persons examined, except in Chiba, Yamanshi, Fukuoka and Saga prefectures.

The 1978 *Surveys*

In 1978 the Ministry re-appointed the same committee as in 1973 (Anon, 1973, Ministry of Health and Welfare. Mimeographed Report) to run to a new series of epidemiologic surveys. A toatl of 9,279 persons from four prefectures were examined from the three remaining known endemic areas. Fukuoka and Saga prefectures constitute the Chikugo river endemic area of schistosomiasis (Table 4). The same techniques were used as in 1973 ; an IDT on all of the people examined, followed by a COPT on those positives on the IDT. Examinations of 5 consecutive stools were carried out again on all COPT positives (who submitted the requisite number of stools). It is significant that of the 281, or 18.2 %, who were positive on the COPT, and 261 who submitted 5 stools each, NONE passed eggs of *S. japonicum*.

Results of Control Efforts

The Snail

Since the snail, *O. h. nosophora*, is the intermediate host of *S. japonicum* in Japan it is important to know the number of hectares* left in the snail breeding areas, the population at risk, and out of these the number who are farming. The most recent survey of this type was completed in February, 1978, and indicated that there are some 56,645 farmers (mostly rice paddy farmers) cultivating a total of 20,192 hectares in four prefectures with a total population of 258,363 persons who theoretically are at risk of infection.

It should be borne in mind that the pilot study in the Nagatoishi area of Kurume city, in 1950-1951 where NaPCP was sprayed twice a year in the highly endemic region of the Chikugo river basin, resulted in 99.5 % control of the snail host in 2 years (Hunter *et al.*, 1957, 1962, 1982). These results apparently encouraged the national and prefectural governments to stop the use of calcium cyanamid and to replace it with NaPCP. Since 1952, almost all of the endemic areas in Japan were treated with NaPCP twice a year, in the spring and fall when irrigation of the paddies was not in progress. By applying 5 gm/m^2 of a solution containing 50 gm of NaPCP in 14 liters of water, a kill of 70-99 % of the snails was obtained (Hunter *et al.*, 1952, 1962 ; Yokagawa, 1974).

Although NaPCP has been used for over 14 years there is no evidence that the snails were becoming resistant to this chemical (Yasuraoka, 1970) in spite of other reports to the contrary (Ritchie and McMullen, 1961).

Recently Yurimin (3, 5-dibromo-4-hydroxy-4-nitroazobenzene) was thoroughly tested. In field trials against the snail, *O. h. nosophora*, Yurimin killed 80-100 % at a dose comparable to NaPCP. This resulted in the replacement of NaPCP throughout Japan by 1972 (Yasuraoka *et al.*, 1968 ; Yasuraoka, 1970). A few years later Phebrol (sodium-2,5-dichloro-4-bromophenol) was checked followging its development and then adopted for use in the Kofu basin (Kajihara *et al.*, 1979a : Kajihara *et al.*, 1979b).

Infections of O. h. nosophora in 1973 *and* 1978 In 1973 and 1978 the Ministry of Health and Welfare, through its committees, carried on surveys for infected snails, *O. h. nosophora*, in the 5 formerly endemic areas of Japan. In 1973 infected snails were recovered from Chiba, Yamanashi and Fukuoka prefectures. However, by 1978 no infected snails were found (Table 5). This is an important observation since a total of 25,522 *O. h. nosophora* were examined in 1973 and 28,157 in 1978. This is a highly significant

* Hectare (ha) consists of 10,000m^2, or 2.5 acres.

Table 5 Results of snail surveys in 1973 and 1978*

Area	1973		1978	
	No. snails examined	Snails infected	No. snails examined	Snails infected
Chiba	50	+	—	—
Yamanashi	20,479	+	25,479	0
Hiroshima	6	0	0	0
Fukuoka	4,372	+	2,576	0
Saga	615	0	102	0
Total	25,522	+	28,157	0

* Data from the Ministry of Health and Welfare, 1973 and 1978 (Mimeographed Report).

finding since the species of snails that carries *S. japonicum* apparently is not now transmitting the disease (Anon, 1978, Ministry of Health and Welfare. Mimeographed Report).

Reservoir Hosts

Cows In the Kofu basin farm cows used in the paddies have decreased from 13,590 in 1955 to 3,552 by 1969 and the percentage of farm cows positive for *S. japonicum* eggs in 1945–1949 dropped from 1,579, or 28.2 % to 0 in the 857 that were examined in 1965–1969. At the same time farm tractors in Kofu basin increased from 1,113 in 1955 to 38,464 in 1969 (Yokogawa, 1974).

Rodents and Dogs Additional evidence of the control of schistosomiasis in some of the potential reservoir hosts in Japan comes from an examination of rodents and dogs over the years by various authors. Table 6 shows that 50.6 % of the rodents examined were infected in 1934 in Yamanashi prefecture but that this was reduced to 0 in 1978. Again in 1967 some 48.2 % of the 85 rodents examined

Table 6 Summary of rodents and dogs examined for *Schistosoma japonicum* infections by prefectures and year*

Prefecture	Rodents examined			Dogs examined		
	Year	No. examined	No. (%) positive	Year	No. examined	No. (%) positive
Yamanashi	1934†	820	415(50.6)	1954†	462	118(25.0)
	1938†	1707	656(36.9)	1962†	683	34(5.0)
	1945†	318	6(1.9)	1971†	208	0
	1974†	63	19(30.1)			
	1978‡	209	0	1978‡	35	0
Hiroshima	1978‡	56	0	1978‡	30	0
Fukuoka	1960-61§	61	43(70.4)	—	—	—
	1967§	85	41(48.2)	—	—	—
	1978‡	44	0	1978‡	24	0
Saga	1978‡	26	0	1978‡	30	0
Total		3,389	1,180(34.8)		1,472	152(10.3)

* In the cells of the table in which a substantial number of animals are examined in 1974 and 1978, a significant decrease in the proportion of positives is found.

† Data presented prior to 1978.

‡ From the Ministry of Health and Welfare Report for February 1978 (Mimeographed Reports).

§ From Okabe *et al.*, 1967a.

in Fukuoka prefecture were positive compared to none in 1978. The remaining data for Hiroshima and Saga prefectures likewise indicate an absence of infection in 1978 (Table 6). A total of 335 rodents were examined in 1978 (species not specified) from the four prefectures and none were parasitized by *S. japonicum* at autopsy (Table 6) (Anon, 1978, Ministry of Health and Welfare. Mimeographed Report).

The infection of dogs in Yamanashi prefecture dropped from 25 % of 462 examined in 1954 to 5 % of 683 in 1962 and none thereafter. In 1978 in the other prefectures none of the dogs were reported as being infected (Table 6).

Control Achieved

A comparison of the data shows a marked reduction of positive stools from 1,632, or 25.5 %, on a *single* stool in 1947–1951, to 1,321 who were positive in 1973 (Table 3) on the COPT ; 1,308 of these submitted stools for examination and these yielded only 124, or 9.6 %, passing *S. japonicum* eggs. It should be emphasized that in 1973, 5 stools each were used instead of only one as in 1947–1951. Using the same techniques in 1978 as in 1973 clearly demonstrated that actual control had been achieved (Table 4). (Anon, 1978, Ministry of Health and Welfare. Mimeographed Report).

All of the available evidence indicates that control of schistosomiasis japonica has actually been achieved and suggests that within the next decade the disease will be *eliminated* from Japan. In this last study only four prefectures were involved, and the absence of infections in these reservoir hosts indicate that more control has been realized than was believed possible. Table 7 summarizes the status of schistosomiasis control throughout Japan at the end of 1978.

This control was achieved through good planning, hard work, and the fortuitous presence of several other factors. The snail control measures, molluscicide and concreting of irrigation ditches, education and treatment programs were relatively easy to administer because there were only five well-defined areas where schistosomiasis occurred. Whatever difficulties did arise were overcome by the determined local workers in cooperation with committed national and prefecturol governments. Finally during the past 30 years Japan has undergone rapid socioeconomic development resulting in changes in living and working styles, land reclamation projects, and increased awareness of schistosomiasis ; all of these have played a role in reducing transmission of the disease.

Thus, schistosomiasis japonica, once an important public health problem in Japan is now primarily a zoonosis. Humans still may be at risk of acquiring the disease, but that risk is exceedingly low. Japan has controlled human endemic schistosomiasis, something few, if any, other countries have been able to do.

Summary

A pilot study for the control of schistosomiasis was undertaken in Nagatoishi, Kurmeu

Table 7 Summary of the status of schistosomiasis in 1978 in Japan

Prefecture	Persons			Snails		Rodents		Dogs	
	No. examined	No. stools examined	No. positive	No. examined	No. positive	No. examined	No. positive	No. examined	No. positive
Yamanashi	2,960	91	0	10,479	0	209	0	35	0
Hiroshima	2,470	18	0	6	0	56	0	30	0
Fukuoka	2,421	96	0	4,372	0	44	0	24	0
Saga	2,428	56	0	615	0	26	0	30	0
Total	9,279	261	0	15,472	0	335	0	119	0

Five stools were examined from each of those who showed IDT positive.

city, Japan, using sodium pentachlorophenate (NaPCP) in 1950-1951 by the staff of the 406th Medical General Laboratory, U.S. Army, and representative Japanese scientists. Shortly after the pilot study, NaPCP was used in all of the endemic areas twice a year. In addition the cementing of the irrigation ditcthes was begun in 1956 in Nagatoishi and Kofu areas. The irrigation ditches were lined with concrete in all the areas between 1956-1980.

There was no organized treatment program by the National Government during these years although some individuals undoubtedly received treatment. In 1973 the Ministry of Health and Welfare, Japan examined 18,923 individuals and 1,321, or 27.6 %, gave a positive COPT. Of these 124, or 9.6 %, passed eggs in a series of 5 stools in those examined from Chiba, Yamanashi and Saga prefectues; no eggs were found in those from Hiroshima,Okayama and Fukuoka prefectures.

Five years later in 1978, 9,279 persons from Yamanashi, Hiroshima, Fukuoka and Saga prefectures were tested; 281, or 18.2 %, gave a positive COPT but no eggs of *S. japonicum* were recovered from the stools of the 261 submitting 5 stools each.

In 1973 snails, *Oncomelania hupensis nosophora*, were examined for *S. japonicum* and positives were found from Chiba, Yamanashi and Fukuoka prefectures. In 1978 none was infected.

Similarly infections in rodents dropped from 51 % in 1934 to 0 in 1978. A total of 1,472 dogs were examined. In 1978, 119 were tested and none was positive for *S. japonicum*.

Thus, schistosomiasis japonica, once an important Public Health Problem in Japan, has been successfully controlled. Although humans still may be at risk of acquiring the disease, the risk is exceedingly low.

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日本における日本住血吸虫症の予防対策について（1950–1978）

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日本では，日本住血吸虫症の流行地としては，千葉，茨城，埼玉および東京にまたがる利根川および江戸川流域，山梨県の甲府盆地，静岡県の沼津地区，岡山・広島県にまたがる片山地区および福岡・佐賀県にまたがる筑後川流域が古くから知られており，今次大戦後も特に，甲府盆地，片山地区，筑後川流域では，その病害は著しかつた．しかし，最近10数年間は，第1中間宿主の宮入貝はなお，2～3の地域ではみられるが，新しい感染者は全くみられなくなつた．

これは，1950年から強力にはじめられた第1中間宿主の撲滅対策に負うところが多い．それには，筑後川流域における米軍406医学綜合研究所を主体とした殺貝剤NaPCPの撒布による撲滅方法の推進と，水田の灌漑溝のコンクリート鋪装という我が国独自の方法による撲滅対策の推進が効を奏したと考えられる．

1973年および1978年に実施された厚生省を中心とする日本住血吸虫症の実態調査においても，その成果がはつきりと示されている．そこで，1950年～1978年に至る迄の日本住血吸虫症撲滅対策の実施状況と，その評価をまとめてみた．