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Shigella Spectrum in Japan and Surrounding Countries; An Enlarged Review

Yoshio AOKI

Department of Bacteriology, Nagasaki University School of Medicine, Nagasaki

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Abstract

A detailed observation of type and subtype distribution within each serogroup of *Shigella* was made in Japan, Korea, Taiwan, and Continental China, based principally on the same references as those used in the previous report (Vol. 10, No. 2 of this journal). Some references have been rejected because of insufficient taxonomic details. Others were adopted as the work by Japanese authors around 1945 and a survey of the etiologic structure of dysentery in the southern most territories of U.S.S.R. In Japan short after the war's end, *S. dysenteriae* 1 and *S. flexneri* 2a were the main etiologic agents. Though the former decreased abruptly and for several years is scarcely found, the predominance of the latter continued till 1963. The organism ranking second within the Flexner group during the years until 1957 was 2b, but 3a took this position since 1958 and has been holding top rank since 1964, just when *S. sonnei* assumed dominance over the entire *S. flexneri* group. Flexner 2a is the member of the *S. flexneri* group occurring most frequently in Korea and Taiwan at present. In Continental China, Flexner 2a also had been ranking first within this serogroup in the 1950's, but it appears that some change took effect there around 1960. *S. dysenteriae* 1 still exists in Korea as well as in Continental China. In Continental China, *S. boydii* type 4 represents the majority of typable strains in that serogroup. On the other hand, type 1 which is frequent in Japan and ranks first in Korea, indeed is scarce in Continental China.

In 1968, several reviews of the serotype relationship of *Shigella* appeared simultaneously, as by chance, in literature of the United States (Eicher et al.)[6], the Soviet Union (Krasheninnikov)[17], Poland (Kostrzewski and Stypulkowska - Misiurewicz)[16], and Japan (Aoki, the present author)[1]. Although the reports from the U. S. A. and Poland were concerned principally with the general status of shigellosis in the respective countries, the others approached the problem of the geographical distribution of *Shigella* serogroups

from an angle called the "etiological structure" (Krasheninnikov) or the "*Shigella* spectrum" (Aoki). In the series of papers of Krasheninnikov, annual changes of the *Shigella* distribution in the world at large except Asian countries were compared and discussed. In the communications of Aoki, the state of affairs in Japan and its neighboring countries were outlined timely.

The present supplemental review is dealing with the *Shigella* spectrum in the form of reference to types and subtypes in each serogroup, simultaneously enlarging somewhat the scope of the review in chronological and geographical respects.

Japan

During the past 15 years, i. e., from 1951 to 1965, the percentage distribution of *S.flexneri* (B group) in this country decreased gradually from 86.9 to 24.1, whereas *S.sonnei* (D group) increased from 4.2 to 72.8 (Table 1 of the previous report)[1]. The distribution of *S.flexneri* strains in all of Japan in the years of 1951 to 1954 (according to Nishide et al.) and in 1955 to 1965 (according to the Annual Report of the Ministry of Health and Welfare) by type, subtype are summarized in Table 1, which shows also the number and proportion of the isolated strains. It was revealed that *S.flexneri* 2a was the most frequent type until 1963, and type 3a which had been on a gradual increase since the first observations, came to the top in and after 1964. In the years of 1950's, the prevalent subtype next to 2a was 2b, but it decreased markedly since 1960. The remaining types and subtypes, except subtype 1b in the early years, were recovered infrequently or in small, negligible numbers throughout the period covered by this survey. Among them, however, it is worthy of notice

Table 1. Classification of *S. flexneri* in all Japan, 1951-1965

Year	No. of strains	Type and subtype distribution (in per cent)													UC
		1a	1b	1*	2a	2b	2*	3a	3b	3**	4**	5	6	X var.	Y var.	
1051	22,119	0.5	13.6	0.0	53.1	14.8	7.1	4.9	0.1	1.2	1.3	0.3	0.4	0.2	2.4	—
1952	45,248	0.9	13.0	0.3	41.2	26.3	5.3	7.4	0.6	1.4	1.1	0.1	0.2	0.8	1.3	0.0
1953	51,969	0.7	8.0	0.1	38.5	35.4	0.2	11.9	0.9	0.2	0.9	0.1	0.3	1.6	1.6	—
1954	46,311	0.6	5.4	0.0	39.2	32.8	0.1	16.0	0.7	0.1	1.1	0.1	0.2	2.0	1.8	0.0
1955	20,037	1.9	3.1	0.5	38.2	23.1	1.7	14.2	0.5	2.3	1.0	0.1	1.6	1.6	0.8	9.6
1956	20,922	0.8	4.7	0.6	40.1	18.7	1.8	16.7	0.8	2.2	1.4	0.1	0.9	1.6	1.1	8.5
1957	18,474	0.7	5.1	1.0	36.2	19.5	2.4	16.6	0.9	2.0	1.6	0.1	0.8	1.7	1.3	10.1
1958	20,613	0.7	4.0	3.2	38.9	14.5	1.5	15.9	0.6	1.5	1.4	0.1	2.7	1.5	1.7	11.7
1959	21,441	0.8	4.4	0.5	36.5	16.2	1.6	18.1	0.6	1.4	2.9	0.0	2.8	2.4	2.7	9.1
1960	25,198	2.3	6.4	0.4	34.1	9.1	1.4	27.1	0.6	1.7	2.2	0.0	1.3	1.6	2.0	9.8
1961	26,155	1.1	5.2	0.4	36.8	7.2	1.3	28.2	0.8	2.7	1.9	0.0	0.8	1.6	1.5	10.4
1962	21,539	2.4	3.4	0.5	39.9	5.4	1.4	30.1	0.6	2.0	3.2	0.0	0.4	2.7	1.3	6.7
1963	17,296	1.1	3.1	0.6	38.2	5.5	1.0	32.4	0.6	1.7	3.1	—	0.6	2.5	1.7	7.9
1964	9,711	1.3	4.5	1.4	29.8	7.7	1.1	34.6	0.8	2.0	3.1	0.1	0.4	2.7	2.2	8.4
1965	6,446	1.3	3.8	1.5	24.0	5.4	1.1	37.5	1.2	2.7	3.9	0.2	0.3	2.6	2.0	12.4

*Reported only in the form of type classification. **Subtypes disregarded.

Table 2. *S. flexneri* in urban districts of Japan ; isolations from sporadic cases

Year	No. of strains	Type and subtype distribution (in per cent)												UC
		1a	1b	2a	2b	3a	3b	3c	4	5	6	X var.	Y var.	
1962	5,575	1.1	12.2	44.0	9.1	21.6	1.0	—	4.1	0.0	0.3	2.2	4.2	0.4
1963	4,831	1.3	6.8	40.6	10.2	25.6	1.0	—	6.8	—	0.2	3.5	1.5	2.7
1964	2,936	1.0	5.2	54.1	14.5	21.0	1.2	—	3.5	0.1	0.0	2.7	4.8	0.9
1965	2,309	1.2	9.1	40.9	5.3	23.8	1.2	1.8	5.5	—	0.1	5.2	5.9	0.2
1966	1,391	1.7	11.1	34.8	11.1	23.7	1.5	2.8	3.7	0.2	0.1	4.1	5.3	0.2
1967	449	2.9	6.5	48.4	6.9	12.2	0.5	1.3	7.1	0.2	—	7.6	6.0	0.5

that type 4 consisting mainly of subtype 4a (antigenic structure, IV : 4) showed a slight trend to increase during the last seven years.

The relevant information on type and subtype distribution quoted from the results obtained by the "Working Group on Drug-resistant Dysentery" which consists of the staffs of several stationary hospitals and public health institutions in the so-called "belt zone bordering on the Pacific" of Japan, is given in Table 2. There is some difference in the data collected in these specially delineated urban districts and the rest of Japan, namely, in the former instance subtype 2a was ahead of 3a by a significant margin every year. There was as well a slightly greater incidence of type 4, and of variants X and Y.

Detailed data on the occurrence of *S. dysenteriae* and *S. boydii* quoted from the reports of Nishide et al. and from the governmental annual reports are shown in Table 3. As can be seen from the last line of this table, the actual number of *S. dysenteriae* strains averaged 25 out of 3,814 isolates and *S. boydii* strains, averaged 23 per year out of 347, in the entire country. Among *S. dysenteriae* type 2 (*S. ambigua* or *S. schmitzii*) and type 3 (Q771, a member of Large-Sacks group) occurred the most frequently, with type 1 (Shiga), types 4, 6 and 7 showing minor or nearly negligible numbers. Although no information was obtainable for the years 1951 to 1954 to permit the classification of *S. dysenteriae* types other than 1 and 2, available data clearly indicate that the frequency of type 2 decreased since 1958 but type 3 displayed a trend to increase in recent years.

As mentioned already in the previous report, *S. boydii* was isolated in Japan for the first time in 1952. It has been considered that its appearance was influenced by the state of affairs in neighboring countries, especieally Korea. The occurrence of strains belonging to this group is given numerically in the right half of Table 3. This group strains, though they were found in negligibly small numbers when compared with strains of other serogroups, has been increasing in absolute numbers since 1954, reaching a peak in 1956 to 1958, then diminishing. Types 1 and 2 were the organisms compartively frequently recovered, followed by types 4, 3 and 6. In 1965, an imported case (the wife of a painter) of *S. boydii* type 2 was found in Ebara Hospital, Tokyo.[23] She had been attacked twice with a disease like dysentery on her journey in India, but she was apparently healthy in the day of medical examination after home-coming.

The literature from Japan proper, particularly the papers of Kobari and his co-

Table 3. *S. dysenteriae* and *S. boydii* isolated in Japan

Year	*S. dysenteriae*									*S. boydii*								
	Total	No. of strains typed							UC	Total	No. of strains typed							UC
		1	2	3	4	5	6	7			1	2	3	4	5	6	7	
1951	87	17	70							0	0	0	0	0	0	0	0	0
1952	204	21	183							8	0	5	0	2	1	0	0	0
1953	210	7	179	(others 24)*						8	0	2	0	0	3	1	1	1
1954	244	27	186	(others 31)						13	4	2	0	0	0	6	0	1
1955	331	25	183	80	2	1	0	1	39	25	9	0	0	3	0	0	0	13
1956	395	30	206	83	18	0	4	2	52	50	10	4	6	10	2	6	0	12
1957	254	31	105	51	9	0	4	1	53	38	12	10	3	1	0	0	0	12
1958	263	8	65	80	4	0	6	25	75	45	2	10	2	4	3	2	8	14
1959	148	6	51	26	10	0	4	4	47	35	13	5	2	0	2	2	0	11
1960	330	25	89	106	12	0	5	6	87	29	2	1	3	2	0	0	0	21
1961	319	31	67	114	10	4	3	2	88	23	0	1	3	1	0	0	0	18
1962	187	8	30	26	6	0	3	0	114	19	2	1	0	0	1	0	0	15
1963	195	16	53	36	8	2	4	6	70	15	1	6	0	0	1	0	0	7
1964	253	17	27	150	7	0	2	0	50	19	0	4	0	6	0	1	0	8
1965	394	6	90	278	3	1	0	1	15	20	2	9	2	1	1	0	0	5
Total	3,814	275	1,584	1,030	89	8	35	48	745	347	57	60	21	30	14	18	9	138

**S. dysenterice* strains other than types 1 and 2 of it are enrolled in "unclassifiable (UC)."

workers during the war time[13)14)] and immediately after the war's end[15)] are not to be disregarded. They studied strains isolated in the Komagome Hospital, a stationary isolation hospital in Tokyo, and contributed valuable data on the distribution of *Shigella* in those days. The spectrum of *Shigella* was, in order from *S. dysenteriae* type 1, *S. flexneri* as serogroup, *S. sonnei*, and others including *S. dysenteriae* type 2 as: 0.3/85.4/10.6/3.3 (1,757 strains, 1940), 0.5/74.8/20.7/4.0 (1,564 strains, 1941), —— data lacking for 1942-1944 ——, 43.9/31.7/-/24.4 (41 strains, 1945), 46.4/16.4/2.9/34.2 (140 strains, 1946), and 11.7/40.0/25.8/22.4 (205 strains, 1947). It is noteworthy that dysentery caused by *S. dysenteriae* type 1 was widespread in 1945 and 1946 as a result of the postwar confusion and mass repatriation but diminished abruptly after that. Among *S. flexneri*, the most frequent type was 2a in all years.

Though the classification of *Shigella* in Japan of the past days had been done according to the traditional schema of Futaki or its modification established by the 53rd Subcommittee of the Japan Science Promotion Society in 1944, each type of the Japanese schema could be identified with those of the International Nomenclature Committee (1950). The names of shigellae mentioned above, used by Japanese workers at that time and employed also in some of the subsequent publications, have been translated into those established in international designations in this communication.

Other data on the members of the *S. flexneri* group encountered in Japan in the postwar period can be found also in the report of Zimmerman et al.[34)] who used material obtained from American and Japanese patients, between January 1948 through June 1950. The results of the typing of his 509 strains were: 45 type 1, 373 type 2, 63 type 3, 21 type 4, 6 type 5, and 3 of the other types. In that report, statistics based entirely on material

obtained from North Korean prisoner-of-war patients, collected January through April 1951, are tabulated for comparson, which shows that 435 out of 714 *S. flexneri* strains (61.0 per cent) were identified as type 4.

Korea and Taiwan

Studies on typing *Shigella* strains isolated in Korea were performed in detail by the 406th Medical General Laboratory, Tokyo[8] in time of the Korean conflict. Afterwards this work has been continued by the W. H. O. Center located in Dr. Doki Chun's Laboratory at the Kyung-pook University Medical College, Taegu, Korea.[4]

As mentioned in the previous report, the relatively high incidence of strains belonging to the *S. dysenteriae* and *S. boydii* groups and the invariably low incidence of *S. sonnei* have been the outstanding characteristics of the distribution of *Shigella* in Korea. The ratio of the occurrence of the various types and subtypes of *S. flexneri* isolated in Korea have been evaluated in three categories and presented in the upper part in Table 4. The first and the second lines marked "N. K." relate principally to strains isolated from North Korean prisoner-of-war ; the third, marked "U. N.", to those cultured from United Nation Forces (C. H. Chun, 1959) ; the fourth (Im and Choi, 1961) and the fifth (Ahn and Chun, 1962 ; Chun et al., 1966) marked "S. K.", to those isolated from South Korean civilians and soldiers in the Kwangjin and Taegu areas.

As mentioned already and shown in this table, *S. flexneri* type 4 (mostly considered subtype 4a) was the organism most frequently recovered from "N. K.". The comparatively high incidence of type 4 is also seen in the data of "U. N." and "S. K." during the years of the Korean conflict, though the former is characterized by an absolute majority of type 2 (considered mostly 2a) and the latter by the prevalence of type 3. In addition, it is noteworthy that the incidence of type 5 was considerably higher than in Japan in those days. Comparing the results of 1952 to 1954 and of 1961 to 1965 in the case "S. K.", a marked increase in the incidence of type 2,

Table 4. Classification of *S. flexneri* in Korea and Taiwan

Area & Year	No. of strains	Type and subtype distribution (in per cent)												Remarks
		1a	1b	2a	2b	3a	3b	4a	4b	5	6	X var.	Y var.	
Korea:														
1951	3,239	5.6	0.3	10.0	0.1	(31.7)		41.4	—	7.9	0.3	0.3	2.0	N. K.
1952, 53	3,149	(10.3)		(20.5)		(11.1)		(30.4)		26.6	0.1	0.3	0.5	
1952, 53	243	(7.4)		(51.2)		(15.6)		(19.8)		5.4	0.8	—	—	U. N.
1952—54	120	(9.2)		(19.2)		(31.7)		(21.6)		16.7	—	1.7	—	S. K.
1961—65	119	2.5	2.5	62.1	8.4	4.2	—	11.8	5.9	2.5	—	—	—	
Taiwan:														U. H. & S. V. L.
1951—63	316	16.8	0.3	34.5	—	24.1	4.1	8.6*	0.3	2.8	1.6	0.3	6.7	
1961—63	109**	(17.8)		(48.6)		(23.8)		(6.4)		3.6	—	—	—	P. C. H.

Percentages in parenthesis are not subtyped. *Including 8 strains designated as 4c, which may be considered as a variant of 4a (Hsu).[11]
**Unidentified strains excluded.

especially subtype 2a, and a decrease of types 3, 4, and 5 were noted. Thus the *Shigella* spectrum of Korea is characteristic, as demonstrated by relations within the groups as well as in the mutual relation of the four *Shigella* serogroups.

Available reports on the detailed classification of shigellae in Taiwan are those from the National Taiwan University Hospital (Yang et al., 1957); the Taiwan Serum Vaccine Laboratory (Hsu, 1964); and from the National Defense Medical Center on materials collected from the Provincial Children's Hospital, Taipei (Yu et al., 1962 ; Wang, 1965). These data on Taiwan listed in combination in the last two lines of Table 4 resemble each other, and the finding that types 2 and 3 (mostly 2a and 3a) are as frequent as about 40 and 20 per cent of the tested strains which bears some resemblance to the spectrum of *Shigella* in Japan during the corresponding period.

Within the scope of references cited in Table 4, the actual numbers and distribution percentages of the strains belonging to the four serogroups can be summed up as follews:

	Korea	Taiwan
S. dysenteriae	442 (5.9)	—
S. flexneri	6,870 (91.5)	425 (87.5)
S. boydii	60 (0.8)	—
S. sonnei	139 (1.9)	61 (12.5)
Total	7,511	486

Only the fact that 442 strains of *S. dysenteriae* and 60 strains of *S. boydii* have been isolated in Korea may be open to question here. Strains of the former group could be divided into seven serotypes as follows: 287 strains of type 2, 110 of type 1, 26 of type 4, 16 of type 6, and one each of types 3, 5 and 7. Of the seven types of *S. boydii*, only four were recovered. Type 1 (38 strains or 63 per cent) was the most frequently isolated organism. Type 4 (17 strains) ranked next. There were 3 strains of type 4, and 2 of type 2 among the remaining. The finding that types 1 and 2 of *S. dysenteriae* and type 1 of *S. boydii* were isolated at high incidence rates in Korea, coincides with the observations made in Japan. It is worthy of noting, however, that the Korean strains of *S. dysenteriae* type 1 (Shiga) and type 2 (Schmitz) showed a ratio of one to 2.6, and the Japanese one to 5.7. Furthermore, comparing the Korean and the Japanese isolations of Shiga bacilli from another point of view, one is impressed by the frequently great discrepancy beween the two sources. In Japan, 275 strains of the Shiga bacillus were found among a total of 526, 736 isolates during the years 1951 to 1965 (0.05 per cent), as compared with 110 out of 7,511 strains in Korea (1.5 per cent).

It is comprehensible that, in the same manner as Japan just after the war's end, dysentery due to Shiga bacilli became prevalent in South Korea, but one cannot overlook the fact that Chun et al.[5] found nine strains of this type among 109 shigellae isolates in the Taegu area during the period from 1963 to 1965. At the same time only one strain has been detected in Yokohama among 17,940 strains isolated in the urban districts of Japan.

In this review some references have been rejected because of insufficient taxonomic details. Two references found newly in literature of Taiwan, however, must be noted here for future attention, namely the paper of Chiang and Huang[3] concerning antibiotic-sensitivity of 18 *Shigella* strains isolated in the Kaohsiung area, and that of Yu and Chen[33] on the Wintomylon treatment of nine dysentery cases caused by *S. flexneri* types 2, 3 and 6 and by *S. sonnei*.

Continental China

The following are data on Continental China to be added to Table 4 of the previous report : 8.3/91.7/ - / - (36 strains, Hunan, 1956, Liang et al.),[18] - /20.0/ - 90.0 (45 strains, Foochow, 1956, Yeh et al.),[32] - /69.6/ - /30.4 (145 strains, Amoy, 1957, Wu et al.)[31], 3.7/47.9/-/48.2 (190 strains, Peking, 1959, the Municipal Children Hospital),[19] and 3.0/60.3/ - /36.7 (169 strains, Peking, 1959, Sino-Soviet Friendship Hospital).[20] Furthermore, a tabulation reviewing the *Shigella* spectrum broadly in 1960 and 1961 in Shanghai appeared in the report of Weng et al.[28] who compared *Shigella* type distributions in "ordinary" and "toxic" dysentery (Table 5).

Table 5. Type distribution of shigellae isolated from "ordinary" dysentery and "toxic type" dysentery
(Weng et al., 1963)

	1960 (per cent)		1961 (per cent)	
	Ordinary	Toxic type	Ordinary	Toxic type
Flexner	77.0	71.4	55.6	48.9
Sonne	20.8	28.6	38.7	48.9
Shiga	0	0	3.8	0
Schmitz	1.4	0	1.9	2.2
Boyd	0.8	0	0	0

There were nine reports available on the classification of *S. flexneri* in the references on the first report (Fang and Wang, 1957; Li et al., 1959; Hou, 1962; Wang et al., 1959; King et al., 1959; Yen and Ma, 1960; Wu et al., 1957; Hsu et al., 1958; Tyan et al., 1966).

In addition, the report of Wu et al. from Amoy, Foochow Province of the additional references is useful for evaluation. Table 6 shows the per cent of the total isolates of *S. flexneri* according to type on the basis of data presented by these authors.

Comparing the data collected in the 1950's and another group of findings by Hou[10] in Peking and Tyan et al.[25] in Hsianghsi, one receives the impression that, from 1960 onward, the distribution of the members within the *S. flexneri* group has greatly altered. During the 1950's type 2 and type 3 (mostly 2a and 3a) were the leading members within this group, but —— as stated by Hou —— since 1959 the percentages of type 1b as well

Table 6. Classification of *S. flexneri* in Continental China

Year	No. of strains	Type and subtype distribution (in per cent)												Area
		1a	1b	2a	2b	3a	3b	4a	4b	5	6	X var.	Y var.	
1954, 55	553	(13.4)		(55.9)		(14.6)		(4.7)		6.2	5.3	—	—	Peking
1954—56	417	10.8	—	61.2	—	(20.8)		1.9	—	5.3	—	—	—	
1960	173	2.3	38.2	—	—	—	—	(19.1)		0.6	1.2	1.7	37.2	
1956, 57	543	0.6	6.4	50.8	0.7	29.5	1.0*	(3.2)		4.8	2.2	0.6	0.4	Tsinan
1954—56	787	1.8	1.1	36.4	2.3**	(39.9)		6.0	2.7**	2.8	6.9	—	0.3	Kiansu
1957	50	6.0	—	60.0	—	(10.0)		(6.0)		—	18.0	—	—	Shanghai
1956, 57	36	(11.1)		(41.6)		(19.5)		(14.0)		2.8	11.1	—	—	Foochow
1957	97	1.1	—	60.8	—	21.6	—	9.3	—	1.1	4.1	—	2.1	
1957	227	0.4	—	(15.0)		(23.8)		(13.7)		—	—	—	—	
1964	35	—	68.6	8.6	5.7	—	—	—	17.1	—	—	—	—	Hsianghsi

Unidentified strains are excluded. *Including 2 strains of 3c.
**Including 10 strains identified simply as type 2, and 2 strains as type 4.

as Y variant abruptly increased to nearly 40 each, whereas before that time they used to be rare in Peking. The predominance of type 1b is also shown in the data of Tyan et al., [24] though the total number of isolates is small.

The report of Chang et al. [2] on shigellae isolated from monkeys used for laboratory studies during three years, from 1960 to 1962, may also be related to this problem, because 371 group Flexner strains have been classified as 67 strains of type 1b, 33 of 2b, 29 of 3, 52 of X variant, and 190 of Y variant.

In the study in Continental China, among the members of *S. dysenteriae* only type 1 (Shiga) and type 2 (Schmitz) appear to be regarded in the serological differentiation within this group. The total number of Shiga and Schmitz bacilli were 53 and 139, respectively, in the total of 12 references available, and additional data in per cent distribution can be found in the Table 5 cited from the paper of Weng et al. It is noteworthy that, still around 1960, Shiga bacilli could be isolated in approximately one per cent in some large cities of Continental China. The report of Tyan et al. which deals with few strains isolated in the mountainous back country of China should not be put in the same category with those concerning urban districts, but it was mentioned by the authors themselves as worthy of consideration and suggestive that eight out of 46 *Shigella* strains isolated in 1964 were Shiga bacilli. Strains belonging to *S. dysenteriae* have been isolated in 9.4 per cent from monkeys (Chang et al.), but all strains were identified as the Schmitz type.

As for the type distribution of *S.boydii*, the report of Wu and Liu (1965)[30] surves as a feasible reference, who isolated a strain of type 5 of this serogroup from a dysentery case. Wu and Liu reviewed ten reports of isolation of this group of *Shigella* organisms before that time. Except for 115 strains not yet typed, 33 strains were typable, namely, 18 as type 4, five each type 1 and type 2, three type 5, and one each type 8 and 9.

The fact that type 4 ranks top and type 1 is sparse is not accordance with the ecological status in Korea and Japan.

Manchuria and the Farthest South-East Region of Siberia

The *Shigella* distribution in the North East Territory of China (Manchuria) in recent years is obscure. Only one reference showing the spectrum 1.3/98.7/…/ - (Changchun, 1951, Wang and Yen) has been cited in the report of Wang and Liu [27], in which the total percentage 1.3 of *S. dysenteriae* isolates was said to consist of 1.0 per cent of Shiga bacilli and 0.3 per cent of Schmitz bacilli. The report of Fujimoto (1943)[9] from Talien Hospital at that time is considered to be helpful, though it is now out of date. He isolated 282 strains of *Shigella* from 589 dysentery patients and was able to classify 258 strains of them as follows (in per cent) : Shiga 31.6, *S. flexneri* type 2a 24.8, type 5 19.5, type 3 7.8, Y variant 6.0, and la 1.8.

The prevalence of Shiga bacilli in mainland China in the wartime is also pointed out by Wada (1941)[26] from Peking (82 out of 255 strains or 32.2 per cent) and by Shimada (1943)[22] from Kuangchou (19 out of 170 strains or 11.2 per cent), contrasting with the finding of Endo (1942)[7] from Taiwan who typed 71 strains but could not find the Shiga type at all. The most prevalent member within the *S. flexneri* group was type 2a throughout the reports of Japanese investiga-

tors on the Continent at that time, though the Y variant was top ranking in the results obtained by Endo in Taiwan.

There is a fair number of data on the southern part of Siberia in the latest information revealed by Krasheninnikov (the second report, 1968),[17] showing the following *Shigella* spectrum : - /93.3/ - / - /by others 6.7 (Khabarovsk, 1951, Voronova et al., 1957),[25] - /77.0/ - / 23.0 (Vladivostok, Kireeva et al., 1958),[12] and 0.7/96.8/ - /1.6/by others 0.9 (South Sakhalin, 1955, Safonov and Zhilin, 1962).[21] These data are not to be disregarded as related too closely to narrow geographical ranges. Inclusive of other data on Chita and the Transbaikal districts, it is worthy of noting that Shiga bacilli have not been isolated at all in Siberia during a period from 1951 to 1965. All strains belonging to the serogroup *S. dysenteriae* shown above in the spectrum on Sakhalin (0.7 per cent) were Schmitz bacilli. *S. sonnei* still shows a low rate in the above quoted surveys, excepting in Vladivostok. But it is illustrated in chart of Krasheninnkov (the second report) that *S. sonnei* was isolated in an overwhelming majority in 1962 in the Khabarovsk area and in 1964 and 1965 in and around Vladivostok. Within the scope of literature available to the author at present, data on type and subtype relations within the Flexner group remains unaccessible.

The Author's View

It goes without saying that changes in clinic and epidemiology of dysentery have been accompanied by changes in the etiologic agent designated in this review as the *Shigella* spectrum. This way of thinking is well applicable to study of the modulations of dysentery during the past 15 years in Japan. As stated in the previous peport, it is regarded irrational to compare the spectrum of a country with that of another country where differences in the selection of objects have to be examined. But, exceptions may be made when *Shigella* spectra that differ essentially from each other or for example when a country or a territory is characterized by a serotype especially by one of rare occurrence. Accordingly, the pirotal point of all comments should be sought first in the year by year changes of the spectrum in every country, and referring also to data in the first available reports.

In Japan, shortly after the war's end, *S. dysenteriae* type 1 and *S. flexneri* subtype 2a were the main etiologic agents of dysentery. Though the former decreased abruptly within some years and is scarcely seen by now, the predominance of the latter continued until 1963. The organism ranking second within the Flexner group in the years till 1957 was 2b, but 3a took that position since 1958 and remained on the top since 1964, just then *S. sonnei* began to dominate over *S. flexneri* as a group. There were some differences in the annual ratios when the situation was evaluated in view of the entire country or from the urban districts alone.

In Korea and as in Taiwan, *S. flexneri* 2a of all Flexner members was the organism occurring most frequently in recent years. Only the status of Korea in 1952 - 1954 had been characterized by comparatively high rates of *S. flexneri* 4a and 5. *S. sonnei* had a tendency of increasing slightly (under 10 per cent, 1961 -1965) and more sharply (more than 20 per cent, 1961 - 1963) in Taiwan. *S. dysenteriae* 1 still

occurs at a fairly high rate (8.3 per cent, Chun et al.[5]; 1.5 per cent, based on all data) in Korea, but not in Taiwan since 1951.

As data on Continental China available for this review center around the 1950's, chronological changes in the *Shigella* distribution and the present state are not quite well known, but it appears that some changes have been effected around 1960. It is remarkable that *S. sonnei* had been isolated at a high rate (40 - 50 per cent) and *S. dysenteriae* 1 in one pert cent or so in those day.

In Continental China, *S. boydii* type 4 holds a majority among the typable strains of this serogroup. On the other hand, type 1 which is superior in Japan and ranking first in Korea, is sparse. Strains belonging to this serogroup have not detected in Taiwan at all. These findings concerning *S. boydii* types, as well as those of *S. dysenteriae* 1, may be regarded as distinctive feature of the *Shigella* spectra in every country.

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日本とその周辺諸国における赤痢菌スペクトラムの展望補遺

青木義勇

長崎大学医学部細菌学教室

摘要

日本，韓国，台湾，中国大陸，北辺について赤痢菌各群内の型や亜型の分布を詳細に観察した．資料は前報（本誌第10巻第2号）のものと大体同じであるが，詳細な分類が行なわれていないものは除外し，その後に知ったものを採用し，終戦前後日本人によってなされた研究を記録に残す意味で加え，さらに最近知ることができたソ聯沿海州や南樺太の資料も引用した．終戦直後日本では志賀菌とフレキシナー2aが最も多かったが，前者は間もなく急激に減少し，現在はほとんど検出できない．後者2aは1963年まで終始首位を保っていたが1964年，あたかも前報で述べたソンネ菌がフレキシナー群を圧倒したその年に3aに首位を譲った．二位は1957年まで2bであったが，その後は上記の3aが躍進した．現在韓国と台湾では2aが首位にある．中国大陸でも1950年代は2aが首位にあったが，1960年前後にかなり形勢の変化があったようである．志賀菌は韓国と中国大陸にまだ存在する．中国大陸ではボイド群4型が型別可能菌中絶対優勢を占め．一方日本では優位に，韓国では首位にある1型が極めて少い．