

## A Report on the Shigella Cultures Isolated in Korea(1971)\*

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—圖文抄錄—

### 1971年 韓國에서 分離된 痢疾菌에 關한 報告

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韓國에서 痢疾에 關한 醫學的인 報告가 이루어 진 지는 歷史的으로 오래 前부터의 일이다. 그리고 近年에 와서 그 報告件數도 해마다 늘어가는 傾向이 있다. 그러나 아직도 先進國과는 달리 全國的인 規模에서 實驗室 組織網의 整備狀況이 未洽한 탓으로 個別的인 患者의 診斷이 臨床的인 印象만으로 이루어진 것이 大部分이며 原因細菌의 檢出으로서 確診된 것은 極小數에 不遇하다.

著者들은 1967년에 서울 近郊에서 痢疾 或은 그와 類似한 症狀을 示한 患者로부터 分離되었던 痢疾菌의 疑心이 濃厚한 菌株 66株에 對하여 形態學的, 生化學的 및 血清學的 同定操作을 施行한 結果 其中 41株가 典型的인 痢疾菌임을 찾아내고, 그 菌株들이 A群 1株, B群 36株 및 D群 4株의 分布로 되어 있었음을 報告한 바 있다.

今番 다시 1971年 2月부터 9月까지 期間 그 範圍를 넓혀서 서울地方, 京畿道, 江原道, 全羅南道, 慶尙北道 및 慶尙南道 地域에서 痢疾 或은 그와 類似한 患者로부터 얻어진 63株의 菌株을 試驗한 結果 其中 45株가 國際 Shigella Commission의 定義에 따라 典型的인 痢疾菌임을 밝혔으며 第 1表에서 보는바와 같이 그 分布는 B群 36株, C群 7株 및 D群 2株였었고 A群은 없었다. 또한 B群 36株中에서는 B<sub>2a</sub>가 27株로서 제일 많았고 B<sub>3c</sub>, B<sub>4a</sub> 및 B<sub>7</sub>가 各其 3株씩 있었다. C群中에서는 C<sub>11</sub>이 1株있었을 뿐 나머지 6株는 C<sub>15</sub>型이었다. D群 2株는 모두 phase I 狀態이었다. 地域的인 分布로서는 B<sub>2a</sub>가 各 地域에서 골고루 分離된데 反하여 B<sub>3c</sub>나 C群은 서울地方에서 分離되었다. 勿論 이 分布狀況은 이번 報告에서 다루어진 적은 數의 菌株만으로 斷定할 수는 없었다.

各 血清型別로 生化學的 性狀을 檢討한 結果는 第2表 및 第3表에서 보는바와 같았으며 1967年度에 著者等 이 報告하였던 것과 또한 1971년에 Ewing 등이 美國에서 報告하였던 性狀과 一部 比較도 하였다.

韓國에서 臨床的으로 널리 使用되고 있던 Chloramphenicol, Neomycin, Erythromycin, Colistin, Kanamycin, Tetracycline, Streptomycin 및 Ampicillin 등 8種의 抗生劑에 對하여 Ericsson 氏 disc 方法으로 痢疾菌의 感受性 與否를 試驗한 結果는 第4表 및 第5表에 나타난 바와 같이 大部分의 菌株가 Neomycin, Erythromycin, Colistin, Kanamycin, Tetracycline 및 Streptomycin 等에 對하여 高度의 耐性을 示示하였 고 Chloramphenicol 에 對하여서도 52.8%가 耐性菌株로서 나타났다. Ampicillin 에 對하여서는 85.8%가 感受性菌株로서 나타났다. 多劑耐性面에서 觀察할때 14種의 서로 다른 樣相을 볼수 있었으며 試驗에 使用되었 던 8劑 全部에 對한 耐性菌이 6株, Ampicillin 을 除外한 7劑 耐性菌이 13株, 6劑 耐性菌이 7株, 5劑 耐性菌 이 7株, 4劑 耐性菌이 8株, 3劑 耐性菌이 3株 및 2劑 耐性菌이 1株 있었으며 單劑 耐性菌은 1株도 없었다.

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## INTRODUCTION

In recent years, the increase in the incidence of Shigellosis has been noticed in Korea by the medical professionals.<sup>1, 2)</sup> Since the function of the nation-wide health laboratory service has not yet been fully organized, the majority of the reported cases has been diagnosed mainly by observing the clinical manifestations, although a number of the statistical analyses of the incidence has been recorded in the publication by the Ministry of Health and Social Affairs.

The authors already published the results of the confirmatory tests carried out in 1967 on 66 cultures isolated from the cases showing Shigellosis or the like symptoms in Seoul area and 41 cultures among them were identified as the typical *Shigella*<sup>3)</sup>, according to the definition by *Shigella* Commission of the International Enterobacteriaceae Subcommittee published in the International Enterobacteriaceae Subcommittee Report, 1954<sup>4)</sup>, consisting of one *Shigella dysenteriae*, 36 *Shigella flexneri* and 4 *Shigella sonnei* cultures.

The authors again attempted to perform the confirmatory tests on 63 cultures isolated in 1971 from the cases showing Shigellosis or the like symptoms in various parts of the country and identified 45 typical *Shigella* cultures. The biochemical and serological properties of them were analyzed and drug sensitivity tests to several antibiotics being frequently in wide use in the country were carried out by means of Ericsson's disc method<sup>5, 6)</sup> and the multiresistant patterns were discussed in this report.

## MATERIALS AND METHODS

The stool specimens were collected from the cases apparently showing Shigellosis or the like symptoms in Seoul, Chunra-namdo,

Kyongsang-bukdo, Kyongsang-namdo, Kangwon-do, and Kyongi-do during the period from February to September, 1971 and the conventional culture method on SS agar and/or MacConkey agar media were adopted.<sup>4)</sup> The selected colonies which did not ferment lactose in earlier stage were picked up and were inoculated into KIA media after being confirmed as Gram negative rods.

Indol test, Methyl Red test, Voges-Proscauer test and Citrate utilization test were performed by means of conventional screening procedures recommended by Edwards and Ewing.<sup>4)</sup>

Motility test by using the semisolid media, gelatin liquefaction test, KCN test and the fermentation tests of lactose, sucrose, mannitol, dulcitol, salicin, adonitol, inositol, sorbitol, arabinose, raffinose and rhamnose were carried out by using Bacto-phenol-red broth, and Jordan's tartrate test and mucate test were done, too.<sup>7)</sup>

The routine procedures were carried out to determine the agglutinability on slides with the diagnostic antisera prepared in the National Institute of Health and forty-five cultures were identified as *Shigella* among the sixty-three suspectable cultures isolated. The determination of the specific serotypes was performed with both ordinary suspensions and boiled suspensions of the cultures by using the type specific and group factors prepared by Broughs Wellcome Laboratories.

The sensitivity tests to chloramphenicol, neomycin, erythromycin, colistin, kanamycin, tetracycline, streptomycin and ampicillin were carried out by means of Ericsson's disc method<sup>5, 6)</sup> using the discs prepared in the National Institute of Health.

## RESULTS

1. Among the sixty-three suspectable cultures, forty-five cultures were identified as

**Table 1.** Number of *Shigella* cultures isolated in 1971 by the geographical distribution

Areas	Number of <i>Shigella</i> cultures	Serotypes						
		B <sub>2a</sub>	B <sub>3c</sub>	B <sub>4a</sub>	B <sub>y</sub>	C <sub>11</sub>	D <sub>15</sub>	D <sub>2</sub>
Seoul area	27	16	3		1	1	6	
Kyongsang-namdo	3	2			1			
Kyongsang-bukdo	3	3						
Kangwon-do	4	4						
Chunra-namdo	7	1		3	1			2
Kyongi-do	1	1						
Subtotal	45	27	3	3	3	1	6	2
Total	45	36			7			2

**Table 2.** The variations in the results of some biochemical properties of *Shigella* cultures comparing with them isolated in 1967

Tests	Subgroups Years Results	A		B		C		D				
		1967	1967	1971	1971	1967	1967	1971	1971			
		Sign	+	-	+	-	+	-	+	-	+	-
		Indol	+	9	27	31	5	7	0	0	4	0
Gas from glucose	-	2	34	0	36	0	7	0	4	0	2	
Lysine decarboxylase	ND <sup>+</sup>	ND	ND	0	36	0	7	ND	ND	0	2	
Lactose	-	0	36	0	36	1	6	4	0	0	2	
Sucrose	-	5	31	1	35	0	7	1	3	0	2	
Mannitol	-	34	2	30	6	7	0	4	0	2	0	
Dulcitol	-	0	36	0	36	4	3	0	4	0	2	
Sorbitol	-	8	28	0	36	7	0	1	3	0	2	
Raffinose	-	33	3	0	36	0	7	3	1	0	2	
Rhamnose	-	1	35	3	33	7	0	4	0	2	0	
Jordan's tartrate	ND	ND	ND	0	36	0	7	ND	ND	2	0	
Mucate	ND	ND	ND	0	36	0	7	ND	ND	0	2	
No. of cultures tested		1	36	36	7	4	2					

<sup>+</sup>ND: not tested

typical *Shigella*, and 36 cultures of them belonged to the Subgroup B, 7 cultures to the Subgroup C and 2 cultures to the Subgroup D. None of Subgroup A was detected this time, which was different in the distribution of subgroups from the result obtained in 1967. <sup>3)</sup>

2. Of 36 cultures belonging to *Shigella flexneri*, 27 cultures were B<sub>2a</sub>, and three cultures belonged to each B<sub>3c</sub>, B<sub>4a</sub> and B<sub>y</sub>, respectively. Of Seven cultures of *Shigella*

*boydii*, one belonged to C<sub>11</sub> and six to C<sub>15</sub>. Two cultures of *Shigella sonnei* appeared to be phase I.

3. According to the geographical distribution, B<sub>2a</sub> cultures were found in all the area where the specimens were collected, and B<sub>3c</sub> and *S. boydii* cultures were recovered only from Seoul area, although this result could not be interpreted as it was obtained from the readily planned epidemiological survey.

4. There was quite a difference between

**Table 3.** The variations in the results of some biochemical properties of *Shigella* cultures comparing with them studied by Ewing

Tests	Subgroups		A		B <sub>2</sub>		B <sub>3</sub>		B <sub>4</sub>		B <sub>7</sub>	C <sub>11</sub>		C <sub>15</sub>		D <sub>1</sub> or D <sub>2</sub>		
	Comparison	1967	Ewing	'71	Ewing	'71	Ewing	'71	Ewing	'71	'71	'71	Ewing	'71	Ewing	'67	'71	Ewing
Indol	+	+	+	23/4	44.3	2/1	88.1	3/0	98.4	3/0	1/0	+	6/0	+	-	0/2	-	
M. R.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Glucose(acid)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Voges-Proscauer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Simmons' Citrate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
H <sub>2</sub> S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Urease	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
K. C. N.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gelatin(22°C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gas from glucose	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Lactose	-	-	-	0/27	-	0/3	-	0/3	-	0/3	0/1	-	1/5	-	+	0/2	1.8 (88.1)	
Sucrose	-	+	+	0/27	0.6 (19)	1/2	3 (66.4)	0/3	-	0/3	0/1	-	0/6	-	25	0/2	0.1 (85.4)	
Mannitol	-	-	-	27/0	99.2	3/0	97.6	0/3	-	0/3	1/0	+	6/0	91	+	2/0	98.9	
Dulcitol	-	+	+	0/27	-	0/3	-	0/3	-	0/3	0/1	-	4/2	-	-	0/2	- (1)	
Salicin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Adonitol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Inositol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sorbitol	-	d	d	0/27	0.7 (0.4)	0/3	84.4 (3.2)	0/3	40.8 (24.3)	0/3	1/0	31.6 (26.3)	6.0	91 (9)	25	0/2	1 (1)	
Arabinose	+	d	+	+	+	+	31.4 (2.9)	+	86.7 (9.3)	+	+	92.1 (2.6)	+	9 (81)	+	+	94.2 (2.9)	
Raffinose	-	-	-	-	21.1 (56)	-	79 (8.6)	-	-	-	-	-	-	-	75	-	2.5 (81.5)	
Rhamnose	-	d	d	0/27	-	0/3	4.9	3/0	49.3 (9.3)	0/3	1/0	-	6/0	-	+	2/0	77.1 (21)	
Motility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Lysine decarboxylase	ND*	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	
Jordan's tartrate	ND	+	-	-	-	-	-	-	-	-	-	-	-	+	ND	2/0	+	
Mucate	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	16.4	

Numbers for Ewing columns: percentage positive

+/-: No. of positive/No. of negative

( ): delayed reactions (3 or more days) in Ewing's report

\*ND: not tested

the *Shigella* cultures collected in 1971 and 1967<sup>3)</sup> in the results of some biochemical properties tested as shown in Table 2. And also the variations in the results of some biochemical properties were compared with them studied by Ewing and his colleagues<sup>8)</sup> according to the different serotypes as shown in Table 3.

5. The results obtained from the antibiotics-

sensitivity tests of 45 *Shigella* cultures were summarized in Table 4. In the test with chloramphenicol, 17.6% were sensitive, 28.6% were moderate sensitive, 26.4% were moderate resistant and 26.4% were shown as resistant. With neomycin, only two cultures were sensitive, 17.6% were moderate sensitive, 19.8% were moderate resistant and 57.2% were resistant. 74.8% of cultures were moderate

**Table 4.** The antibiotics-sensitivity patterns of 45 *Shigella* cultures isolated by means of Ericsson's disc method

Antibiotics tested	Result	S	M. S.	M. R.	R
Chloramphenicol	Numbers %	8 17.6	13 28.6	12 26.4	12 26.4
Neomycin	Numbers %	2 4.4	8 17.6	9 19.8	26 57.2
Erythromycin	Numbers %	0	9 19.8	34 74.8	2 4.4
Collistin	Numbers %	7* 15.6	*	*	*
Kanamycin	Numbers %	0 0	0 0	0 0	45 100
Tetracycline	Numbers %	1 2.2	3 6.7	5 11.1	36 80
Streptomycin	Numbers %	8 17.6	0 0	1 2.2	36 79.2
Ampicillin	Numbers %	36 79.2	3 6.6	0 0	6 13.2

S: Sensitive

M. S. : Moderate sensitive

M. R. : Moderate resistant

R: Resistant

\*: The remaining 38 cultures showed either no inhibition zone or the inhibition zone of less than 17mm.

resistant to erythromycin and all 45 cultures were resistant to kanamycin. About 80% of cultures were resistant to both tetracycline and streptomycin, too. Fortunately there was a drug called ampicillin which had been in clinical use only for a few recent years, to which 79.2% of cultures showed very sensitive and 6.6% moderate sensitive.

6. The sensitivity patterns of 45 *Shigella* cultures were plotted out in Table 5 according to the multi-resistant patterns, specific serotypes and the area where they were originally isolated. In Table 5, the sensitive and the moderate sensitive cultures were expressed as S together with, and the resistant and the moderate resistant cultures were included in R. With the results of antibiotics-sensitivity tests, fourteen different patterns were observed in regard to the multiple resistance of the forty-five *Shigella* cultures. Six cultures showed resistant to all the eight kinds of

antibiotics tested, five of which were isolated in Seoul area and thirteen cultures showed resistant to the seven kinds of them except ampicillin, nine of which were isolated in Seoul area, too.

## SUMMARY

The authors identified 45 *Shigella* cultures among 63 suspectable cultures obtained from the cases showing dysentery or the like symptoms in various parts of the country during the period from February to September, 1971. Of 45 cultures, 36 cultures belonged to Subgroup B, 7 cultures to Subgroup C and 2 cultures to Subgroup D. There was none of cultures belonging to Subgroup A in 1971, although the authors detected one culture of that among 41 identified *Shigella* in 1967. Of 36 cultures belonging to Subgroup B, 27 cultures were B<sub>2s</sub>, and 3 cultures of each B<sub>3c</sub>, B<sub>4s</sub> and B<sub>v</sub> were serotyped, respectively. Of

**Table 5.** The sensitivity patterns of *Shigella* cultures to antibiotics tested by the serotypes and the geographic distribution

Different patterns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Subtotal
Chloramphenicol	S	S	R	R	S	R	S	S	R	S	S	S	R	S	
Neomycin	R	R	R	R	R	R	R	R	S	R	S	S	S	R	
Erythromycin	R	R	R	R	R	R	R	S	S	R	S	R	R	S	
Collistin	S	S	*	*	*	*	S	*	*	*	*	*	*	S	
Kanamycin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Tetracycline	R	R	R	R	R	R	S	R	R	R	R	R	R	S	
Streptomycin	S	R	R	S	S	R	S	R	R	R	R	R	R	S	
Ampicillin	S	S	R	S	S	S	S	S	S	S	S	S	S	S	
B <sub>2a</sub>						9	3	2	2	4	2	2	2	1	27
B <sub>3c</sub>						2		1							3
B <sub>4a</sub>	2		1												3
B <sub>7</sub>		1									1	1			3
C <sub>11</sub>				1											1
C <sub>15</sub>				4		2									6
D					1	1									2
Subtotal	2	1	6	1	1	13	3	3	2	4	3	3	2	1	45
Seoul area			5			9	1	2	1	2	2	2	2	1	27
Chunra-namdo	2	1	1	1	1		1								7
Kyongl-do							1								1
Kangwon-do						2		1	1						4
Kyongsang-bukdo						2						1			3
Kyongsang-namdo										2	1				3
Subtotal	2	1	6	1	1	13	3	3	2	4	3	3	2	1	45

S: Sensitive and moderate sensitive patterns are included.

R: Resistant and moderate resistant patterns are included.

\*: The diameter of inhibiting zone was less than 17mm.

7 cultures belonging to Subgroup C, one was C<sub>11</sub> and other six cultures were C<sub>15</sub> and all *S. boydii* were isolated in Seoul area. It might be possible to suggest that there was a tendency of decreasing prevalence of *S. dysenteriae* and of increasing prevalence of *S. boydii* in Korea, although the number of cultures tested were very much limited to conclude, if it was compared with the results obtained by the authors in 1967<sup>2)</sup> that the forty-one identified *Shigella* were composed of one culture of *S. dysenteriae*, 36 cultures of *S. flexneri*, 4 cultures of *S. sonnei* and none of *S. boydii*. According to the results obtained from the biochemical tests, the positive ratio of Indol

tests in Subgroup B was 31/36, which could be higher than 9/36 observed in 1967, but which was nearly correlated with the result published by Ewing and his colleagues in U.S.A. The positive rates of both sorbitol and raffinose were lower than that observed by Ewing and his colleagues<sup>2)</sup> in *S. flexneri*. Regarding with the sensitivity of *Shigella* cultures to the antibiotics being widely used in the country, 46.2% were sensitive to chloramphenicol, which was very much higher than that observed by Park<sup>2)</sup>, and 85.8% were sensitive to ampicillin, which would be the drug of choice according to the results from the In Vitro tests.

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