

A Report on the Salmonella Cultures Isolated in Korea(1973)*

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=國文抄錄=

1973年 韓國에서 分離된 살모넬라菌에 關한 報告

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著者들은 1937년부터 繼續的으로 韓國에서 分離檢出되는 살모넬라菌屬에 對한 微生物學的의 性狀을 檢討하고 血清型的 分類 結果를 觀察報告하고 있다^{1,2,3,4}.

1973年度에는 全國 11個市道衛生試驗所와 各級 綜合病院에서 1,644株의 類似腸內病原性細菌을 蒐集하여 通常的인 微生物學的의 試驗方法과 抗原分析을 遂行한 結果^{5,6} 426株의 典型的인 살모넬라菌屬을 同定하였다. 其中 11株가 S. paratyphi A 였으며 B 群에 屬하였던 63株中 44株는 S. paratyphi B 였으며 19株는 S. typhimurium 이었다. C 群 2株中 1株는 S. newport 이었고 또 1株는 S. potsdam 이었던 바 S. paratyphi C 는 1株도 없었다. D 群 350株中 S. enteritidis 16株를 除外한 나머지는 모두 S. typhi 로서 亦是 우리나라에서는 아직도 腸티프스菌이 多數를 차지하였다. 이들 살모넬라菌屬이 나타낸 生化學的의 性狀은 成書에 整理된 바와 다름 없었으며 다른 나라에서 檢討된 內容과도 符合되었다^{5,6}. disc 方法으로 各種 抗菌劑에 對한 感受性試驗成績에서 얻어진 結果로는 8株가 chloramphenicol 에 對한 耐性을 보였고, 1株가 gentamycin 에 對하여 耐性을 나타냈으며 34株가 ampicillin 에 對하여 耐性을 나타내기는 하였으나 아직도 우리나라에서는 이들 세가지 抗生劑가 다른나라에서와 마찬가지로 治療用으로 勸獎될 수 있을 것으로 觀察되었다⁷.

INTRODUCTION

A tremendous number of reports concerned with members of the Genus Salmonella have appeared since the isolation, made by Smith in 1855, of the bacterium presently recognized as the type species of Salmonella cholerae-suis. The Genus Salmonella contains a wide variety of species pathogenic for man or animals and

usually for both, and there have been a number of Salmonella organisms detected in Korea as well as in other countries¹⁻⁷

The authors identified 426 Salmonella cultures among 1644 specimens collected from various parts of the country in 1973 and the results of the tests for biochemical and serological properties and for the sensitivity patterns performed with those cultures were summarized in this report.

MATERIALS AND METHOD

As a result of the routine function of the

* The content of this report was presented at 33rd academic meeting of the Korean Society for Microbiology held on April 27, 1974.

National Salmonella Centre, 1644 suspectable cultures of enteric pathogens were collected in 1973 from the eleven hygiene laboratories of cities and provincial level and some hospital laboratories, which were primarily screened by them through the conventional enrichment and differential procedures recommended by Edwards and Ewing⁹.

Indole test, methyl red test, Voges-Proscauer test and Simmons' citrate utilization test were performed and the production of hydrogen sulfide was observed in Kligler's iron agar media. Urease test, KCN test and motility test were carried out prior to the performance of decarboxylation tests with lysine, arginine and ornithine, and of deamination test with phenylalanine. Malonate test was done and for the fermentation tests of carbohydrates glucose, lactose, sucrose, mannitol, dulcitol, salicin, adonitol, inositol, sorbitol, arabinose, raffinose and rhamnose were used.

For the determination of antigenic structures the group-specific diagnostic antisera prepared in the National Institute of Health, Korea, were used and the flagellar antigens were confirmed by comparing the results with the type-specific antisera prepared by both Wellcome Research

Laboratories and Difco laboratory. The nomenclatural system for the Genus *Salmonella* employed was that suggested by Ewing, which was based upon the three species concept proposed by Kauffmann and Edwards that the species *Salmonella enteritidis* included all other serotypes than *Salmonella cholerae-suis* and *Salmonella typhi*⁹.

The sensitivity of *Salmonella* cultures identified to chloramphenicol, gentamycin, tetracycline, streptomycin, ampicillin and kanamycin was tested by means of single disc methods recommended by Bauer et al.¹⁰, using the discs prepared in the National Institute of Health, Korea.

RESULT

1. Four hundred twenty-six cultures of *Salmonella* were identified from 1644 suspectable cultures of enteric pathogens collected from various parts of the country in 1973, among which eleven cultures belonged to the A group, sixty-three cultures to the B group, two cultures to the C group and three hundred fifty cultures to the group D and the geographical distribution was that tabulated in Table 1.

Table 1. *Salmonella* serotypes isolated from different provinces

Type	S. para-typhi A	S. para-typhi B	S. typhi-murium	S. potsdam	S. newport	S. typhi	S. enteritidis	Total
Seoul	3	2	5	1	1	211	4	227
Busan								
Kyongi-Do						20		20
Kangwon-Do			10			7	10	27
Chungbuk-Do			1			15		16
Chungnam-Do						8	1	9
Jeonbug-Do	8	42				42	1	93
Jeonnam-Do			3			31		34
Kyongbuk-Do								
Kyongnam-Do								
Cheju-Do								
Total	11	44	19	1	1	334	16	426

Table 2. Number of cultures and antigenic formulas of *Salmonella* confirmed

Type	Somatic (O) antigen	Flagella (H) antigen		Group	Number of cultures
		phase 1	phase 2		
<i>S. paratyphi</i> A	1, 2, 12	a	—	A	11
<i>S. paratyphi</i> B	1, 4, 5, 12	b	1, 2	B	44
<i>S. typhimurium</i>	1, 4, 5, 12	i	1, 2	B	19
<i>S. potsdam</i>	6, 7	l,v	e,n,z ₁₅	C	1
<i>S. newport</i>	6, 8	e,h	1, 2	C	1
<i>S. typhi</i>	9, 12(Vi)	d	—	D	334
<i>S. enteritidis</i>	1, 9, 12	g,m	—	D	16
Total					426

2. The eleven cultures belonging to the A group were all *Salmonella paratyphi* A. The forty-four cultures out of sixty-three cultures belonging to the B group were *Salmonella paratyphi* B and the rest were *Salmonella typhimurium*. There were two cultures of *Salmonella* belonging to the C group, one of which was *Salmonella potsdam* and another was *Salmonella newport* and both serotypes were very rarely isolated in the country before. Three hundred thirty-four cultures out of three hundred fifty *Salmonella* belonging to the D group were *S. typhi* and the rest were *Salmonella enteritidis* as summarized in Table 2.

3. The physical and biochemical tests on the *Salmonella* cultures identified demonstrated the typical results comparing with the characteristics obtained in other countries as summarized in Table 3.

4. In regards to the sensitivity patterns of *Salmonella* cultures tested, six cultures out of three hundred thirty-four *S. typhi* appeared to be resistant to chloramphenicol and twenty-eight cultures to ampicillin, but all the *S. typhi* cultures were found to be sensitive to gentamycin.

The two cultures of *S. typhimurium* among the *Salmonella* cultures other than *S. typhi* were

Table 4. The results of sensitivity test to antibiotics of *Salmonella* cultures tested during 1971—1973

Antibiotics	Years											
	1971				1972				1973			
	S. typhi		Salmonella other than S. typhi		S. typhi		Salmonella other than S. typhi		S. typhi		Salmonella other than S. typhi	
No. of cultures*	%	No. of cultures*	%	No. of cultures*	%	No. of cultures*	%	No. of cultures*	%	No. of cultures*	%	
Chloramphenicol	3	1.84	0	0	5	0.65	2	3.13	6	1.79	2	2.17
Erythromycin	163	100.00	13	100.00	769	100.00	64	100.00	ND**		ND**	
Colistin	134	82.21	13	100.00	191	24.84	42	65.62	ND**		ND**	
Gentamycin	ND**		ND**		86	11.19	18	28.13	0	0	1	1.2
Tetracycline	133	81.59	13	100.00	749	97.41	64	100.00	176	52.69	80	81.8
Streptomycin	151	92.84	12	91.54	289	37.58	36	56.52	167	50.02	64	69.5
Ampicillin	9	5.52	5	38.46	3	0.39	2	3.13	28	8.41	6	9.8
Kanamycin	ND**		ND**		ND**		ND**		239	71.58	90	97.8
Total No. of cultures tested	163		13		769		64		334		92	

* Number of cultures: Number of cultures showing resistance to the antibiotics tested.

** ND: Not tested.

Table 3. Biochemical properties of Salmonella serotypes

Test or Substrate	Salmonella enteritidis												S. typhi	
	S. paratyphi A		S. paratyphi B		S. typhimurium		S. potsdam		S. newport		S. enteritidis			
	sign	%(+)	sign	%(+)	sign	%(+)	sign	No.	sign	No.	sign	%(+)		
Indol	-	0	-	0	-	0	-	1	-	1	-	0	-	0
M.R.	+	100	+	100	+	100	+	1	+	1	+	100	+	100
V.P.	-	0	-	0	-	0	-	1	-	1	-	0	-	0
S.C.	-	18.2	+	93.2	+	100	+	1	+	1	+	100	+	100
H ₂ S (KIA)	+	81.2	+	100	+	100	+	1	+	1	+	100	+	100
Urea	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Motility	+	90.9	+	100	+	100	+	1	+	1	+	100	+	100
KCN	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Lysine decarboxylase	-	0	+	100	+	100	+	1	+	1	+	100	+	100
Arginine dihydrolase	+	90.9	+	81.8	+	89.5	+	1	+	1	+	93.7	+	88.9
Ornithine decarboxylase	+	100	+	100	+	100	+	1	+	1	+	100	+	100
Phenylalanine	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Malonate	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Glucose (gas)	+	100	-	19.2	+	94.7	+	1	+	1	+	100	+	100
Glucose (acid)	+	100	+	100	+	100	+	1	+	1	+	100	+	100
Lactose	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Sucrose	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Mannitol	+	100	+	100	+	100	+	1	+	1	+	100	+	100
Dulcitol	+	90.9	+	100	+	100	+	1	+	1	+	100	+	100
Salicin	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Adonitol	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Inositol	-	0	+	95.4	+	94.7	+	1	+	1	+	6.3	+	98.0
Sorbitol	+	100	+	100	+	100	+	1	+	1	+	93.7	+	100
Arabinose	+	100	+	100	+	73.7	+	1	+	1	+	93.7	+	100
Raffinose	-	0	-	0	-	0	-	1	-	1	-	0	-	0
Rhamnose	+	100	+	100	+	100	+	1	+	1	+	100	+	100
Total No. of cultures tested		11		44		19		1		1		16		334

appeared to be resistant to chloramphenicol and one of which also showed resistance to gentamycin. The six cultures of *Salmonella* cultures other than *S. typhi* demonstrated resistant results to ampicillin, two of which were *S. paratyphi B* and the others were *S. typhimurium*.

The antibiotics-sensitivity patterns of *Salmonella* cultures isolated in previous two years were also analyzed and compared with that obtained in 1973 and it was found that the drugs of choice for treating *Salmonella* infections could still be chloramphenicol, ampicillin and gentamycin etc. as shown in Table 4.

SUMMARY

The authors identified 426 cultures of the Genus *Salmonella* among 1644 suspectable cultures of enteric pathogens submitted, to be bacteriologically confirmed, by the eleven hygiene laboratories of cities and provincial level and some hospital laboratories in 1973.

According to the results obtained from the physical and biochemical tests, and the antigenic structural analyses, eleven cultures of *Salmonella paratyphi B*, nineteen cultures of *Salmonella typhimurium*, one each culture of *Salmonella potsdam* and *Salmonella newport*, sixteen cultures of *Salmonella enteritidis* and three hundred thirty-four cultures of *Salmonella typhi* were confirmed.

The drugs of choice for treating *Salmonella* infections were found to be chloramphenicol, ampicillin and gentamycin in Korea, although there were a few cultures appearing in a couple of previous years which showed resistant patterns by the In Vitro tests.

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