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March 15, 1965

SHIGELLA SURVEILLANCE

FOURTH QUARTER 1964

Report No. 5

43 Participating States

### PREFACE

This report summarizes data voluntarily reported from various states, territorial and city, Health Departments. Much of the information is preliminary.

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#### I. Introduction

Forty-six reporting centers are now participating in the Shigella Surveillance Program. These include 43 states as well as New York City, the District of Columbia, and the Virgin Islands. We welcome the participation of 21 new centers, data from which is reported here for the first time. These are: Alabama, Arkansas, Colorado, Florida, Georgia, Idaho, Iowa, Kentucky, Maine, Montana, Nevada, New Hampshire, Pennsylvania, Utah, Virginia, West Virginia, Wisconsin, Wyoming, the District of Columbia, New York City, and the Virgin Islands.

# II. Summary of the Fourth Quarter

A total of 2,101 shigella isolations were reported from the 43 states and the three other reporting centers during the fourth quarter of 1964. Using the figures for the states that have been reporting for longer periods of time for comparison, the fourth quarter total represents a moderate decline from a third quarter peak. As has been true in the past, about 70 per cent of shigella isolations are reported from children under 10 years of age. Likewise, in accordance with reports from previous quarters, there were slightly more shigella isolations reported from females than from males. This difference is most marked in the 20 to 49 year age group. The most frequently isolated serotypes during the fourth quarter, as in the past, were Shigella sonnei and S. flexneri 2a. The predominance of S. sonnei in northern states and S. flexneri in southern states is again noted. In both northern and southern states the seasonal increase in shigella isolates is due primarily to an increase in S. flexneri during the late summer and fall. As in all previous quarters, significantly more salmonella than shigella isolations were reported from the states reporting both. Only a few states show the opposite trend.

#### III. Current Morbidity Trends

## A. Season (Figure 1)

Seventeen states have been reporting shigella isolations since January, 1964. These isolations showed a marked seasonal increase beginning in July and peaking in September, at which time the isolations were approximately double the level during other seasons (Figure 1). Most of this fall peak was accounted for by a rise in <u>S. flexneri</u> isolations, with much less change occurring with <u>S. sonnei</u>. <u>Shigella dysenteriae</u> and <u>S. boydii</u> were too rarely reported to comment meaningfully on their seasonal patterns. Similar curves constructed for larger number of states that have been reporting for shorter periods of time suggest that the 17 states give an accurate picture of the seasonal pattern of shigellosis.

## B. Age (Figure 2 and Table II)

Shigella isolations from the fourth quarter of 1964 show an age distribution similar to that of previous quarters (Figure 2 and

Table II). Approximately 70 per cent of shigella isolations are reported from children under 10 years of age. Of these approximately 10 per cent occur in children under 1 year of age, with high rates in the 1 to 4 year age group. It is not known how accurately these figures represent the true age prevalence of shigellosis, since children are more likely to have stool cultures obtained when diarrhea occurs.

#### C. Sex (Table III)

Of the 2,102 reported shigella isolations reported from 46 centers during the fourth quarter of 1964, 2,010 were identified by sex. Of these 2,010 isolations 1,021 (50.8 per cent) were from females. Although not statistically significant in itself, this is in accord with a previously observed trend toward slightly more isolations from females than males. In 13 of the 15 months of shigella surveillance, more shigella isolations were reported from females than from males. During these 15 months 6,786 shigella isolations have been reported which were identified by sex. Of these, 3,495 or 51.5 per cent were from females, a statistically significant difference (p = .001).

As shown in Table III, this over-all female dominance is noted primarily among individuals over 20 years of age. In the age group 20-49 years, 63.8 per cent of isolations were from females. Isolations from people over 50 years of age revealed a similar pattern, with 62.0 per cent from females. In the age groups between 1 and 19 years the number of isolations was essentially the same from both sexes. Under 1 year of age, however, a reverse pattern is seen. In this group 57.8 per cent of shigella isolations in the past 15 months have been from males.

The pattern in salmonella isolations for 1963 was similar to that of shigella. Salmonella isolations from females between the age of 20 and 49 years accounted for 58.6 per cent. Women accounted for 56.7 per cent of isolations reported from people over 50 years of age. Between the age of 10 and 19 years there was no significant difference in the number of isolations from males and females. In the age groups less than 1 year, 1 to 4 years, and 5 to 9 years, males predominated with 51.7 per cent, 54.8 per cent, and 53.2 per cent respectively.

It is not easy to explain these findings. It is attractive to suggest that the higher proportion of females in the 20 to 49 year age group represents higher attack rates due to more intimate contact of mothers than fathers with their children. It might also be due to cultures being obtained more frequently from mothers than fathers when their children are ill, either because they are usually the ones who take the children to the physician, or because the mothers are the ones who are home when contact surveys are performed. It seems less likely that the same kind of reasoning would apply to women over the age of 50. Likewise, there exists no ready explanation for the male predominance in infants. Male prevalence in infants and children has been noted in several diseases including purulent meningitis, <sup>1,2</sup> staphylococcal infections, <sup>3-5</sup> infectious croup, <sup>6</sup> and ECHO type 9 infections of the central nervous system, as well as salmonellosis and shigellosis. Lund' noted that 303 cases of spinal fluids from children under 10 years from which pneumococci were recovered, 197 or 65.0 per cent were from males. Similar analysis of 340 specimens from adults revealed no statistically significant difference. In a prospective study of neonates Thompson et al,<sup>3</sup> showed that 198 of 290 (69 per cent) infants with staphylococcal skin lesions were males.

#### D. Serotype Frequencies (Table I)

During the fourth quarter of 1964 the most frequently isolated shigella serotype was <u>S</u>. <u>sonnei</u>, accounting for 38.9 per cent of reported isolations. <u>Shigella flexneri 6</u> was the next most frequently isolated single serotype, accounting for 8.5 per cent of isolations. Many states, however, do not carry out the final subgrouping of <u>S</u>. <u>flexneri</u> serotypes, (combining 2a and 2b, etc.) therefore, a more accurate reflection of serotype frequencies is obtained by comparing them by main subgroups. Under these considerations <u>S</u>. <u>flexneri 2</u> was the second commonest and <u>S</u>. <u>flexneri 6</u> was the third most commonly reported serotype. The six most commonly isolated during the fourth quarter were:

	Fourth Qua	rter 1964		Previous	Quarter
Rank	Serotype	Number	Per cent	Rank	Per cent
1	S. sonnei	817	38.9	2	29.0
2	S. flexneri 2	442	21.0	1	30.3
3	S. flexneri 6	179	8.5	6	4.0
4	S. flexneri 3	160	7.6	3	11.6
5	S. flexneri 4	93	4.4	4	6.7
6	S. flexneri 1	63	3.0	5	4.0
			83.4		85.6

From month to month the relative frequencies of the shigella serotypes is fairly constant. The six most frequently reported serotypes during the fourth quarter of 1964, have also been the six most frequently isolated serotypes during all previous quarters, though the order varies somewhat from month to month. Shigella sonnei is usually the most commonly reported serotype, followed by S. flexneri 2, with these two serotypes accounting for 60 to 70 per cent of reported isolations. During the third quarter of 1964, S. flexneri 2 was slightly more frequently reported than S. sonnei, due to the summer and fall increase in the S. flexneri group. Shigella flexneri 1, 3, 4, and 6 are fairly common and are always the next four most frequently reported serotypes (after S. sonnei and S. flexneri 2), varying in order among themselves. Shigella flexneri 5 and all S. dysenteriae and S. boydii serotypes are unusual; outbreaks due to these serotypes have not been reported since the shigella surveillance program began. The factors accounting for these variations in prevalence are not known.

#### E. Serotype Distribution by Region (Figures 3, 4, and 5)

Two of the four main shigella serotype groups, <u>S</u>. <u>flexneri</u> and <u>S</u>. <u>sonnei</u> have accounted for more than 98 per cent of reported isolations in each quarter since shigella surveillance began. As has been noted in past surveillance reports, <u>S</u>. <u>flexneri</u> is the dominant reported shigella serotype group from states in the southern part of the United States (states south of the 37th parallel, see Figure 3), while <u>S</u>. <u>sonnei</u> organisms are the dominant organisms from the northern part of the country. The data obtained from the 46 centers (excluding Hawaii and Alaska, as explained below) reporting during the fourth quarter of 1964, continue to demonstrate this trend:

		No	orth	South			
		Number	Per cent	Number	Per	cent	
<u>s</u> .	dysenteriae	3	0.3	6	0	.6	
s.	flexneri	444	49.2	706	69	.3	
s.	boydii	2	0.2	16	1	.6	
<u>s</u> .	sonnei	453	50.2	291	28	.6	
TO	TAL	902		1019			

Further analysis of this data failed to show a significant difference in the serotype distribution between East and West:

		Ea	ast	Wes	st
		Number	Per cent	Number	Per cent
s.	dysenteriae	7	0.6	2	0.3
s.	flexneri	765	60.7	385	58.3
s.	boydii	4	0.3	14	2.1
s.	sonnei	485	38.5	259	39.3
TO	TAL	1261		660	

The dominance of <u>S</u>. <u>flexneri</u> in the South, and <u>S</u>. <u>sonnei</u> in the North, is fairly constant from month to month but the degree varies with the season for the 15 states which have reported since January 1964 (Hawaii and Alaska excluded). In both North and South there is a rise in the ratio of <u>S</u>. <u>flexneri</u> to <u>S</u>. <u>sonnei</u> in the summer. As shown in Figure 5, this is due to a summer rise of <u>S</u>. <u>flexneri</u> isolations, peaking in September, with relative constancy of <u>S</u>. <u>sonnei</u> isolations. Though this pattern is more pronounced in the South it also occurs in the North.

As has been indicated, Hawaii and Alaska have excluded from the above calculations. This is because of obvious geographical and sociological differences from the rest of the United States. It is also noteworthy that they show the reverse pattern expected from their latitude, i.e., Hawaii shows a predominance of <u>S</u>. <u>sonnei</u> organisms while Alaska reports almost exclusively <u>S</u>. <u>flexneri</u>. Several other centers also do fit the regional pattern. These include Illinois, Montana, and New York City, all of which report considerably more <u>S</u>. <u>flexneri</u> than <u>S</u>. <u>sonnei</u>. As yet there seems to be no clear explanation for these regional differences, or the variants from them.

#### F. Family Associated Isolations

Of the 2,101 isolations reported during the fourth quarter of 1964, 540 (25.6 per cent) represented those who also had other members of their family positive for shigella. This ratio is similar to that reported for previous quarters, and is higher than that for salmonellae (18.1 per cent of 1963 salmonella isolations were family associated). Since this figure represents only members of family units who were cultured, found positive, and reported, it is likely that the true rate of family association for shigellosis is higher than that obtained here.

#### G. Nonhuman Isolations

One nonhuman shigella isolation, from a monkey, was reported during the fourth quarter of 1964. Reports from nonhuman sources in previous quarters has also been unusual, and almost all have been from primates.

### IV. Reports of Outbreaks from the States

### A. A Foodborne Outbreak Due to Shigella flexneri 2a at a Private Party

Dr. W. F. Lyons, State Epidemiologist, and Mr. Harold T. Matsuura, Communicable Disease Investigator, Hawaii Department of Health.

On October 25, at approximately 3:00 PM, 25 persons from 10 families shared a pot luck dinner prepared by four of the families. From 9 to 64 hours later 13 of these 25 people ranging in age from 6 to 47 years developed gastroenteritis. Symptoms consisted of nausea, vomiting, diarrhea, and fever. Hospitalization for dehydration was required for an 11-year old, but there were no deaths. Subsequent stool examinations by public health authorities were positive for <u>Shigella flexneri</u> 2a, in seven of the patients.

The items served at the suspect meal included: potato-macaroni salad, hamburger chili, boiled eggs, pickles, cookies, and canned beverages. All but one of the people who had consumed the potato salad became ill, while all those who had not eaten this item remained well. None of the food remained for bacteriologic confirmation.

The potato salad had been prepared by one of the mothers and a daughter of one of the families attending the supper. It was prepared 6 hours prior to consumption and remained at ambient temperature until served. Both mother and daughter, and four other children in the family had been suffering from diarrhea on the 2 days prior to the supper. Stool cultures from three members of this family were positive for <u>S</u>. <u>flexneri</u> <u>2a</u>, 7 days after the dinner. Editor's Comment: Foodborne outbreaks of shigellosis are relatively infrequent compared to salmonellosis, where animal products may harbor the organisms. As in this case, careful epidemiological investigation will usually reveal recent diarrheal illness among one or more of the food handlers. Various foods may be involved but potato salads are among the most frequent (See Part B and C below, and Shigella Surveillance Report No. 4, November 1964). High attack rates and short incubation periods, e.g., 9 hours in this report, are also characteristic of foodborne shigellosis.

## B. A Foodborne Outbreak Due to Shigella sonnei at an Army Camp.

Major L. J. Legters, Deputy Surgeon, Ft. Bragg, North Carolina.

Between September 12 and 21, 22 cases of gastroenteritis occurred among members of two separate battalions (A and B) at Ft. Bragg. All but three of the cases occurred in the preceding 6 days and were thought to be secondary cases. The illnesses were characterized by varying degrees of headache, cramps, nausea, vomiting, diarrhea, and fever (99 to 102.8 degrees F). Diarrhea was frequent and watery but contained blood in only one case. Stool cultures were positive for <u>S. sonnei</u> in four cases. All patients recovered after treatment with oxytetracycline.

These two units had no activities in common and had separate dining and food preparation facilities. However, Battalion B had had a party on September 12, for which three Battalion A cooks had helped prepare the food. Food histories revealed that the only item common to all who were ill in Battalion B was potato salad. This item had been prepared by one cook from Battalion A who had prepared the potato salad in the Battalion A mess hall at 10:00 AM on the morning of the party. It remained refrigerated until 3:00 PM when it was placed on the serving line at ambient temperature where it remained until 10:00 to 11:00 PM when the remaining salad was discarded. Stool cultures obtained from the 10 cooks involved in the preparation of food for the Battalion B party were negative, except for the Battalion A cook who had prepared the potato salad. His culture was positive for <u>Shigella sonnei</u>, and he was discovered to be suffering from severe hemorrhoids.

Though all patients developing diarrhea in Battalion A had eaten at least one meal in the Battalion A mess hall, a single common food item could not be incriminated. It is assumed that the cook contaminated several food items at approximately the same time as he prepared the potato salad for Battalion B.

# C. A Foodborne Outbreak Due to Shigella flexneri 6 at a Public School.

Dr. John E. McCroan, Chief Epidemiologist, Georgia Health Department and Dr. Robert J. Walker, District Director of Public Health.

Over the week of November 20 to 26, approximately 220 cases of gastroenteritis due to Shigella flexneri 6 occurred among 526 children attending a public school. The majority of the cases occurred in the first 3 days. The disease was characterized by malaise, nausea, vomiting, bloody diarrhea and fever. There were no deaths.

The large number of cases and short period of time over which they occurred implicated a common source. Water and milk could not be incriminated. Though cases could not be differentiated on the basis of food items eaten, the school cafeteria was clearly involved:

	1	I11	Not	Total	
	Number	Per cent	Number	Per cent	Number
Ate in cafeteria	205	48%	220	52%	425
Did not eat in cafeteria	15	14%	86	86%	101
Total	220	42%	306	58%	526

The suspect meal was prepared during the morning of November 20, and served beginning at 11:30 AM. One item of particular interest was a tuna fish salad which had been prepared from onions, hard boiled eggs, canned tuna, and commercial mayonnaise. These ingredients were chopped and mixed without detectable violations in accepted techniques. The food was stored in a walk-in cooler until time for serving. The only cook involved in the preparation of this salad began to feel ill after the completion of her duties, and went home without eating or taking home any of the food. On that day or the following day she began to have diarrhea as did her 4-year-old child, who had been fretful and febrile for several days. Stool cultures from both mother and child were positive for Shigella flexneri 6.

Editor's Comment: This epidemic like the previous two, demonstrates the contamination potential of salads such as tuna, chicken, or potato. The minimal time for significant contamination to occur doubtlessly varies with the infecting dose, constituents of the item and temperatures involved. Nonetheless, as demonstrated here, an outbreak can occur even when these factors are all within the range of what is generally considered satisfactory food handling technique. When the food handler has not developed symptoms of a pathogenic organism he is carrying there is no way in which it can be detected beforehand, thus, demonstrating once again the need for habitual thorough hand washing by food handlers.

D. <u>Contaminated Well Water Causing an Outbreak of Dysentery Due to</u> Shigella flexneri.

Dr. Fred T. Foard, Director, Communicable Disease Control Section, North Carolina, and Dr. Ronald Levine, EIS Officer.

Seventeen cases of gastroenteritis occurred among residents of a rural North Carolina community over a 2-week period beginning October 19. Symptoms included diarrhea and abdominal pain in all cases. Varying degrees of vomiting, fever, toxicity, dehydration, and headache were seen. Two cases had still necks but spinal fluid examinations were normal. A 12-year-old girl died the day following the onset of her symptoms despite hospitalization with fluid and antibiotic therapy. The cases occurred among several families in an extremely low socioeconomic area. Water was obtained from wells and waste products were deposited in pit privies. Garbage and feces, however, were observed to be strewn on the ground in the area. For several weeks prior to the outbreak there had been no rain, and the ground was extremely dry. For 2 days prior to the outbreak there was heavy rainfall, with a total of 3.42 inches falling in that period. On the day following this rainfall the water obtained in one of the wells was noted to be cloudy. Six of seventeen members of two families living in this house developed symptoms over the next 3 days, including the fatal case who was known to have consumed at least a glass full of the cloudy water. Other members of these families became ill later. One person known not to have consumed the water remained well. In addition four next door neighbors became ill, though some denied having consumed water from this well.

Most of the patients had received antibiotics before stools could be obtained for cultures. Two who had not received antibiotics were positive for <u>S</u>. <u>flexneri</u>. The other families would not co-operate in attempts to get specimens for bacteriological examination.

It is thought that the epidemic was caused by a heavy rain, following prolonged dry weather, washing the accumulated fecal materials into the inadequate wells. It is also considered likely that secondary personto-person spread accounted for the later cases.

Editor's Comment: This is very similar to an outbreak reported by the same investigators in Shigella Surveillance Report No. 1, March, 1964. In both cases heavy rainfall immediately preceded an outbreak in a low socio-economic, poorly sanitized area.

## E. A Dysentery Outbreak in an Institution for the Mentally Retarded.

Dr. James Hart, Director, Preventable Disease Division, and Dr. Mila Rindge, Regional Health Officer, Connecticut.

Between October 19 and November 18, 22 cases of <u>Shigella sonnei</u> dysentery occurred among the residents of 2 of 17 buildings in an institution for the mentally deficient which maintained a usual census of around 1,850. Twenty-two cases occurred among 135 patients, all of whom were severely retarded children incapable of maintaining personal hygiene. Cases ranged in age from 2 to 12. Symptoms were moderately severe, sudden in onset, and included diarrhea and fever. It was not possible to detect a source or means of spread from one building to the other.

Editor's Comment: This is another in an accumulating series of reports on shigellosis in institutions for the mentally retarded. The story reported here is typical. The organism is introduced from an undetected source, probably a carrier among the personnel or patients. It then spreads via person-to-person contact to other patients, the ward attendants and their families. The spread is sporadic and usually relatively slow, i.e., occurring over a number of months. Carrier rates (or reinfection rates; they are not easily distinguished) are high and the institution often remains chronically involved for years. The overcrowding, understaffing and deficient financing of these institutions contribute to the problem and make adequate investigation and management difficult.

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TABLE I SHIGELLA SEROTYPES ISOLATED FROM HUMANS FOURTH QUARTER, 1964

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\*Shigella cultures examined by CDC Enteric Bacteriology Unit, Fourth Quarter, 1964

The following States reported no Shigella isolations - Delaware, Maine, Rhode Island, Wyoming

# TABLE II

# AGE AND SEX DISTRIBUTION OF 2102 ISOLATIONS OF SHIGELLA

# REPORTED FOR THE FOURTH QUARTER 1964

					Per cent of	Per cent in
Age	Male	Female	Unknown	<u>Total</u>	Subtotal	Previous Quarter
Under 1	78	56	5	139	9.9	10.6
1-4 yrs	246	245	6	497	35.2	38.4
5-9 yrs	147	160	4	311	22.1	19.1
10-19 yrs	79	99		178	12.6	12.5
20-29 yrs	44	70	1	115	8.2	8.6
30-39 yrs	24	35	1	60	4.3	4.1
40-49 yrs	15	20		35	2.5	2.5
50-59 yrs	18	17		35	2.5	1.6
60-69 yrs	7	14		21	1.5	1.3
70-79 yrs	4	8		12	0.9	0.9
80+ yrs	2	5		7	0.5	0.4
Subtotal	664	729		1410		
Unknown	325	292	75	69 <b>2</b>		
Total	989	1021	92	2102		
Per cent of total (unkno	own)	49 <b>.2</b>	50.8			
Per cent in Previous qua	arter	49 <b>.2</b>	50.8			

# TABLE III

# SHIGELLA ISOLATIONS BY SEX AND AGE GROUP

Fourth Quarter 1963 to Fourth Quarter 1964

	Ma	ale	Fer		
Age group	Number	Per cent	Number	Per cent	Total
Under 1	240	57.8	175	42.2	415
1-4 yrs	745	50.6	727	49.4	1472
5-9 yrs	459	49.6	466	50.4	925
10-19 yrs	296	49.9	297	50.1	593
20-49 yrs	233	36.2	411	63.8	644
50+ yrs	71	38.0	116	62.0	187
Subtotal	2044	48.3	2192	51.7	4236
Unknown age	1247	48.9	1303	51.1	2550
Total	3291	48.5	3495	51.5	6786

Figure I.



NUMBER OF ISOLATIONS REPORTED



\*For 1410 in whom age was reported; in 692 age was not reported.

