Intensive clinical and epidemiological studies strongly pointed to a common source of acute Salmonella reading infection occurring in more than 300 persons in widely separated areas of the United States during a 12-month period. However, no common source of infection could be identified.

Widespread Salmonella reading Infection of Undetermined Origin

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DURING the period from September 1956 through early September 1957, 325 acute sporadic cases and 3 outbreaks of salmonellosis due to *Salmonella reading* occurred in the United States. Previous to this time *S. reading* had been rarely encountered in typing laboratories. Although the epidemiological picture strongly pointed to a common source of infection, none could be identified in spite of intensive study. This "outbreak" is an example of a phenomenon periodically noted by *Salmonella* typing laboratories when, within a few weeks, a relatively large number of cultures are received containing a serotype which has previously been encountered only rarely. This phenomenon is seldom explained except when circumscribed outbreaks of salmonellosis are clearly involved. The salient features of the 1956–57 "outbreak" follow.

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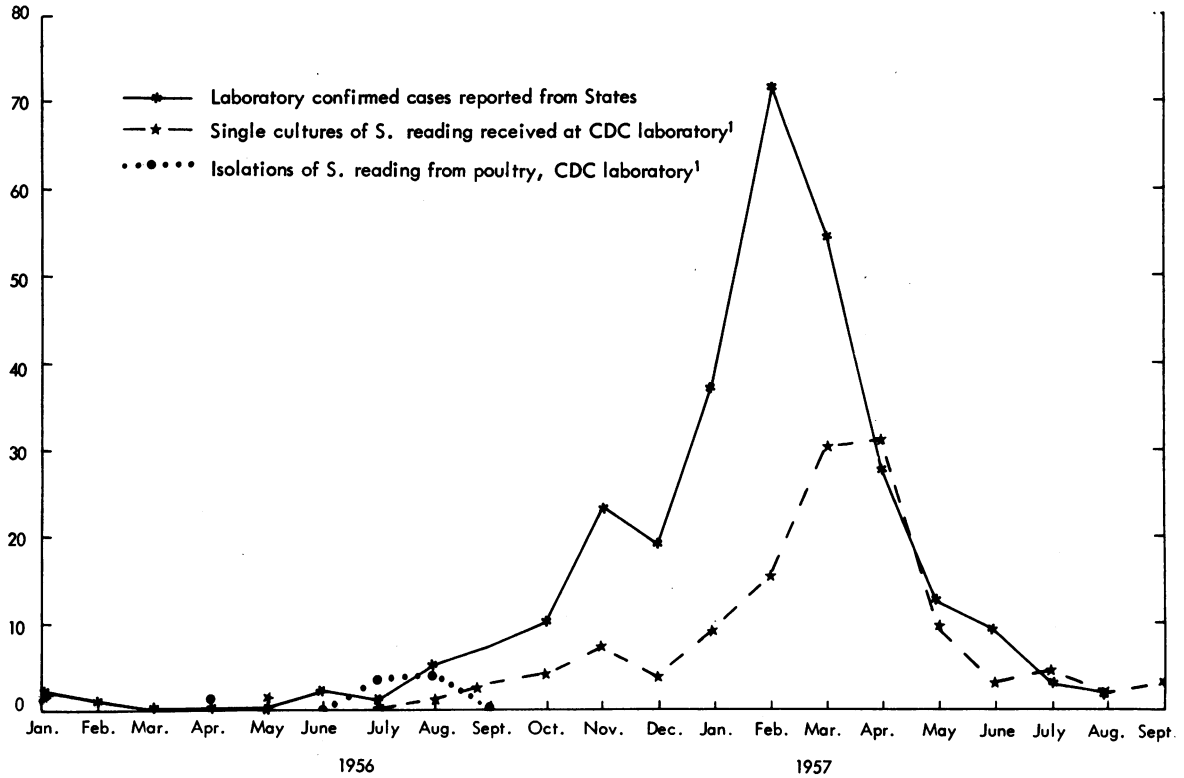
The paper was presented in part before the epidemiology section of the American Public Health Association at its annual meeting in Cleveland, Ohio, November 14, 1957.

The "Salmonellosis" Outbreak

In late March of 1957, Dr. Frederick H. Wentworth of the bureau of communicable diseases, Ohio Department of Health, reported 13 isolations of *S. reading*, indicating a sharp increase of this type of *Salmonella* compared with the previous experience of the health department. About half of the isolations were from blood cultures, and all came from children in widely separated areas of the State. Inquiries to Dr. Philip R. Edwards, chief of the Enteric Bacteriology Laboratory, Communicable Disease Center, and to other *Salmonella* typing centers throughout the country revealed a similar recent increase in *S. reading* isolations. Accordingly, a plan for national surveillance was instituted. A summary of available data was distributed to State health officers, epidemiologists, and laboratory directors. Requests were made for the prompt submission of epidemiological data on all instances of *S. reading* infection, with particular attention to pos-

Month of onset of 283 cases of salmonellosis due to Salmonella reading, exclusive of asymptomatic carriers and secondary cases.



[1] Data provided by Dr. Philip R. Edwards, chief, Enteric Bacteriology Laboratory, Communicable Disease Center, Public Health Service, Atlanta, Ga.

sible sources of infection. A standard food history form was prepared and circulated. Several Epidemic Intelligence Service officers worked in cooperation with 11 State health departments in obtaining field data.

The chart shows the month of onset for 283 reported cases of salmonellosis due to *S. reading* for which such information was available. A total of 392 isolations of this type representing repeat cultures, family contacts, and outbreaks was reported during the same period. An early increase in cases is noted in October of 1956 with a peak in February of 1957 and a decline to previous incidence by May of that year.

Table 1 shows the distribution of the reported cases by State and month of onset. In this table, family and other group outbreaks are counted as single episodes. Cases appeared simultaneously in several widely separated areas of the country. No progression of *S. reading* isolations from one geographic area to another is apparent. However, most positive isolations were reported from the northern tier of States. In view of the wide variation in the degree of utilization of laboratory facilities in various areas, no attempt is made to calculate attack rates.

The age distribution of 248 patients with salmonellosis due to *S. reading* for whom age data were given is presented in table 2. Cases are concentrated among infants and children, with 18 percent of the total number under 1 year of age and 11 percent under 6 months. This grouping agrees with the tabulation by MacCready and co-workers of ages for 2,092 patients with *Salmonella* infections in general (*1*).

Clinical and Laboratory Data

Detailed clinical and laboratory data were obtained for 69 patients, and henceforth these will be called the study group. The information is summarized in tables 3–7. Hospital records of 20 patients were abstracted, and health

department records and personal interview data were available for all 69 patients. These patients are probably not representative of persons ill with salmonellosis due to *S. reading* but for prejudicial reasons happened to have been cultured during a bout of gastroenteritis. It is striking that the vast majority of homes visited revealed families of above average income. However, this was merely an impression, and no attempt was made to evaluate the economic status of the families interviewed.

The median age of the study group was 3 years, with a range of from 1 week to 64 years (table 3). In this respect the lower age range of the study group approximated the age distribution of the previously described group of 248 patients. More than half of the patients were hospitalized, with a median hospital stay of 8 days (table 3). Patients were reported to have been severely ill in 53 percent of the cases, 27 percent were moderately ill, and 20 percent were mildly ill (table 4). These were subjective impressions by patients and were not quantitated objectively. Symptoms persisted for a median of 7 days although the time was some-

Table 1. Distribution of 283 cases [1] of salmonellosis due to Salmonella reading, by State and month of onset, January 1956–July 1957

State	1956					1957						
	January–August	September	October	November	December	January	February	March	April	May	June	July
United States	12	7	10	23	19	37	71	54	26	12	9	3
New England:												
Maine							1					
Vermont					1							
Massachusetts						5	4	2	1			
Connecticut	1	2	1	3	2	2	1	2	1	1	2	1
Middle Atlantic:												
New York	4	3	2	1	3	9	7	6	6	1		
Pennsylvania							2					
East North Central:												
Ohio						1	11	8	4		1	
Illinois	1	1	2	2		1		3	1			
Michigan			2	3	2	6	13	5				
Wisconsin	1		1	5	2	2	2		2	1		
West North Central:												
Minnesota						2	4	5	1	1		
Iowa					1		1	3				
Missouri				2	1							
North Dakota					1							
Kansas												2
South Atlantic:												
Maryland			1						1	5		
Virginia						1	1	1				
North Carolina							1	1				
Georgia								3	2		1	
East South Central:												
Tennessee								1	1			
Kentucky							1	2	1			
West South Central:												
Arkansas						1						
Louisiana							3					
Texas							2					
Mountain:												
Wyoming							2					
Pacific:												
Washington	1				3	2	5	3				
Oregon		1	1	2				1				
California	4			5	3	5	10	8	4	3	5	

[1] Secondary cases and asymptomatic carriers excluded.

Table 2. Age distribution of 248 patients with salmonellosis due to Salmonella reading

Age group	Number	Percent
All ages	248	100
6 years and under	171	69
Less than 6 months	28	11
6–11 months	18	7
1 year	19	8
2 years	38	15
3 years	30	12
4 years	18	7
5 years	10	4
6 years	10	4
Over 6 years	77	31
7	4	2
8	6	2
9	3	2
10	6	2
11–14	11	4
15–19	4	2
20–29	7	3
30–39	15	6
40–49	5	2
50 and over	16	6

what longer in the group less than 1 year of age.

Leukocyte counts were available for only 20 patients and are summarized also in table 4. The counts ranged from 3,150 to 20,000 per cubic millimeter with the median values tending to decrease with increasing age. A slight to moderate lymphocytosis is reflected in the differential counts, with the expected higher lymphocyte counts in the younger age group.

All study group patients were, of course, positive for *S. reading* by stool culture. Blood cultures were made for only 8 patients. Of these, 7 cultures yielded *S. reading*. No diarrhea was reported for 4 of these 7 patients.

Elevated temperatures were reported for 94 percent of the 65 patients for whom this information was given. The median of highest recorded values was 103.2° F. (table 5). Febrile convulsions occurred in only one child, a 2-year-old girl. Diarrhea was considered present only when 5 or more stools occurred in 1 day.

Table 6 summarizes the data regarding secondary episodes of gastroenteritis in 65 exposed families. Attack rates calculated by family size revealed similar rates in all families.

Local health department personnel obtained stool cultures from family contacts in 33 households harboring index cases. *S. reading* was isolated from specimens obtained in 55 percent of these households (table 7). Mothers were positive four times more frequently than were fathers. As noted in table 6, only 5, or 23 percent, of the 22 *S. reading* positive children reported any gastrointestinal illness. However, *S. reading* was found in cultures from one-third of the children ill with gastroenteritis who were family contacts.

Among the index cases, other *Salmonella* types in addition to *S. reading* were isolated from 9 patients. These types included *S. muenchen* isolated from 3 patients, *S. paratyphi* B, from 2 patients, and *S. manhattan*, *S.*

Table 3. Hospitalization of 69 patients with salmonellosis due to Salmonella reading

Age group [1]	Total		Hospitalized			
	Number	Percent	Number	Percent	Duration (days)	
					Median	Range
All ages	69	100	35	51	8	2–26
Children:						
0–5 months	8	19	7	54	8	4–26
6–11 months	5					
1–4 years	30	44	14	47	6	2–13
5–9 years	12	17	6	50	9	3–18
10–17 years	10	15	5	50	6	3–20
Adults:						
32–64 years	4	6	3	75	10	6–14

[1] Median age 3 years (range 1 week–64 years).

Table 4. Severity and duration of illness and leukocyte counts of 69 patients with salmonellosis due to Salmonella reading

Age group	Severity and duration of illness						Leukocyte counts				
	Total patients	Severity			Duration (days)		Number patients	1,000 cells per cubic millimeter		Differential (median percent)	
		Mild	Moderate	Severe	Median	Range		Median	Range	Polymorphonuclears	Lymphocytes
All ages	[1] 64	13	17	34	7	------	20	-------	----------	--------	--------
Children:											
0–11 months	13	2	3	8	14	5–60	2	13	9. 7 –17	20	78
1– 4 years	29	6	8	15	7	2–70	12	11. 5	3. 15–20	33	64
5– 9 years	9	2	3	4	8	3–60	6	10. 35	5. 8 –11. 8	51	43
10–17 years	9	3	3	3	6	2–30	------	-------	----------	--------	--------
Adults:											
32–64 years	4	------	------	4	17	4–25	------	-------	----------	--------	--------

[1] Severity and duration of illness unknown for 5 patients.

typhimurium, *S. montevideo*, and *S. siegburg* from 1 patient each. Cultures of family contacts revealed 6 individuals with other *Salmonella* types: *S. typhimurium*, *S. bareilly*, *S. sandiego*, *S. muenchen*, and *S. oranienburg* were each isolated from one patient, and another patient was found positive for both *S. muenchen* and *S. oranienburg*. Admittedly, the usual press of laboratory work does not permit the serotyping of any large number of colonies from a single specimen. Consequently, the above is only a suggestion of what other *Salmonella* types may have been present in these patients and contacts.

Food History

A summary of the responses to questions on food consumption is given in table 8. No comparable data were collected from an unaffected control population. Some difficulty was anticipated in obtaining accurate food histories since the average time lapse between the date

Table 5. Clinical characteristics of 69 patients with salmonellosis due to Salmonella reading

Age group	Total	With fever	Without fever	Median temperature (F.) [1]	Symptoms							
					Diarrhea [2]		Blood and mucus in stool		Vomiting		Abdominal cramps	
					Number	Percent [3]	Number	Percent [4]	Number	Percent [3]	Number	Percent [3]
Total	[5] 69	61	4	103. 2	58	84	31	53	30	43	39	70
Children:												
0–11 months	13	11	2	102. 4	13	100	9	69	3	23	------	------
1–4 years	[5] 30	24	2	103. 3	24	80	18	75	14	47	19	63
5–9 years	12	12	0	103. 2	10	83	3	30	6	50	9	75
10–17 years	10	10	0	103. 8	8	80	1	13	5	50	7	70
Adults:												
32–42 years	4	4	0	102. 4	3	75	0	0	2	50	4	100

[1] Highest values recorded.
[2] 5 or more stools per day.
[3] Based on total of 69 patients.
[4] Based on 58 patients with diarrhea.
[5] Temperature unknown for 4 patients.

of onset of gastroenteritis and that of the interview was 8 weeks. Recall of specific foods eaten prior to onset of the illness, therefore, appeared to be an unrealistic expectation. Consequently, an enumeration of the family's usual food intake was requested. Families were looked upon as a unit in terms of foods consumed since transfer of *Salmonella* among family members may have easily occurred in many instances.

Special emphasis was placed on a search for some single consistently mentioned brand name of a nationally distributed food or food product. None was found frequently enough to implicate it as the presumed common vehicle.

Table 6. Secondary episodes of gastrointestinal disease in 65 families

	Total	Families or persons ill	
		Number	Percent
Exposed:			
Families	65	27	42
Family members	252	[1] 45	18
Positive for *Salmonella reading:*			
Children	22	5	23
Adults	15	2	13

[1] Median age 16 years.

Table 7. Results of stool cultures of family contacts of patients with salmonellosis due to Salmonella reading

Group cultured	Cultures		
	Total	Positive for *S. reading*	
		Number	Percent
Families	33	[1] 18	55
Children	64	[2] 22	34
Mothers	33	12	36
Fathers	33	3	9
Patients ill with gastroenteritis:			
Children	15	5	33
Adults	11	2	18

[1] 2 or more family members positive for *S. reading* in 8 families, or 24 percent of total families.
[2] Median age, 5 years.

Table 8. Frequency of consumption of foods [1] in families of patients with Salmonella reading infection

Food item	Total families questioned	History of food consumption	
		Number	Percent
Mayonnaise or salad dressing	60	60	100
Chicken	68	67	99
Peanut butter	40	39	98
Ice cream	69	67	97
Cheese [2]	69	62	90
Cottage cheese	69	46	67
Gelatin dessert	69	61	88
Oleomargarine	60	50	83
Uncooked dried fruit	60	38	63
Toothpaste A	69	36	52
Toothpaste B	69	19	28
Frozen meat pies	68	33	49
Infant formula or foods	60	21	35
Precooked frozen dinners	58	6	10

[1] Multiple brand names mentioned for all items.
[2] Other than cottage cheese.

Many different brand names were mentioned for the most frequently reported foods listed in table 8. Foods previously implicated in extensive outbreaks of salmonellosis, such as canned meats (*2*) or dried eggs (*3*, *4*), were not commonly used in these families. Frozen meat items requiring only warming before use were also infrequently encountered. The possibility remains, of course, that the crucial food item may not have been included among those on the food questionnaire.

Families were also questioned about the presence of pets in the home. Only 8 families of the 69 questioned owned either a cat, a dog, or a parakeet.

In view of these negative findings, an alternative hypothesis was employed which suggested that some common additive to a frequently mentioned food might be the sought-after common vehicle of infection. This possibility was investigated by means of a study of ice cream which had been mentioned by 97 percent of the families interviewed. A careful enumeration of the ingredients used in several of the ice cream brands consumed failed to reveal any single nationally distributed common additive. Other commonly used foods, such as mayonnaise or salad dressing and peanut butter

(table 8), were disqualified as potential *Salmonella* vehicles because of the failure of these organisms to survive in such media (*5*, *6*). Chicken was consumed by 99 percent of families questioned. However, it was not apparent how birds from many different sources, including small home-fed flocks, could all be infected with a similar, previously rare *Salmonella* type.

In view of the large number of children affected, special attention was given to foods which might be common to this age group. Despite several specific questions included in the food questionnaire, no common brand name baby food, vitamin preparation, or formula mixture was encountered.

Discussion

As an estimate of the magnitude of the problem, data on the number of isolations of *S. reading* in previous years were provided by Dr. Philip R. Edwards, who reported that, during the 8-year period from 1948 through January 1956, only 24 cultures of *S. reading* were identified among approximately 18,000 cultures received. In contrast, 125 isolates representing individual cases were identified at the Communicable Disease Center as *S. reading* during the 16-month period from May 1956 through early September 1957. Of particular interest was the apparent concentration of cases in this country, with few cases reported elsewhere. Inquiries to *Salmonella* typing centers in Canada, England, Northern France, West Germany, and the Netherlands failed to reveal any recent marked increase of *S. reading* isolations in these areas corresponding in time with the peak of cases in this country. However, in 1952 the Netherlands had experienced a sharp rise in *S. reading* cases from an average of 2 to 4 per year to 51 isolations that year. No explanation of this sudden increase and equally sharp decline was available.

Isolations From Animals

As a further attempt at solution of the problem, additional instances of recent *S. reading* isolations, other than from humans, were looked for. State veterinary public health officers were contacted by Dr. James H. Steele, chief, Veterinary Public Health Section, Communicable Disease Center, and 9 recent poultry outbreaks of clinically evident salmonellosis due to *S. reading* were reported. The chart shows the few July and August 1956 poultry isolations which preceded the sharp rise in human cases. Since the virulence of *Salmonella* types varies considerably in chicks (*7*), the organism may be carried with minimum symptoms, and *S. reading* might have been extensively distributed among poultry despite the few reported isolations. Galton and associates (*8*) have demonstrated the frequency with which salmonellae may be detected in poultry processing plants. If fowl were contaminated with salmonellae, then some nationwide means of infecting poultry would have to be postulated. Feeds might serve this function particularly since a constitutent of many poultry feeds is frequently contaminated with *Salmonella*.

Fishmeal imported into West Germany, where much of it is used in animal feeds, was frequently found to be contaminated with *Salmonella* according to Rohde and Bischoff (*9*) and Adam (*10*). Furthermore, the isolation of the new serotype *Salmonella blockley* from fishmeal in 1955 occurred almost simultaneously with the occurrence of the first human cases of *S. blockley* infection (*11*, *12*). A relationship between the two through the medium of infected animals was inferred. During 1957, according to a personal communication from Dr. H. P. R. Seeliger, *S. reading* was isolated in West Germany from imported fishmeal and was also found to be the etiological

Data on the incidence of *Salmonella reading* isolations in their respective countries were provided by: Dr. E. T. Bynoe, Laboratory of Hygiene, Department of National Health and Welfare, Ottawa, Canada; Dr. Joan Taylor, Salmonella Reference Laboratory, Central Public Health Laboratory, Colindale, London, England; Dr. R. Buttiaux, Institut Pasteur de Lille, Centre d'Enseignement et Recherches de Bactériologie Alimentaire, Lille, France; Dr. H. P. R. Seeliger, Salmonella-Zentrale, Hygiene-Institut der Universität Bonn, Bonn, Germany; Dr. A. Clarenburg, Rijks Instituut Voor de Volksgezonheit, Utrecht, Netherlands.

agent in several outbreaks of food poisoning. Other investigators have had varying degrees of success in isolating salmonellae from fishmeal. Walker (*13*) found no positives among 10 samples cultured while Cook, Hobbs, and McCoy recovered salmonellae from 14 of 54 samples studied. Their unpublished report is cited by Walker (*13*). Rohde and Bischoff (*9*) found salmonellae in 43 of 270 samples, while Adam (*10*) reported 16 percent of 833 fishmeal specimens positive for the organism.

In the United States fishmeal is used extensively in a variety of poultry feeds. Of 16 specimens of domestic fishmeal examined bacteriologically by one of the authors (Boring), salmonellae were found in 9 instances. *S. reading* was not among the types isolated, but these specimens were collected during July and August of 1957, well after the peak of the "outbreak." If poultry flocks may in fact become infected with *Salmonella* from contaminated feeds, a potentially major public health problem exists. Thal and co-workers (*14*) and Seeliger (*12*) have discussed the probability of infection of domestic animals with *Salmonella* from such contaminated feeds. The danger of human infections from contaminated flocks has been discussed by Abelseth and Robertson (*15*), Edwards (*16*), and others.

Clinical and Laboratory Material

Among the 300 or 400 reported acute cases of salmonellosis due to *S. reading*, two deaths occurred in children. A 10-year-old Negro boy died 5 days after onset of symptoms, following a rapidly downhill course. Stool and blood cultures were positive for *S. reading*. The final diagnosis included congenital heart disease, acute and subacute bacterial endocarditis with *Salmonella* sepsis, and sickle cell anemia. His hemoglobin level was reported as 6.2 gm./100 ml. An infant death was reported with no other information available. The only localized *Salmonella* infection reported occurred in a 2-year-old white boy who developed septic arthritis of the calcaneotibial joint. No attempt is made to calculate a case fatality rate in this epidemic for want of a reasonably accurate denominator.

Salmonellosis due to *S. reading* appears to present clinical features similar to those described for previous series of patients with *Salmonella* infections (*17*, *18*). However, complications were not present in the study group, although they were reported among patients for whom only incomplete histories were available. The rarity of complications reflects the relatively low virulence and noninvasiveness of *S. reading*. Furthermore, previous reviews referred to dealt only with hospitalized patients, while in the present series half of the patients were not hospitalized. As noted previously, a majority of these patients came from families with above average incomes so that nutrition, sanitation, and medical care approached the optimal level. Eisenberg and associates (*18*), reporting on a series of 95 patients with salmonellosis seen at the Philadelphia General Hospital noted localized infections in 13 percent of their patients. Many patients in that series were from a lower socioeconomic group, which further sets them apart from the present series of patients. Among 100 infants and children with salmonellosis reported by Clyde (*19*) from Nashville, Tenn., localization occurred in 9 percent. By comparison with these reports, the 69 patients with *S. reading* infection reported had a relatively mild illness. Nevertheless, 53 percent of the patients voiced the subjective impression that their illness was severe.

Several factors serve to indicate that the "epidemic" of *S. reading* infections was a family affair with a common source of infection in the family. Of the 252 family members exposed in the homes of index cases, 30 percent were either positive for *S. reading* by stool culture or had suffered from gastroenteritis. Even more striking was the finding that in 42 percent of families, at least one secondary illness had occurred. Also, in 55 percent of the 33 families cultured (table 7), at least one contact was found to be positive for *S. reading*. In 55 percent of the 65 exposed families, at least one person was bacteriologically positive or had developed gastroenteritis.

As shown in table 7, mothers were more frequently positive for *S. reading* than were fathers. The significance of this finding is not entirely clear. The mother might be infected or reinfected from her children, who are physically closer to her than they might be to

the father. However, the mother would also be the first member of a family to come in contact with an infected foodstuff. If she prepared this item for cooking, perhaps as with poultry, she might infect herself and other family members by handling salad, the bread plate, the baby's formula, or a host of other items. Necessarily, this is only conjecture.

Two infants aged 2 weeks and one infant 1 week old developed diarrhea, which was later proved to be due to *S. reading* The mother of one infant had been ill with gastroenteritis prior to delivery, while the mothers of the two other infants were positive for *S. reading* sometime later. As has been demonstrated previously (*20*, *21*), these mothers may have infected their newborn infants during parturition. Since asymptomatic carriers of *S. reading* appeared to be common among family contacts (table 6), inadvertent infection of the more susceptible infants and young children may have occurred frequently.

Among the younger patients in this series, a problem was apparent because of the unusually long duration of the convalescent carrier state. Where a series of cultures negative for *Salmonella* was required before hospital discharge, hospitalization was often unduly prolonged. The difficulty and expense of keeping an asymptomatic child hospitalized usually resulted in discharge due to desperation before the required number of negative cultures were obtained. Realistically, greater emphasis should be placed on the child's clinical course in determining the need for hospitalization than on the duration of stool cultures positive for *Salmonella.* Rubinstein and associates (*22*) have noted the long duration of carrier states with various *Salmonella* types. In a followup study of an outbreak of *S. oranienburg* in a nursery for the newborn Rindge has also noted the long duration of the carrier state in infants (personal communication). Among infants in families without other *S. oranienburg* positive members, the mean duration of the carrier state was about 7 months. Szanton (*23*) reporting the 40-month followups on this same series of 33 infected infants found, for the total group, that the carrier state persisted for an average of about 14 months. The futility of applying standard "three negative stool" requirements to young children hospitalized with salmonellosis is emphasized by these findings. Perhaps parents of these children might be instructed in the necessary home precautions so that, when the clinical condition permits, a child could be discharged from the hospital. Subsequent stool specimens could then be obtained at home.

Summary

More than 300 acute sporadic cases of salmonellosis due to *Salmonella reading*, a previously extremely rare serotype, were reported during a 12-month period. Intensive study of food histories from patients in various parts of the country failed to reveal the presumed common source responsible for this "outbreak." A possible but unknown relationship between infected animal feeds and poultry to the present *S. reading* problem is discussed.

Detailed clinical and laboratory data are presented for 69 salmonellosis patients. The absence of complications in this group is noted and discussed. Among 252 exposed family members, 30 percent had either been ill or were found positive for *S. reading* by stool culture. In 55 percent of 65 families studied at least one member had gastroenteritis or was positive for *S. reading.*

REFERENCES

(*1*) MacCready, R. A., Reardon, J. F., and Saphra, I.: Salmonellosis in Massachusetts. A sixteen-year experience. New England J. Med. 256: 1121–1128, June 13, 1957.

(*2*) Lovell, R.: Food poisoning in man, with special reference to meat and meat products. Royal Soc. Promotion Health J. 77: 85–91, March 1957.

(*3*) Medical Research Council, Great Britain: Bacteriology of spray-dried egg with particular reference to food poisoning. Special Reports Series 260. London, His Majesty's Stationery Office, 1947.

(*4*) Abramson, H., Greenberg, S., Plotkin, S., and Oldenbusch, C.: Food poisoning in infants caused by egg yolk powder. A. M. A. Am. J. Dis. Child. 87: 1–6, January 1954.

(*5*) Wethington, M. C., and Fabian, F. W.: Viability of food-poisoning staphylococci and salmonellae in salad dressing and mayonnaise. Food Res. 15: 125–134, March–April 1950.

(*6*) Hall, I. C., and Van Meter, J.: The bacteriology

of peanut butter and the germicidal action of *Arachis* oil. Am. Food J. 13:463 (1918). *Cited in* Tanner, F. W.: The microbiology of foods. Champaign, Ill., Garrard Press, 1944, p. 1006.

(7) Shaffer, M. F., Milner, K. C., Clemmer, D. I., and Bridges, J. F.: Bacteriologic studies of experimental *Salmonella* infection in chicks. II. J. Infect. Dis. 100:17–31, January–February 1957.

(8) Galton, M. M., Mackel, D. C., Lewis, A. L., Haire, W. C., and Hardy, A. V.: Salmonellosis in poultry and poultry processing plants in Florida. Am. J. Vet. Res. 16:132–137, January 1955.

(9) Rohde, R., and Bischoff, J.: Die epidemiologische Bedeutung salmonellainfizierter Tierfuttermittel (insbesondere Knochenschrot und Fischmehl) als Quelle verschiedener Lebensmittelvergiftungen. Zbl. Bakt. 159:145–164, February 1956.

(10) Adam, W.: Über die Herstellung und Pasteurisierung von Fischmehl im Hinblick auf dessen Gehalf an Salmonellabakterien. Berl. Münch. tierärztl. Wschr. 70:49–51 (1957).

(11) Handloser, M.: Epidemiologische Beobachten bei einer Masseninfektion durch *Salmonella blockley*. Arch. Hyg. 140:569–580, December 1956.

(12) Seeliger, H. P. R.: Salmonellosen in Deutschland (1953–1955). Arch. Hyg. Münch. 140:499–528, November 1956.

(13) Walker, J. H. C.: Organic fertilizers as a source of *Salmonella* infection. Lancet 273:283–284, Aug. 10, 1957.

(14) Thal, E., Rutquist, L., and Holmquist, H.: *Salmonella* isolated from animals in Sweden during the years 1949 to 1956. Nordisk Veterinaermedicin 9:822–830 (1957).

(15) Abelseth, M. K., and Robertson, H. E.: *Salmonella typhimurium* infection in 1952 turkey flocks. A public health hazard. Canad. J. Pub. Health 44:263–265, July 1953.

(16) Edwards, P. R.: *Salmonella* and salmonellosis. Ann. New York Acad. Sc. 66, art. 1:44–53, August 1956.

(17) Seligmann, E., and Hertz, J. J.: *Salmonella* infections. Report of 37 cases observed at Beth Israel Hospital, New York, in the past four years. Ann. Int. Med. 20:743–751, May 1944.

(18) Eisenberg, G. M., Palazzolo, A. J., and Flippin, H. F.: Clinical and microbiological aspects of salmonellosis; a study of ninety-five cases in adults and children. New England J. Med. 253:90–94, July 1955.

(19) Clyde, W. A., Jr.: Salmonellosis in infants and children. A study of 100 cases. Pediatrics 19:175–183, February 1957.

(20) Neter, E.: Observations on the transmission of salmonellosis in man. Am. J. Pub. Health 40:929–933, August 1950.

(21) Ocklitz, H. W., and Schmidt, E. F.: Enteropathogenic *Escherichia coli* serotypes. Infection of the newborn through mothers. Brit. Med. J. No. 5052:1036–1038, Nov. 2, 1957.

(22) Rubinstein, A. D., Feemster, R. F., and Smith, H. M.: Salmonellosis as a public health problem in wartime. Am. J. Pub. Health 34:841–856, August 1944.

(23) Szanton, V. L.: Epidemic salmonellosis. A 30-month study of 80 cases of *Salmonella oranienburg* infection. Pediatrics 20:794–808, November 1957.

Bertha Adkins Named Under Secretary

Bertha Sheppard Adkins was named Under Secretary of Health, Education, and Welfare on July 21, 1958, succeeding John Alanson Perkins who resigned. She had been assistant chairman and head of the women's division of the Republican National Committee since 1953.

From 1934 to 1942 Miss Adkins held the post of dean of women at Western Maryland College and during the following 4 years served as dean of residence at Bradford Junior College in Massachusetts. On graduation from Wellesley College in 1928, Miss Adkins taught in private schools until 1932. She holds a master of arts degree from Columbia University conferred in 1943 and is a life member of Pi Lambda Theta, an honorary society for women in education.