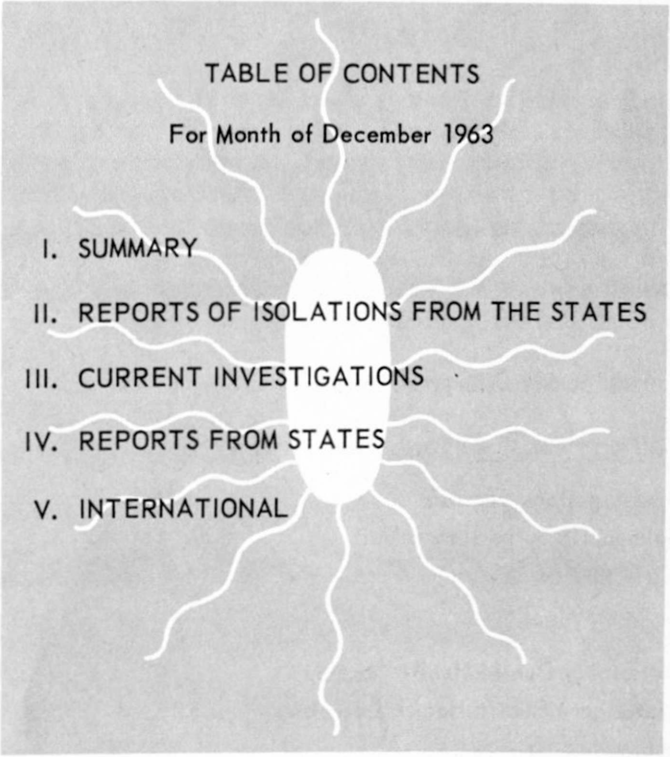
REPORT NO. 21
FEBRUARY 3, 1964

COMMUNICABLE DISEASE CENTER

SALMONELLA

EILLANCE



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For Month of December 1963

U. S. Department of Health, Education, and Welfare/Public Health Service

PREFACE

Summarized in this report is information received from State and City Health Departments, university and hospital laboratories, the National Animal Disease Laboratory (USDA, ARS), Ames, Iowa, and other pertinent sources, domestic and foreign. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Please address to: Chief, Salmonella Surveillance Unit, Communicable Disease Center, Atlanta, Georgia, 30333.

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I. SUMMARY

The 1,439 isolations of salmonellae from humans during the final month of 1963 represented a slight increase over the 1,381 figure for a comparable period during November. During December 66 different serotypes were reported and accounted for an average weekly total of 360 isolations from human beings.

From nonhumans, 413 isolations of 49 different serotypes were reported during December.

Included in this month's report is a summary of the investigation of a community-wide outbreak of S. typhimurium in Vermont.

Two interesting articles were abstracted and appear under Special Reports - one dealing with pullorum disease and the other summarizing a report of a waterborne outbreak of salmonellosis and shigellosis in Morocco.

The international section reports on typhoid fever in Europe, and State Reports include a family outbreak of typhoid fever, and an outbreak of S. montevideo in Wisconsin.

II. REPORTS OF ISOLATIONS FROM THE STATES

A. Human

During December, 1,439 isolations of salmonella were reported for an average weekly total of 360. This figure represents a slight increase over the average weekly total of 345 reported during the previous month (See Figure 1). While the data presented in Figure 1 appear to portray a seasonal pattern for the reported incidence of salmonellae in human beings, they also hint that there is probably an increasing trend. Most of the available data on salmonellae indicate that this is true and that salmonellosis is indeed becoming a more impressive public health problem.

The seven most frequently reported serotypes during December were:

No.	Serotype	Number	Per Cent	Standing Last Month
1	S. typhimurium	388	27.0	1
2	S. derby	175	12.2	2
3	S. heidelberg	101	7.0	3
4	S. newport	86	6.0	6
5	S. infantis	85	5.9	5
6	S. enteritidis	60	4.2	4
7	S. montevideo	42	2.9	10
	Total	937	65.1	

Total salmonella isolated (December) 1,439

The salmonella serotypes listed above accounted for 937 (65.1 per cent. of the 1,439 isolations reported during December while they represented only 10.6 per cent of 66 different serotypes reported. With only a few minor exceptions, the seven serotypes listed appear in an order and relative frequency which would be expected based on past experience. While S. derby remained in the same position on the most common serotype list, the percentage of S. derby isolations increased by 3.0 per cent to 12.2 per cent (See Table VII). This is a reversal of the apparent trend in the proportion of isolations of this type since July, which was the peak month of the interstate hospital associated outbreak attributed to S. derby. The current increase appears to be concentrated primarily in Illinois, Ohio, Pennsylvania, New Jersey, New York, and Massachusetts where 26.9 per cent (139 of 516) of the reported isolations are S. derby compared to 3.9 per cent (36 of 923) in the remainder of the country. Certain areas in these states appear to have been well seeded with S. derby by the outbreak and their problem is not likely to dissipate in the near future.

During December, 314 (21.8 per cent) of the 1,439 individuals reported with salmonella isolated had other members of their families simultaneously positive for salmonella. The family attack rate for this month does not represent a departure from those computed for past months. In each and every month since the beginning of salmonella surveillance, 1-4 years has been the modal age of individuals reported as harboring salmonella. December is no exception to this rule nor the rule that approximately 50 per cent of the individuals reported each month have been male (See Table IV).

B. Nonhuman

During December, 413 salmonella isolations were reported from nonhuman sources, a considerable increase from the previous month's total of 326. It was noted in report Number 20 that the number of human isolations for November was considerably lower than usual; this was true also of the nonhuman isolations. There were 49 serotypes and 3 isolations identified only as to group.

The seven most commonly reported serotypes for December were:

	No.	Per Cent	Standing Last Month
1. S. typhimurium S. typhimurium var. copenhagen	101	24.5	1
2. S. heidelberg	71	17.2	4
3. S. infantis	32	7.7	2
4. S. pullorum	22	5.3	Not Listed
5. S. montevideo	15	3.6	Not listed
6. S. newport	12	2.9	Not Listed
7. S. cholera-suis var. kunzendorf	12	2.9	Not Listed
	265		

These 7 types comprise 64.2 per cent of the total isolates reported. The four species of animals from which the greater number of isolates were reported in order of frequency are chickens 134 (32.4 per cent);

turkeys 123 (29.8 per cent); bovine 50 (12.1 per cent); and porcine 20 (4.8 per cent). Altogether these 4 sources represent 79.2 per cent of all nonhuman isolations reported in December.

S. typhimurium and S. typhimurium var. copenhagen retain the usual constancy with 24.5 per cent of all types reported. It is rare that any other type has exceeded 10 per cent in a given month. The appearance of 17.2 per cent S. heidelberg isolations is considered unusually high. Fifty-eight of the 71 cultures of this type reported were isolated from turkeys with the remainder from chickens. The distribution of reported isolates is wide encompassing 9 states with the greatest number (54) reported from California and Minnesota. Reported human S. heidelberg isolations are generally the second or third most prevalent type. The hypothesis that poultry is a primary source for human salmonellosis is supported by these observations. It would be difficult to draw the same analogy with many of the other reported types and sources. An exception would be the rarely reported S. dublin which remains in cattle in the Western States and most human isolates reported are from these States as well.

CURRENT INVESTIGATIONS

A. Island Pond, Vermont

Community Outbreak of Salmonella typhimurium. Dr. Robert B. Aikens, State Health Commissioner; Dr. Linus J. Leavens, Director, Division of Communicable Disease Control, Vermont Department of Health; Dr. K. White, University of Vermont; Dr. Nicholas Wright, EIS Officer assigned to the State of Vermont; Dr. Charles E. McCall, EIS Officer and Mr. James Goldsby, Statistician, CDC

During late October and early November, 1963, a large number of persons in Island Pond, Vermont, experienced symptoms of fever, headache, vomiting, abdominal cramps, and diarrhea, which lasted between one day and two weeks. There was no mortality. Six patients required hospitalization. Seven out of eight stool cultures yielded Salmonella typhimurium - all phage type 1 a.

A door-to-door survey of Island Pond was conducted on November 26 and 27. Sixty per cent of the population of the town was included in the survey, representing 776 out of a total of 1300 persons living in the village (based on 1960 census figures). The forty per cent not seen represented those persons not at home, call backs not being attempted. No similar outbreak was found when surrounding communities were visited.

The attack rate based on the number of index cases (first case within a family) for the total number of people interviewed was 14.3 per cent, and that based on all cases was 25.4 per cent. Projecting the latter attack rate upon the total population, approximately 325 cases occurred within the village.

The epidemic curve of index cases revealed that the cases occurred between October 5 and November 30, with the peak during the first week in November. Using 6 to 48 hours as the average incubation period for

Salmonella typhimurium, this curve suggested that the agent responsible for the outbreak remained within the population either continuously or intermittently for at least 4 weeks.

Age specific attack rates for index cases revealed that significantly lower attack rates existed in those under 1 year of age and in the 30-39 year age group. The lower attack rate occurring in those less than 1 year, a group more susceptible to salmonella infections than the adult, suggested that this group had less contact with the vehicle responsible for the epidemic. Significantly higher attack rates occurred in those between the ages of 1 and 9 and in the 50-59 year age group. Comparing this curve with the curve based on nationwide salmonella surveillance experience, it was immediately evident that the adult population had a much higher attack rate than expected.

Food histories suggested that within the limits of the study, either milk or water was responsible for the outbreak. The people in Island Pond received their milk from one distributor, supplied by 4 farms. The milk was pasteurized and distributed in bottles and cartons. Twelve samples of milk were cultured during the epidemic. Coliform organisms were recovered in 4 out of the 12 samples; however, only one of these could be accepted because the other samples were not delivered to the state laboratory in the original containers. This sample contained 102 coliform organisms per milliter. Salmonella organisms were not found. Phosphatase studies were performed on four milk samples. Two of these revealed that approximately 0.5 per cent of the samples tested was unpasteurized. This was not considered significant by the members of the State Department of Agriculture who tested the milk. None of the four farms supplying milk for pasteurization reported illness within their herds during October and November, and stool cultures taken from 100 out of a total of 112 cows from these four farms were negative for salmonella. Six families consumed raw milk from these four farms. Two of the six families reported an illness during early November in one member of the family. Symptoms consisted of fever, abdominal cramps, but no diarrhea; cultures were not obtained. Both of these families obtained their milk from the same farm.

Families who used the local milk, but who lived outside the village were studied in an effort to find the population that used the village milk but did not have contact with the village water, the other suspected item. Forty-one people meeting these criteria were questioned. No cases of gastroenteritis were found within this group. The difference was significant. This, of course, assumed that the milk distributed to this community was in all ways similar to that distributed within Island Pond.

The water used in Island Pond was derived from two untreated sources on opposite sides of the town. The water from each source flows into the town along one pipe which joins in the center of the town; therefore, the two sources freely communicate. During the first 9 months of 1963, approximately 7 routine samples of water had been submitted to the State Laboratory for culture. None of these samples had been positive for coliform organisms. In the early part of November, 8 out of a total of 24 samples collected over a three-week period were positive for coliform organisms. Of these, only 2 contained greater than a hundred organisms per milliliter. No distinction between fecal and soil coliform organisms was made; however, subsequent samples have revealed fecal coliforms.

Sources of the contaminated samples were scattered throughout the village. No variation in pressure had been noted within the water system in late October and early November and no cross connections or "suck-back" was found during an inspection by sanitary engineers.

It was felt that if water were the vehicle of infection, onset dates and attack rates might vary along the water line with a higher attack rate and earlier dates of onset occurring on the side of the contaminated source or at the point of contamination. No significant differences were found.

Evidence for and against milk and water was weighed separately, for *Salmonella typhimurium* was recovered from neither. Milk, although an uncommon source of salmonella outbreaks, has been definitely incriminated in a number of epidemics of salmonellosis. Most of these have been caused by *Salmonella typhimurium* and resulted from drinking contaminated raw milk from sick cows (1). Out of 43 milkborne salmonella epidemics in the United Kingdom between 1942 and 1962, only five were traced to contamination by symptomless cows (1). The majority of these outbreaks were the result of raw milk being contaminated by cow feces. It is distinctly unusual to find an asymptomatic cow excreting salmonella organisms in its milk. Although the lack of reported illness within the supply herds before and during this epidemic and negative rectal cultures obtained from the cows weighed against milk as the vehicle of infection, it did not rule it out.

Two other facts were also against milk as the agent responsible for this outbreak, but again neigher was conclusive. First, no cases of gastroenteritis occurred in the 41 rural people questioned who used local milk but who did not use local water. This was statistically significant data (P is less than 0.05). Secondly, if milk were responsible for the outbreak, one would have expected that the age specific attack rates would have been much higher in the younger age groups, for they usually drink more milk. A subsequent survey confirmed this supposition, revealing that among index cases, the amount of milk consumed in the 1-20 year group was approximately twice that of those over 20. In this outbreak, attack rates were only slightly higher in the 1 to 10 year age group.

On the other hand, evidence tending to incriminate milk was also threefold. First, milk was a more likely source of salmonellosis than water based on literature dealing with previous outbreaks of salmonellosis. Secondly, illness consisting of fever and abdominal cramps, occurred in two families drinking the raw milk from one of the four suppliers; however, neither of these cases had diarrhea and neither was cultured. Thirdly, there was evidence that the milk was incompletely pasteurized during the epidemic, although chemical determination was within the range that was considered legally acceptable. In addition, one milk culture was definitely contaminated with a significant number of coliform organisms.

Water as a source of salmonella outbreaks other than typhoid fever has been extremely rare (2, 3, 4). Another point against water was that if water were the source, one might have expected variations in geographical attack rates and epidemic curves within areas along the two courses of water, although they communicated in the center of town. Such was not the case; however, since communication between the two water supplies did exist, equal rates could have occurred if the contamination were great enough or if for some reason one source was supplying the entire village. It is also true that in a mobile population, geographical attack rates based on place of dwelling may give false information because people may come in contact with the etiological agent at a locale other than their own home.

Evidence in favor of water as the agent responsible for the outbreak was twofold. First, only one index case denied using town water, whereas ten index cases denied using local milk. Secondly, coliform counts of water samples taken within the town were positive for the first time in 9 months during this epidemic. Although initial samples did not distinguish between fecal and soil coliforms, subsequent samples revealed fecal coliform organisms. It would not be unusual to miss recovering Salmonella typhimurium from the water unless cultures were specifically made for this organism.

Thus, there was evidence both for and against milk and water. Definite distinction as to which one of the two caused the epidemic could not be made, although the weight of evidence favored water. In spite of the lack of a definitive answer, state health officials plan to (1) continue culturing water samples, (2) frequently recheck the milk pasteurization process and to take environmental cultures of the dairy, including stool cultures from milk handlers. They recommended that a chlorinator for the public water supply be installed as soon as possible.

References:

(1) Know, W. A., et al. A Milkborne Outbreak of Food Poisoning Due to Salmonella heidelberg. J. Hyg., Camb. 61, 175, 1963.

(2) Dauer, C. C. and Sylvester, G., 1956 Summary of Disease Outbreaks. Public Health Reports, 72: 735, 1957.

(3) Dauer, C. C. and Davids, D. 1958 Summary of Disease Outbreaks. Public Health Reports, 75: 1025, 1960.

(4) Metcalf, Lt. H. I. (MC USN) Salmonellosis and Shigellosis, United States Navy Medical Newsletter, 42: 7, 1963.

REPORTS FROM STATES

A. Missouri

Outbreak of Gastroenteritis Due to S. montevideo Following a Factory Luncheon. Dr. E. A. Belden, Communicable Disease Consultant, Missouri Division of Health.

Several employees of a shoe factory in a small Missouri town developed gastroenteritis on November 27, 1963. Most consulted their physicians immediately because of severity of symptoms, and thus state health officials were promptly notified of a possible outbreak. Investigations revealed that at least 48 employees of a local shoe factory had developed vomiting, diarrhea, chills, fever, headache, and generalized muscle aches 1 1/2 to 15 hours following their factory's pre-Thanksgiving banquet. S. montevideo was identified as the infecting organism.

The shoe factory employs over 500 persons of which 90 per cent are female. The employees reside over a rather wide and scattered geographic area. There are no facilities for cooking or serving food at the factory and thus the pre-Thanksgiving banquet was an unusual event. Of the dozen divisions in the plant, each prepared its own dinner. The employees prepared the foods at home and brought them to the factory, where portable ovens had been set up to heat the food prior to serving.

It was learned that all primary cases occurred among members of just one division at the factory. There were 84 individuals who ate that division's meal; 48 of these became ill. Average duration of illness was 5 days, and there were no fatalities.

Because of the multiplicity of foods and food sources, a precise evaluation of food histories to determine vehicle of infection was not possible. However, because of incrimination of turkey and dressing as agents responsible for similar outbreaks, the circumstances surrounding their preparation and use were investigated. Two women, one retired, had each cooked a turkey and prepared dressing for this particular dinner. Both stated that the foods were well cooked and properly stoved before the dinner. In both instances, the dressing was prepared with bread, seasoning, beaten raw eggs, meat from a boiled hen, and juice from the cooked hens and turkey giblets. The dressing was cooked apart from the turkeys. One woman brought her turkey and dressing from home just before the dinner. The other took hers to work early in the morning and kept it in a portable electric oven turned on "low" until noon. The husbands of both these women ate some of their wive's dressing at home and neither became ill. A portion of turkey and dressing was found at the home of each of two luncheon guests several days later. Culture of both of these specimens grew S. montevideo. Because of mixing at the meal, the source of the specimens obtained for culture could not be identified.

To date, stool specimens obtained from 10 symptomatic patients have grown S. montevideo on culture.

"Based on the information available, the investigators are of the opinion that one or both of the dishes of dressing were inadvertently contaminated by transfer of the salmonella from the surface of the eggs into the dressing and that the dressing, because of its volume, was not sterilized in the course of cooking. Admittedly, there were other food items which could have been the source of these infections, but it is unlikely that there was a sufficient quantity of any one of them to have infected so many people."

Editor's Comment:

The reasons for implicating the surface of eggs as the source of salmonellae in this outbreak are not entirely clear. In similar outbreaks the turkeys themselves have frequently been shown to be the source of infection.

B. Virginia

Family Outbreak of Typhoid Fever. Dr. J. B. Kenley, Director, Bureau of Epidemiology, Virginia State Department of Health.

On June 11, 1963, an 8-year-old white female of Rockbridge County, Virginia, became ill with severe headache. On June 11, 1963, she developed abdominal pain, nausea, vomiting, high fever and chills. On June 12, she was admitted to the hospital with a working diagnosis of acute appendicitis which was ruled out on surgical consultation and by subsequent laboratory procedures. A clinical diagnosis of typhoid fever with laboratory confirmation was established. In the course of the epidemiological investigation, it was learned that a family meeting had taken place May 26, 1963 with 14 members present. Stool cultures on all present at this meeting were negative except for the mother of the patient (age 41), and the patient's five-year-old brother.

The brother had been sick for one day when he experienced one episode of vomiting without chills or fever. Since the patient's stools were positive for S. typhi, he was assumed to be a subclinical case that would not have come to light if the epidemiological study had not been conducted.

The mother gave no history of having had typhoid fever in the past and for a time she was considered a second subclinical case. Subsequent interviews revealed that approximately eighteen months ago she experienced a severe illness with headache, chills, and fever of four to five days' duration. This episode has been considered to be a possible case with establishment of the carrier state since she continues to excrete S. typhi.

This family lives in the area where a known carrier dwells. None of the family had eaten at this home nor had any food been prepared by this known carrier for the family.

Salmonella typhi was found in fecal specimens from the mother collected in June, July, August, and October. An isolate from the specimen collected June 20 was phage type 1 a. A specimen collected from the brother on June 18, 1963 showed S. typhi, phage type 1 a. A specimen from the index case collected June 17 showed S. typhi phage type 1 a. The known carrier is an excretor of phage type 1 a as well as phage type D 6 and W forms.

SPECIAL REPORTS

A. Waterborne Shigellosis and Salmonellosis - Morocco. Lt. H. L. Metcalf, MC, USN, Station Hospital, Naval Air Station, Port Lyautey, Morocco in U. S. Medical Newsletter, Vol. 42, No. 9, November 1, 1963, and Captain Jack W. Millar, Director, Preventive Medicine, Division Department of Navy, Washington, D. C.

During the period July 1, 1962 through January 1, 1963, a large number of confirmed cases of gastrointestinal salmonellosis and/or shigellosis were seen as out-patients at the Station Hospital, Port Lyautey, Morocco. Of a total of 481 cases checked by culture, salmonellae were isolated from 33 and shigella from 136, for a total of 169 cases with known etiology.

Symptoms experienced by these individuals included vomiting, nausea, diarrhea, abdominal cramps and fever as high as 101° for a duration of

24 to 48 hours. Several individuals were hospitalized because of dehydration and one death was recorded during the outbreak.

Most cases occurred among wives and children of service personnel living off base in Kenitra, a town adjacent to the air station and situated at the delta of one of Morocco's largest rivers.

Early in the investigation of the outbreak, the Kenitra water supply came under suspicion. Of the 169 bacteriologically confirmed cases, 91 per cent occurred in families who used the water supply in Kenitra. The remaining 15 cases involved individuals who had lived on the base and were believed to have acquired their illness either by eating in restaurants in Kenitra or by contact with infected patients at the base. The Kenitra water supply was obtained from either surface supply or shallow wells. The river was always considered to be contaminated, as were many wells. The latter were not capped or covered and may have been drilled at the lower edge of farm land slopes or in valleys. The water was inadequately chlorinated and the water and sewer mains ran in the same underground channels, the sewer pipes having only mud stills at their joints. Often the water in the American occupied villas was grossly silty or smelled of sewage. Local sanitary practices were meager, animal and human defecation taking in any convenient farm land or vacant field. Little rain fell between March and November, 1962; from November 1 through January 15, 1963 (during which the peak number of cases occurred) 18.42 inches of rain fell, which is more than twice the average rate of 8.77 inches for that period.

Water specimens randomly selected were obtained from 58 homes in the European section of Kenitra, where most off-base American homes are located. Results of the bacteriological analysis of specimens are presented below:

Water Specimens - Kenitra (Oct. 13 - Dec 8, 1962)

Organism	Number Positive Cultures
Salmonella	5
Shigella	18
Salmonella and Shigella	22
Shigella and *E. coli*	3
E. coli	1

Water specimens tested for residual chlorine content, regardless of the original source, were negative. There was no distinct geographic distribution of the positive cultures and no particular water sources could be excluded.

New residents were told that the water supply in Kenitra must be considered contaminated and that it must be chlorinated before use for drinking, cooking, brushing teeth or making ice cubes. New residents were advised to carry water for such purposes from the naval base to home.

A questionnaire was given to 29 randomly selected cases of salmonellosis or shigellosis to evaluate health conditions and customary sanitary practices within the family. Results obtained from these questionnaires indicated that at least two breaks in recommended health practices occurred in each case. The information on basic sanitary practices was then published in hope that re-emphasis would serve to reduce the incidence of cases.

Editor's Comment:

The reference describing this outbreak was alluded to under Current Investigations. Two points concerning this epidemic are of particular interest. First is its rarity, and secondly is the fact that the outbreak appeared to have occurred during the heavy rains which followed a period of drought. The explanation usually given for this phenomenon is that during a period of drought contaminated water becomes highly concentrated and then is disseminated when it is spilled over during heavy rains.

B. **Is Eradication of Pullorum Disease Realistic?** Dr. H. Van Roekel, Journal American Veterinary Medical Association, 1 January, 1964.

The author points out that eradication of pullorum disease is feasible. Support for this thesis lies in the decreased incidence occurring in 14 northeastern states under a voluntary serological testing program of chickens.

In these 14 states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia and West Virginia), the number of breeding birds tested annually has remained relatively constant over a 13 year period (1950 - 1962) with a drop of per cent infected from 0.2 to 0.01. Similar data exists on a national level with the exception of a slightly higher percentage of reactors.

The author notes that the time appears appropriate for considering and attempting area eradication with state and federal programs supplanting the present voluntary program.

. International

Typhoid Fever in Europe. Dr. Reimert T. Ravenholt,
Epidemiologic Consultant, Division Foreign Quarantine USPHS
American Embassy, Paris, France.

The recent epidemic of typhoid fever from Zermatt, Switzerland, dramatizes the hazard which this disease still poses for travelers to many parts of Europe.

In the absence of an official Swiss report of that incident, the summary of known facts are that an epidemic of Type E_1 typhoid fever, consisting of more than 300 cases, occurred among the roughly 8,000 persons who were in Zermatt from February 13 to 22, 1963. By onset of illness, the epidemic began on or about February 20, reached a peak on March 3 and tailed off to the end of March. By country, the number of human cases is as follows: The Swiss total varies, depending upon the degree of proof one accepts, from 175 cases confirmed by isolation of Salmonella typhi to 212 probable cases based upon all clinical, epidemiological and laboratory findings. As of April 30, there had been reported in addition 68 cases in England and Wales, 5 in Scotland, 23 in West Germany, 11 in the U.S.A., 13 in France, 5 in Holland, 4 in Italy, 3 in Austria, 1 in Belgium, 1 in Denmark, and 1 in Canada - for a total of approximately 347 cases, including 2 fatalities in Switzerland and 1 in England.

These infections were undoubtedly derived from a common source in Zermatt, probably the village water supply - as indicated by the large and explosive epidemic; the generalized geographic distribution of the cases according to place of residence in Zermatt; the recollection of tap water consumption by cases; the known inadequacies of the water system, and the lack of an alternative theory demonstrable epidemiologically. The exact means of contamination of the probable vehicle, the Zermatt water supply, has not been ascertained. It is known that hundreds of people, most of whom were Italian laborers on various hydroelectric projects, inhabited the watersheds from which the Zermatt water supply was derived. Sanitary facilities for waste disposal were available to many of these people, but it is unlikely that all of their waste was adequately disposed of. In the past, and more particularly in March, bacteriological examination of water entering Zermatt revealed a high content of coliform organisms, and chlorination was inadequate much or all of the time. In addition to the possibility that the outbreak may have been derived from contamination of the watershed and inadequate chlorination, the possibility remains that it may have been derived from contamination within the distribution system. Investigations during March revealed at least one defect in a Zermatt water main. Swiss authorities are continuing their investigation.

Propagation of infection was entirely or almost entirely limited to the period February 13 to 22 and by the time the outbreak was recognized on March 10, no appreciable change in the ultimate number of cases could be effected.

Only one secondary case was recognized among family contacts of Zermatt typhoid cases in Switzerland and one in Britain, which emphasizes the overwhelming dependence of typhoid upon an ingested vehicle for epidemic propagation.

The population at risk in Zermatt during February can only be approximately ascertained; in addition to the roughly 2,000 villagers and transient workers (1,200 Italians), a rapidly changing population of thousands of visitors crowded the resort. The number and nationality of the visitors can be roughly estimated from the published figures for the preceding year (Table 1).

Table 1

Hotel Guest-nights in Zermatt during February, 1962

Nationality of Guest	Number Guest-nights
Switzerland	20,613
North America	9,472
Belgium	2,416
Italy	2,361
Netherlands	1,365
Austria	584
Luxembourg	265
South America	133
Asia	121
Africa	66
Foreign Total	54,732
TOTAL	75,345

The impact of the Zermatt epidemic upon Western European typhoid occurrence is discernable in Table II. It obviously contributed significantly to the yearly total in lower incidence northern countries, such as the United Kingdom, Denmark and the Netherlands, but the Zermatt cases were an insignificant addition to usual occurrence in Italy, France, Germany and Austria.

Typhoid is highly endemic in large areas of Spain, Italy, Portugal, Yugoslavia, and Greece. In central Europe - France, Czechoslovakia, Austria, Germany and Switzerland - it poses a changing and often difficult to quantitate hazard. In these countries, the water supplies of major municipalities are dependably potable, but in smaller villages and perhaps especially resorts, rapid fluctuations in populations and other conditions may suddenly impair water quality.

At least for the present, it would seem desirable to continue recommending immunization for typhoid for American travelers to Southern and Central Europe, and, more importantly, advise them to drink bottled water (as most Europeans do) when visiting resorts and villages where the water is of questionable quality.

Table 2

Typhoid Fever in Principal Western European Countries During 1961*

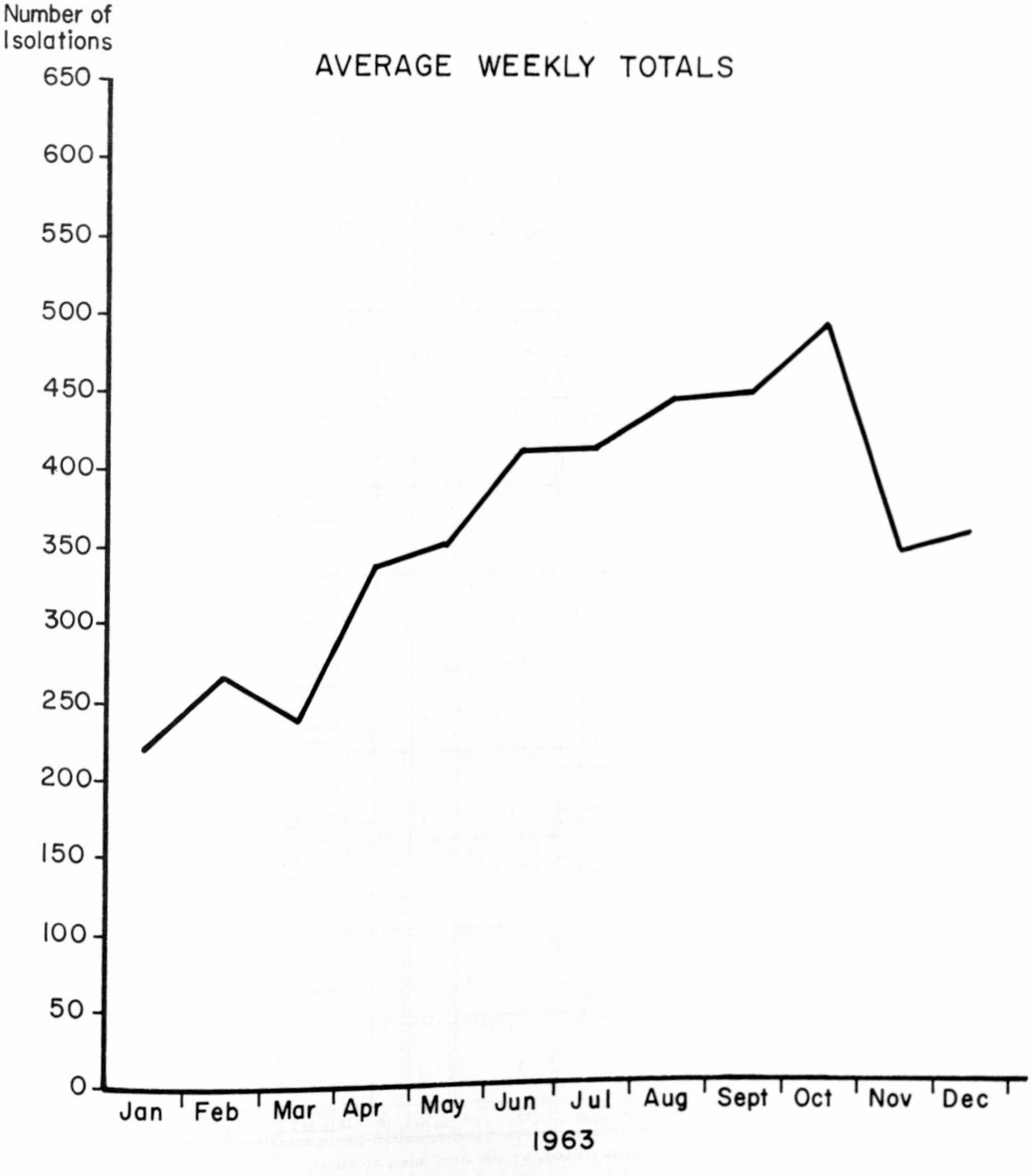
	Cases	Deaths	Cases per 100,000 pop.	Deaths per 100,000 pop.
Austria	235	12	3.32	0.169
Belgium	84	--	0.92	--
Czechoslovakia	793	15	5.81	0.110
Denmark	4	0	0.09	0
Finland	62	--	1.40	--
France	2,102	44	4.68	0.098
Germany (West)	1,347	--	2.42	--
Greece	1,316	21	15.82	0.252
Irish Republic	13	0	0.45	0
Italy	14,420	--	29.21	--
Netherlands	5	0	0.04	0
Norway	3	0	0.08	0
Portugal	2,147	49	23.57	0.538
Spain	9,082	61	30.18	0.203
Sweden	16	0	0.21	0
Switzerland	62	8	1.18	0.152
United Kingdom	108	1	0.18	0.002
Yugoslavia	3,267	26	17.38	0.138

*Figures obtained from respective ministries of health by direct inquiry.

-- Indicates mortality figures not yet available.

Figure I.

REPORTED HUMAN ISOLATIONS OF SALMONELLAE
in the United States



Note: Average weekly totals rather than monthly totals are presented because some months have 5 instead of 4 weeks.

TABLE I

SALMONELLA SEROTYPES ISOLATED FROM HUMANS DURING DECEMBER, 1963

SEROTYPE	REGION AND REPORTING CENTER													
	NEW ENGLAND							MIDDLE ATLANTIC						E
	MAINE	NH	VT	MASS	RI	CONN	TOTAL	NY-A	NY-BI	NY-C	NJ	PA	TOTAL	OHIO
abony										1			1	
alachua														
albany														
amager														
anatum								1				3	4	1
babelsberg														
bareilly										1			1	
berta														
blockley				4		1	5		1	1		2	4	
bovis-morbificans														
braenderup				1			1	1					1	1
brandenburg														1
bredeney										1	1	1	3	
california								1					1	
carno						1	1							
cerro														
chester														
cholerae-suis														1
cholerae-suis var.kun														
cubana											1		1	
derby		1	1	16		7	25	11	26	9	5	46	97	7
dublin														
enteritidis	1			8	1		10	1	5		2	4	12	6
gatow														
give														1
heidelberg				10		3	13	1	1	6	1	9	18	
indiana														
infantis	2			4		1	7	6	4	4	2	4	20	2
javiana														
kentucky														
litchfield				1			1		1				1	
livingstone														
manhattan									1				1	
meleagridis														
miami														
mississippi														
montevideo				1		3	4		2	1			3	
muenchen									1	1		2	4	
new-brunswick														
newington									1				1	
newport				1			1		3	1		4	8	3
norwich														
oranienburg				2	4		6	2	1			2	5	
panama				1			1							
paratyphi B var.java	1						1							
paratyphi B				1			1		1		1		2	
pomona														
poona														
aint-paul				4			4		1	1		3	5	2
an-diego				4			4	1					1	2
chwarzengrund				1			1							2
enftenberg														
eigburg														
ennessee				5		1	6	2		1		1	4	1
hompson				1			1	1	4	3		2	10	
yphi						1	1	1	1				2	3
yphimurium	1		1	26	3	6	37	19	10	4	3	29	65	20
yphimurium var. cop	1			9			10				2		2	
rbana				1			1							
eltevreden														
orthington														1
ntypable Group A														
ntypable Group B										1			1	
ntypable Group C-1	1						1		4				4	
ntypable Group C-2		1					1							
ntypable Group D														
ntypable Group O														
ntypable														
unknown								1					1	
TOTAL	7	2	2	101	8	24	144	49	68	36	18	112	283	54

New York (A - Albany, B - Beth Israel Hosp., C - City)

C E N T R A L		
MICH	WIS	TOTAL
1		2
		1
1		4
1		1
		1
		1
		1
1		1
		1
1		1
2		2
3	1	30
3	10	22
		1
3	2	13
		1
3	1	13
1		1
		1
	1	2
	1	5
		1
	2	19
	1	2
	2	2
		2
	2	7
		5
		2
		3
	1	1
		5
	8	70
		1
		1
		1
	32	227

TABLE I

BY SEROTYPE AND REPORTING CENTER

REGION AND REPORTING CENTER																
WEST NORTH CENTRAL								SOUTH ATLANTIC								
MINN	IOWA	MO	ND	SD	NEBR	KAN	TOTAL	DEL	MD	DC	VA	WV	NC	SC	GA	FLA
											1				2	
																2
									1							4
															2	
													1			
											1					
								2	4						1	
								1	3	1					3	1
	2						2									1
9							9		3	1	4		2		1	8
2		4					6		1		7		3		2	4
													1			4
																3
	1						1				2					
															1	
																1
		12					12	2			2		1		1	
									1							2
													3		3	9
1							1		1				1			12
												2				1
1			1				2		2	1			1			4
																1
																2
2						2	4	1			3					3
		3					3									
		1				1	2		1		5		1			2
16	6	7	7			13	49	2	5	3	4		6		12	19
			1				1									
										7						
										1						
										1						
										2						
										1						
			1				1			3						
31	9	27	10	0	0	16	93	8	22	21	29	2	20	0	28	83

TABLE I

SEROTYPE	REGION AND REPORTING CENTER																		
	EAST SOUTH CENTRAL					WEST SOUTH CENTRAL					MOUNTAIN								
	KY	TENN	ALA	MISS	TOTAL	ARK	LA	OKLA	TEX	TOTAL	MONT	IDA	WYO	COLO	NM	ARI	UTAH	NEV	TOTAL
abony																			
alachua																			
albany																			
amager							32			32									
anatum							2	1	1	4									
babelsberg																			
bareilly								1	1	2									
berta																			
blockley							1			1									
bovis-morbificans																			
braenderup							1			1									
brandenburg																			
bredeney														1					1
california																			
carno																			
cerro																			
chester														3					3
cholerae-suis																			
cholerae-suis var. kun																			
cubana																			
derby									1	1				3					3
dublin																			
enteritidis			1		1				5	5									
gatow							1			1									
give							2			2									
heidelberg		2			2		1		1	2		2				1			3
indiana																			
infantis	1	2	1		4		3	1	1	5									
javiana							3	1	1	5									
kentucky							2			2									
litchfield																			
livingstone							1		1	2									
manhattan							14		1	15									
meleagridis																			
miami																			
mississippi							1			1									
montevideo							4			4									
muenchen								1		1									
new-brunswick																			
newington																1			1
newport		2			2	1	4	1	4	10				3		3			6
norwich																			
oranienburg								1		1									
panama		1			1														
paratyphi B var. java							3			3	1								1
paratyphi B									4	4									
pomona																			
poona									1	1									
saint-paul														3					3
san-diego			1		1														
schwarzengrund														1			1		2
senftenberg																			
siegburg																			
tennessee		1	2		3														
thompson			1		1		1			1									
typhi	1	3			4	1			1	2									
typhimurium		3	3		6	3	6	4	12	25				9					9
typhimurium var. cop																2			2
urbana									1	1							1		1
weltevreden																			
worthington																			
Untypable Group A				1	1														
Untypable Group B				2	2	3				3				2				1	3
Untypable Group C-1																			
Untypable Group C-2																			
Untypable Group D																			
Untypable Group O																			
Untypable																			
Unknown						1				1									
TOTAL	2	14	9	3	28	9	82	11	36	138	1	2	0	25	0	7	2	1	38

TABLE I

ORTING CENTER									
IFIC			OTHER VI	TOTAL	PERCENT OF TOTAL	12 Mo. MONTH TOTAL	% 12 MONTH TOTAL	CDC TOTAL	PERCENT OF TOTAL
LASKA	HAWAII	TOTAL							
				1		1			
		1		1		10			
				-				1	
				32		39			
		8		21	1.5	222	1.2		
		1		1		1			
		1		6		60			
		1		2		64			
		8		27	1.9	358	1.9	1	.7
				1		4		1	
		1		5		56			
				1		4			
	2	13		18		153		1	
				1		11			
				1		1			
				2		6		2	
				5		190		1	
				1		20			
				1		54		1	
				4		39		1	
	7	12		175	12.2	1,620	8.6	10	7.4
		1		1		2			
		1		60	4.2	803	4.3	4	3.0
				1		1			
		1		7		65			
	3	22		101	7.0	1,531	8.2	5	3.7
				1		14			
		13		85	5.9	967	5.2	4	3.0
				11		166		1	
		3		8		63			
		1		3		67			
				2		17			
	8	8		28		192		2	
		3		4		82			
	1	1		2		65			
				1		27			
	1	11		42	2.9	490	2.6	4	3.0
		6		19		266		2	
		1		1		6			
		1		4		47			
		25		86	6.0	1,077	5.8	5	3.7
		2		2		13			
	1	6		35	2.4	538	2.9	4	3.0
	3	5		9		141			
		4		9		173		3	
				12		160			
				-				1	
				1		48			
	2	10		39	2.7	586	3.1	2	1.5
				11		120			
		4		10		147		2	
				2		33		4	
				-				1	
	1	2		29		164			
		1		18	1.3	318	1.7	3	2.2
		4		29	2.0	712	3.8	15	11.1
	2	76		388	27.0	5,439	29.1	44	32.6
				16		172		5	
	1	1		4		32		1	
	3	3		3		46			
	6	7		8		34		1	
				1		4			
				16		292		1	
		2		8		72			
		1		3		49		1	
		1		3		75			
		1		1		3			
		1		2		32		1	
				7		77			
-0-	41	275	- 0 -	1,439		18,701		135	

VI (Virgin Islands)

TABLE II

Reporting Center	Total Number of Isolates Reported	Number of Isolates From Family Outbreaks	Per Cent of Total
Alabama	9	0	0
Arizona	7	1	14.3
Arkansas	9	4	44.4
California	190	67	35.3
Colorado	25	4	16.0
Connecticut	24	1	4.2
Delaware	8	2	25.0
District of Columbia	21	2	9.5
Florida	83	21	25.3
Georgia	28	2	7.1
Hawaii	41	0	0
Idaho	2	1	50.0
Illinois	78	13	16.7
Indiana	10	2	20.0
Iowa	9	2	22.2
Kansas	16	2	12.5
Kentucky	2	0	0
Louisiana	82	11	13.4
Maine	7	0	0
Maryland	22	4	18.2
Massachusetts	101	26	25.7
Michigan	53	19	35.8
Minnesota	31	10	32.3
Mississippi	3	0	0
Missouri	27	12	44.4
Montana	1	0	0
Nevada	1	0	0
New Hampshire	2	0	0
New Jersey	18	1	5.6
New York-Albany	49	6	12.2
New York-Beth Israel	68	7	10.3
New York City	36	8	22.2
North Carolina	20	4	20.0
North Dakota	10	4	40.0
Ohio	54	18	33.3
Oklahoma	11	2	18.2
Oregon	10	2	20.0
Pennsylvania	112	28	25.0
Rhode Island	8	2	25.0
Tennessee	14	0	0
Texas	36	0	0
Utah	2	0	0
Vermont	2	0	0
Virginia	29	5	17.2
Washington	34	13	38.2
West Virginia	2	2	100.0
Wisconsin	32	6	18.8
Total	1,439	314	21.8

TABLE III

Infrequent Serotypes

Serotype	Center	December	12 Month Total*	CDC**	Comment
S. abony	NY-BI	1	1	2	Two previous isolations: One from water in Colorado, one from human in Georgia.
S. alachua	CAL	1	10	14	First isolated from a swine holding pen in Alachua County, Fla., 1962.
S. babelsberg	CAL	1	1	0	Extremely uncommon isolate in USA.
S. bovis-morbificans	MICH	1	4	15	Rare cause of human illness. First isolated in 1894.
S. brandenburg	OHIO	1	4	1	Previous isolations from cases of gastroenteritis occurring in Colorado (1963) and Texas (1955).
S. california	NY-A	1	11	143	Of 143 CDC isolations, 66 from chickens and turkeys, 43 from humans.
S. carno	CONN	1	1	0	First isolated 1957 from meat meal and bone scraps during field study in Great Britain.
S. cerro	GA	2	6	35	Previous isolates from NY, LA, TEX. and VA. Not infrequent isolate from poultry feed ingredients.
S. dublin	CAL	1	2	38	Rare cause of human illness. In U.S. confined primarily to states west of the Rocky Mountains. Commonly isolated from catt other parts of the especially in Brit
S. gatow	LA	1	1	0	Another extremely uncommon isolate in USA.
S. new-brunswick	CAL	1	6	12	Of CDC isolations, 6 from dogs or other carnivore, 3 from turkeys and chickens, 3 from humans.

* Represents 18,696 human isolations of salmonellae reported to the Salmonella Surveillance Unit - January 1 - December 27, 1963.

** Represents approximately 28,000 isolations of salmonellae from all sources between 1947 and 1958.

TABLE IV

Age and Sex Distribution of 1,396 Isolations of Salmonellae Reported for December, 1963

Age	Male	Female	Total
Under 1	63	61	124
1-4 Yrs.	116	82	198
5-9 Yrs.	72	46,	118
10-19 Yrs.	46	68	114
20-29 Yrs.	19	40	59
30-39 Yrs.	13	34	47
40-49 Yrs.	18	25	43
50-59 Yrs.	19	30	49
60-69 Yrs.	14	32	46
70-79 Yrs.	10	26	36
80+	1	12	13
Unknown	280	269	549
TOTAL	671	725	1,396
% of Total	48.1	51.9	

TABLE VI

NON-HUMAN ISOLATES REPORTED BY THE NATIONAL ANIMAL DISEASE LABORATORY AND STATE REPORTING CENTERS BY SER

STATE

LASKA	ARK	CALIF	CONN	FLA	GA	ILL	IND	IOWA	LA	MD	MASS	MICH	MINN	MISS	MO	MONT	NJ	NC	OHIO	ORE	PA	SC	TENN	TEXAS	UTAH	VE
				1																						
									1																	
		3					1																			
													1													
	2	2			2									1											1	
	1	2											2													
																			1							
									1				2													
							7	1										1				2				
1		3											3													
1													3						1		6					
		2																							3	
							1					1	2													
					1									1							1					
	1	35	2		4					3	2		22											1		
							1											1								
	2				1		20				1							1	1			1		1	2	
													1													
										1									1							
1																										
		1											2													
					1	4																				
		4																								
		1		1																						
		1		1		2				3				1	2											
										1			2												1	
													4	1												
		7										1	1									1				
																			1							
	2						1			3			1						1							
													1													
												1														
							1						1													
	1				3	1	7								1			2								
	1												1						1							1
		1			1		2						3													
		1																								
		1						1					5													
		5						1																1		
	1																									
3																										
				1	2		5								1											
	5	21		3	2		15	2				14	16	1		2	1	2	2	1						
							1	2		1		1		2		1					1	1	1			
																			1							
1																										
1																										
		1																								
		2																								
8	16	93	2	7	17	7	62	7	2	12	3	18	73	7	4	3	1	7	10	1	8	5	1	3	7	1

nal Disease Laboratory, Ames, Iowa, and Weekly Salmonella Surveillance Reports from California, Colorado,Connecticut
New York, Ohio, Oklahoma, Rhode Island, Texas, Virginia, and Washington.

TABLE VII

Salmonella derby Isolations and Total Salmonella Isolations Reported by Month*

	Total Salmonella Isolations	S. derby Isolations	Per Cent of Total
1962 November	922	18	2.0
December	794	16	2.0
1963 January	1,111	30	2.7
February	1,059	22	2.1
March	931	28	3.0
April	1,330	61	4.6
May	1,738	139	8.0
June	1,640	203	12.4
July	2,133	303	14.2
August	1,770	155	8.8
September	1,786	164	9.2
October	2,462	228	9.3
November	1,381	127	9.2
December	1,439	175	12.2

* As reported to the Salmonella Surveillance Unit from 50 States and the District of Columbia.