REPORT NO. 43
NOVEMBER 30, 1965

COMMUNICABLE DISEASE CENTER

SALMONELLA SURVEILLANCE

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For the Month of October 1965

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.

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I. SUMMARY

During October, 1,910 human isolations of salmonella were reported in the United States for an average of 478 per week. This figure represented a decrease of 26 per week from September, but an increase of 16 over October 1964. The seasonal pattern through October is similar to previous years (Figure 1). The cumulative number of reported human isolations for the first 10 months of 1965 (17,495) continues to lag behind the previous year's figure of 17,818. This appears to be due to the large interstate outbreak of Salmonella derby which boosted the figures for both 1963 and 1964. (See REPORTS OF ISOLATIONS FROM THE STATES).

Nonhuman isolations of salmonellae during October totaled 761, an increase of 109 over September.

A preliminary report of the investigation of an unusual serotype, S. saphra, is in the CURRENT INVESTIGATIONS section. Included in this month's REPORTS FROM STATES are: a report of an outbreak related to a wedding party in Illinois, a summary of salmonellosis in Chicago during 1964 and the report of a Salmonella typhi-murium epidemic in North Carolina traced to a school lunchroom.

An isolation of salmonella from x-ray contrast powder is reported in the SPECIAL REPORTS section, and summaries of Australian and Belgian salmonella data are included in the INTERNATIONAL section.

II. REPORTS OF ISOLATIONS FROM THE STATES

A. Human

The seven most frequently reported serotypes during October were:

Rank	Serotype	Number	Per cent	Rank Last Month
1	S. typhi-murium and S. typhi-murium var. copenhagen	618	32.4	1
2	S. newport	149	7.8	3
3	S. heidelberg	136	7.1	2
4	S. enteritidis	110	5.8	4
5	S. infantis	98	5.1	5
6	S. saint-paul	77	4.0	8
7	S. thompson	56	2.9	7
	Total	1,244	65.1	
	Total (all serotypes - October)	1,910		

The number of different serotypes reported during October decreased to 67 from 85 reported during September. However, the seven most common serotypes accounted for approximately the same percentage of all isolations in both months (65 per cent). This percentage has been consistent each month regardless of the number of serotypes reported.

The incidence of human salmonellosis (other than typhoid fever) in the United States has been increasing since 1942 (See Figure 2). This steady increase has been seen both in figures reported by the Morbidity and Mortality Weekly Report Annual Supplements (case reports, not necessarily bacteriologically confirmed) and from the Salmonella Surveillance Unit data (isolations of salmonellae from humans). Data compiled thus far this year, however, indicate a decrease in the number of isolations from 1964. The number of reported isolations of salmonella for 1965

through October was 17,495, 323 less than the 17,818 isolations reported during the same period for 1964 (See Table 1). Therefore, the data indicate an apparent leveling off in the number of reported human isolations.

During 1963 and 1964, a large interstate outbreak of salmonellosis attributed to S. derby, had a profound effect on the number of reported isolations for those years. This is demonstraced in Figure 1 and the table below which shows the number of isolations of salmonella reported through October for each of the three years of surveillance.

	1963	1964	1965
All serotypes	15,881	17,818	17,495
S. derby	1,318	2,223	549
All serotypes (excluding S. derby)	14,563	15,595	16,946

The decrease this year, as shown in this tabulation, can be explained by the S. derby epidemic in the two earlier years. Salmonella derby, prior to the epidemic (which began in March, 1963) accounted for less than 2 per cent of all isolations reported. It reached a peak of 22.5 per cent of all isolations in the country and almost 50 per cent in the northeastern United States during March 1964. When the total isolations of salmonellae other than S. derby are calculated (third line of the above table) the resultant figures for 1965 demonstrate an increase over 1964 in line with the established trend.

The over-all sex distribution, which showed a significant male predominance last month, indicated no such distribution during October. The age distribution demonstrated that 67 per cent of the reported individuals (for whom age was known) were less than 20 years of age. This high percentage was evident during September also and both months were significantly higher than the figure for 1964, 60.6 per cent. The divergence last month appeared to be predominately among children in the 5-9 year age group and was largely accounted for by an outbreak due to S. typhi-murium in an elementary school in North Carolina (See REPORTS FROM STATES - North Carolina). The increase during October was in the less than 1 year group, which was more than 3 per cent higher than in 1964. No apparent explanation is presently available.

During October, 354 (18.5 per cent) individuals had other members of their family simultaneously positive for salmonella, a finding consistent with past experience.

B. Nonhuman

There were 761 isolations of salmonellae from nonhuman sources reported in October. This is an increase of 109 from the previous month. There were 59 serotypes identified among those submitted from 38 states.

The seven most common types reported for October were as follows:

Rank	Serotype	Number	Per Cent	Rank Last Month
1	S. typhi-murium S. typhi-murium var. copenhagen	137	18.0	1
2	S. heidelberg	89	11.7	2
3	S. newport	69	9.1	Not listed
4	S. saint-paul	38	5.1	5
5	S. infantis	37	4.9	3
6	S. anatum	33	4.3	Not listed
7	S. blockley	31	4.1	Not listed
		434	57.2	

These seven types accounted for 57.2 per cent of the total.

The four species from which most of the isolations were obtained in order of frequency were: turkeys, 226 (29.7 per cent); chickens, 139 (18.3 per cent); bovine, 55 (7.2 per cent); and swine, 21 (2.8 per cent).

III. CURRENT INVESTIGATIONS

Outbreak of Salmonella saphra in Children. Reported by Van C. Tipton, M.D., Director, Communicable Disease Division, State of Texas Department of Health; Richard N. Fenno, M.D., Director, Communicable Disease Service, Houston Health Department; Ben Primer, M.D., Director, Austin City Health Unit; J. C. McGuire, M.D., Director, Brazoria County Health Unit; Albert R. Martin, M.D., EIS Officer, Investigations Section, CDC, Atlanta, Georgia.

An outbreak of Salmonella saphra involving young children has occurred in four Texas cities near the Gulf of Mexico. The cases, which were widely scattered geographically, occurred over a period of six weeks from late August through early October. Ten children were known to be involved at that time; no cases have been detected since. The dates of onset of illness and the location of each case are listed below:

Name	Date of Onset	City
G. M.	8/21/65	Houston
T. B.	8/26/65	Houston
K. B.	8/28/65	Houston
B. M.	8/28/65	Austin
L. M.	9/15/65	Freeport
D. P.	9/24/65	Pt. Arthur
A. R.	9/27/65	Austin
P. H.	10/11/65	Austin
S. B.	Asymptomatic	Houston
D. T.	Asymptomatic	Houston

The most striking aspect of this outbreak is the organism's apparent predilection for very young children. The age distribution is as follows:

Age	Number of Cases
0-3 months	5
4-6 months	0
7-12 months	0
1 yr. - 2 yrs.	4
Over 2 years	1 (9 yrs.)

Based on data compiled by the Salmonella Surveillance Unit during 1964, only 24 per cent of the individuals reported as having salmonella were less than 2 years of age. The probability of at least 9 of 10 randomly selected individuals with salmonella falling in this age group is approximately 0.00003.

The two asymptomatic cases were both amongst the older of the children (one 9 years old, and one 15 months). The cases include six males and four females. Stool cultures were obtained from the members of eight of the nine families involved at the time of the positive culture from the index case. This included a total of 35 persons, and only one (S. B., age 15 mos.) had a culture positive for S. saphra. All of the contacts with negative cultures were over 2 years of age.

Salmonella saphra is a rare serotype about which relatively little is known. It was originally isolated by Dr. Ivan Saphra and named shortly after his death. No information is available as to the source of this original culture; however, a few cases have appeared sporadically since that time. The cases in this outbreak follow the pattern of previous ones involving this serotype. They have been limited to very young children and have occurred principally in cities near the Gulf coast. Texas has had 11 previous isolates, Louisiana 3, and Florida 1. Salmonella saphra was also isolated from a marmoset monkey imported to the United States from South America in May 1965 and in 1960 from egg products in Britain.

A thorough investigation is in process and further reports will be available in future issues. Thus far, no readily apparent common source of the outbreak is known. We encourage careful investigations of all isolations of S. saphra in order to attempt identification of the vehicle of infection.

IV. REPORTS FROM THE STATES

A. Illinois

(1) A Case of Gastroenteritis Due to Salmonella albany.

Reported by Samuel L. Andelman, M.D., Commissioner of Health, and Olga Brolnitsky, M.D., and Herbert L. Slutsky, M.D., Epidemiologists, Chicago Board of Health.

A six-week-old female infant was recently hospitalized in a Chicago hospital because of severe gastroenteritis of several days' duration. Symptoms included bloody diarrhea and high fever. A salmonella was isolated and identified as S. albany by the State Enteric Laboratory.

Subsequent investigation revealed that the infant's diet consisted of a formula, properly prepared from evaporated milk and boiled water. The home environment was excellent. Cultures taken from other members of the family were negative. The child's mother worked as a nurse's aid in a convalescent home, and frequently employed a young woman as a baby sitter. This woman had recently returned from a trip during which she had suffered a bout of gastroenteritis. She had experienced diarrhea and fever approximately 15 hours after eating turkey which appeared to her undercooked. Unfortunately, the baby sitter refused to submit any specimens for examination, and definite evidence proving her as the source of the child's disease could not be obtained.

Editor's Comment: Although direct evidence of the mode of the spread could not be obtained, it draws attention to a problem which has recently become more apparent. Baby sitters in their contact with young children, a population very susceptible to salmonella infection, are an important potential source of this organism. In a future issue we will have a report of an outbreak among children in Kansas traced to a child care group.

(2) An Outbreak of Salmonellosis Related to a Wedding Party.

Reported by Norman J. Rose, M.D., Chief, Bureau of Epidemiology, Illinois State Department of Public Health, and Richard A. O'Connor, M.D., Peoria City and County Health Departments.

On July 5, 1965, approximately 500 persons attended a wedding party near Peoria and shared a menu which consisted of "chicken salad" (made from turkeys), cake, iced tea, coffee, fruit punch, rolls, and fresh fruit. The following morning many of the guests developed symptoms of nausea, vomiting, and abdominal cramps. Two persons

were hospitalized. Information received from the brother of the bride and local physicians indicated that an estimated 90 per cent of the people who attended the party had become ill. From the histories obtained, the "chicken salad" was the suspected vehicle.

Stool cultures positive for S. san-diego were available from 13 of the involved patients; however, specimens of the food were not obtainable. At least one of the positive stool cultures was from an employee of the catering firm which catered the party. This firm, a local one in Peoria, had purchased frozen turkeys on July 3, 1965. They were boiled and cooled on July 4, and the salad was made on that same day. The salad was subsequently stored in transport cans with ice and placed in a wall cooler. When investigated, the temperature in the cooler was approximately 50°F.

Editor's Comment: The source of contamination in this case could have been either the frozen turkeys or a carrier in the catering firm. The prolonged period between cooking and preparation of the salad and/or storage at inadequate refrigeration temperature gave ample opportunity for the organisms to multiply. Salmonella san-diego is a frequent isolate from turkeys and was responsible for a large outbreak of human salmonellosis in Colorado in December 1964.

(3) Salmonellosis in Chicago, Illinois, 1964. Reported by Samuel L. Andelman, M.D., Commissioner of Health, Olga Brolnitsky, M.D., and Herbert L. Slutsky, M.D., Epidemiologists, Chicago Board of Health.

During 1964, 508 isolations of salmonellae from humans were reported by the Chicago Board of Health. This represents an increase of 111 isolations from the total for 1963. Isolations reported by the Chicago Board of Health over the past three years are listed below:

Years	No. of Isolations	Per 100,000 Population*	Per Cent Increase
1962	195	5.5	-
1963	397	11.2	103.6
1964	508	14.3	28.0

*1960 Census.

The increase in 1964 of 313 isolations over the 1962 total represents a 160.5 per cent increase. This striking change may be explained in part by a vigorous surveillance program initiated in early 1963, which not only requires the culturing of all salmonella cases, but of known case contacts as well. It is of interest and perhaps a reflection of this surveillance that the attack rate for Chicago, 14.3 per 100,000 is higher than the estimated 11 per 100,000 for the country and 10 per 100,000 for the state of Illinois (SSR Annual Summary 1964).

The following tabulation demonstrates the number of reported isolations in Chicago for each month during 1964:

January - 39	July - 42
February- 27	August - 40
March - 38	September - 52
April - 37	October - 48
May - 67	November - 32
June - 50	December - 36

Total - 508

The period of below average incidence was January to April with the trough occurring in February. The period above average began in late Spring and continued through October. The peak in May was artificial as it primarily represented an outbreak due to S. senftenberg at a hotel banquet.

During 1964, 52 different serotypes isolated from humans were reported. This number accounted for approximately 5.8 per cent of the estimated 900 known salmonella serotypes. Ten of the 52, or 19.2 per cent, accounted for 396 (78.9 per cent) of the 508 isolations reported during 1964. The 10 most frequently reported serotypes in 1964 were:

Rank	Serotype	Number
1	S. typhi-murium	148
2	S. derby	52
3	S. senftenberg	34
4	S. heidelberg	32
5	S. enteritidis	31
6	S. infantis	28
7	S. thompson	20
8	S. newport	18
9	S. blockley	17
10	S. oranienburg	16
	Total	396

Sex and race distributions for the past three years appear in the following table:

		Human Isolations					
		Number			Number/100,000 Pop.		
	Population*	1962	1963	1964	1962	1963	1964
TOTAL	3,550,404	195	397	508	5.5	11.2	14.3
Male	1,726,986	84	178	253	4.9	10.3	14.6
Female	1,823,418	111	219	255	6.1	12.0	14.0
WHITE	2,712,748	108	257	271	4.0	9.5	10.0
Male	1,325,389	-	120	128	-	9.1	9.7
Female	1,387,359	-	137	143	-	9.9	10.3
NON-WHITE	837,656	87	140	237	10.4	16.7	28.3
Male	401,597	-	58	125	-	14.4	31.1
Female	436,059	-	82	112	-	18.8	25.7

*1960 Census

While only small changes occurred in isolations per 100,000 population for whites between 1962 and 1964, large increases were determined for non-whites.

Both groups showed their highest attack rates among children. In 1964, 40.9 per cent of the total cases (508) were in pre-school children. Children under 1 year of age were responsible for 26.8 per cent of the total isolations with an attack rate of 165.2 per 100,000 as compared to a rate of 14.3 for the total cases.

Summary:

1. The number of reported isolations in Chicago increased substantially during the past three years.

2. Over 50 per cent of all isolations occurred in the lowest socio-economic census tracts of the city (data not included in this report).

3. A high incidence occurred among the non-white population. In 1962, the attack rate per 100,000 population was 10.4 for non-white as compared to 4.0 for white; in 1963, the rate was 16.7 for non-white and 9.5 for white; in 1964, the rate was 28.3 for non-white and 10.0 for white.

4. A very high per cent of all reported isolates were in children of pre-school age.

B. North Carolina

Salmonella typhi-murium Outbreak Traced to a School Lunchroom. Reported by Ronald H. Levine, M.D., Chief, Communicable Disease Control Section and Joseph L. Kinzie, Jr., M.D., EIS Officer, North Carolina State Board of Health.

On Friday, September 10, 1965, many members of the student body and faculty of a North Carolina elementary school developed diarrhea and fever. Over the subsequent weekend, five patients were hospitalized with diarrhea, fever, cramping abdominal pain, and dehydration. On Monday, September 13, 135 out of a total of 530 students and 6 of 18 teachers were absent from school. Twelve additional students left during the course of the day. By the end of the outbreak, approximately 50 per cent of all of the students had experienced some of the symptoms, however, none of the first graders, the only group which does not eat in the cafeteria, became ill. A food-borne outbreak of salmonellosis originating in the lunchroom was immediately suspected.

Epidemiologic information indicated that the source of the outbreak was potato salad served in the lunchroom on Tuesday, September 7. Almost all of the students in the school and five of the six teachers who had become ill had eaten this food. The manager and employees of the school cafeteria who had taken excess food home were also stricken with this illness. All of the employees and their relatives who had eaten the potato salad displayed symptoms ranging from mild diarrhea alone to high fever and bloody diarrhea. In addition, 5 patients in a home for aged veterans operated by the cafeteria manager ate this same potato salad and all developed bloody diarrhea. A total of 10 persons required hospitalization; however there were no fatalities, and all patients recovered in 7 to 10 days. Initial stool cultures revealed that S. typhi-murium was the infecting organism. On September 28, a rectal swab survey was performed on the 470 students in the second through sixth grades who had been affected by the epidemic. Of a total of 475 cultures taken, 95 proved positive for S. typhi-murium, an incidence of 20 per cent.

The potato salad was prepared on September 2, five days prior to being served, and was kept in a refrigerator incapable of maintaining a temperature below 55°F. After the lunch had been served, the potato salad was taken from the school, and there were long periods when refrigeration was not maintained. Cultures from the food itself were not available.

Control measures were immediately instituted, consisting of inspection of the cafeteria premises, emphasis on safe food-handling practices, and correction of faulty equipment. All food handlers were cultured and many found positive for S. typhi-murium. Three consecutive negative cultures taken 48 hours apart were required before return to work. The initial source of salmonella is not known. Since all of these personnel had eaten the potato salad themselves, it was impossible to determine whether they were the source of infection or simply victims.

V. SPECIAL REPORTS

Isolation of Salmonella From X-Ray Contrast Powder. Reported by Dr. P. A. M. Guinée, Head of the Laboratory for Enterobacterial Research, National Institute of Health, Netherlands.

Routine investigation of an x-ray contrast powder was performed when it was learned that this substance was prepared utilizing egg yolk powder. Five isolates of S. typhi-murium were made from the material.

As a result of this investigation, the contrast media has been withdrawn from use. No human infections have been associated with this material.

VI. INTERNATIONAL

A. Summary

Two salmonella outbreaks of particular interest have occurred in Europe recently. At Blackpool, England, a resort area, there has been an outbreak of illness caused by Salmonella paratyphi B (S. schottmulleri). This has involved large numbers of people from various parts of the country, many of them vacationers who had been in Blackpool during the outbreak. There were more than 700 isolations of the serotype related to the outbreak at the time of our last report.

In Switzerland, a group of school children who were on an excursion near Mount Etzel, were apparently exposed to S. typhi. Unofficial reports indicate that there were 40 cases of typhoid infection among the children and that drinking water may have been the source of the outbreak. It is hoped that more detailed information will be available for future reports.

B. Australia

(1) Salmonellae Isolated in Australia between April 1 and September 30, 1965. Reported by K. F. Anderson, M.D., M.R.A.C.P., M.C.P.A., Senior Medical Bacteriologist, Salmonella Reference Laboratory, Institute of Medical and Veterinary Science, Adelaide, South Australia.

During the period of April 1 to September 30, 1965, 810 isolates were submitted for identification, of which 773 were confirmed and typed. Of the 773 salmonella isolations made, 130 were from humans, 496 were from animal sources, and 147 were from other sources.

The five most common serotypes from human origin were:

Rank	Serotype	Per Cent
1	S. typhi-murium	53.9
2	S. newport	5.5
3	S. bovis-morbificans	5.5
4	S. anatum	3.9
5	S. virchow	3.9

There were 646 isolations of salmonellae from nonhuman sources during the stated period, and the seven most common serotypes were:

Rank	Serotype	Per Cent
1	S. anatum	24.9
2	S. typhi-murium	11.8
3	S. muenchen	6.8
4	S. derby	6.7
5	S. adelaide	5.7
6	S. give	5.3
7	S. st. paul	4.6

The most prominent sources of nonhuman isolations were: cattle (45.1 per cent), soil samples (14.4 per cent), pigs (12.2 per cent), and mincemeat (7.0 per cent).

(2) Identification of a Typhoid Carrier in an Aboriginal Settlement.

Following the death of a young aboriginal woman from typhoid fever in a settlement in the Northern Territory, an intensive search for a carrier was instituted. Blood and fecal samples were collected and examined by the Salmonella Reference Laboratory. A total of 244 fecal specimens were examined, using direct plating of S. S. medium and culture in mannitol selenite broth. Sera were examined for Vi antibodies using the hemagglutination technique. These investigations proceeded independently and the results were not compared until the work had been completed. Of the 237 sera tested, 8 gave significant titres (1:20, 4 specimens, 1:40, 2 specimens, 1:80, 1 specimen, 1:320, 1 specimen).

One fecal specimen yielded a growth of S. typhi phage type D1, both from the direct plating and from the mannitol selenite broth. The blood sample from this case was found to have the highest Vi antibody titre (1:320). The organism isolated from the fatal case was also type D1. Further inquiries revealed that the carrier was a worker on the water supply to the island. No other cases were reported. It is interesting to note that, had only preliminary serological screening been employed, the carrier would have been identified. In the same area, when larger populations have been involved, this technique has proved invaluable by reducing the number of fecal and urine specimens which have to be examined.

C. Belgium

Report of Salmonella Isolations for Third Quarter, 1965.
Reported by E. van Oye, M.D., Ministry of Public and Family Health, Brussels, Belgium.

There were 740 human salmonella isolations during the third quarter of 1965. The table on the following page indicates the distribution of the most common serotypes.

Rank	Serotype	Number	Per Cent
1	S. typhi-murium	529	71.4
2	S. panama	81	10.9
3	S. brandenburg	43	5.8
4	S. bovis-morbificans	14	1.8
5	S. anatum	5	0.9

A number of serotypes were isolated for the first time from humans in Belgium. These included: S. brancaster, S. emek, S. isangi, S. kisangani, S. mikawashima, and S. pullorum.

Editor's Comment: S. pullorum, an organism pathogenic for poultry, is quite host-specific and has been isolated only occasionally from man in this country.

VII. FOOD AND FEED SURVEILLANCE

A. Abstracts From the July Meeting of the American Veterinary Association, Portland, Oregon.

(1) Hatchery and Flock Control of Avian Salmonellosis by Dr. J. E. Williams, Southeast Poultry Research Laboratory, U. S. Department of Agriculture.

Eggs contaminated with salmonella organisms from infected supply flocks are an important link in the transmission cycle of this disease. Shells contaminated with feces of infected birds can introduce infections into the incubator, and in so doing help perpetuate the disease. Routine pre-incubation fumigation of hatching eggs with formaldehyde is recommended as one of the important steps in the elimination of salmonella infection from poultry farms. Every egg entering the hatchery should be subjected to fumigation with a high level of gas as soon as possible after its collection from the nest.

Breeder flocks that experience acute outbreaks of salmonellosis or those that are known to carry the infection should not be used for hatching purposes. One of the major problems in this regard is the difficulty in determining the infected or non-infected status of a flock. Fecal cultures, culture of egg shells, and serologic tests can all be helpful if available.

Editor's Comment: Incubators contaminated with salmonellae are certainly one source of our continuing problem in poultry. Studies are continuing in an effort to determine the most efficacious means of disinfection. Efforts made in this area, however, must be combined with an effective program to obtain animal feeds free of salmonellae.

(2) The Current Status of National Reporting and Investigation of Animal Salmonellosis. By John W. Walker, Acting Senior Staff Veterinarian, Animal Disease Eradication Division, ARS, USDA, Hyattsville, Maryland

In the past few years the United States Department of Agriculture has had a number of activities designed to help check the problem of salmonellosis in animals. In this regard they have maintained a national salmonella typing laboratory to aid animal diagnosticians, and have routinely carried out general surveys of animal feeds and feed ingredients to determine the incidence of salmonella contamination. In addition, the USDA has provided a great deal of scientific and technical information to state agencies and has compiled and distributed sanitation guide lines to processors of animal by-products and fish meal to aid them in the prevention of

salmonella contamination. The following activities are planned for the fiscal year 1966: (1) Develop an accurate reporting system to determine the significance of salmonellosis in livestock and poultry. (2) Provide epidemiologic assistance to seek out the origin of salmonella outbreaks and to extend this epidemiologic aid to salmonella eradication programs. (3) Conduct field studies to develop information needed to provide feed manufacturing industries with sanitation guide lines to avoid the presence of salmonellae in livestock and poultry feeds. (4) Provide educational programs for livestock and poultry producers. (5) Assure more stringent regulations on imports of animal products and fish meal so as to render these imports free of salmonellae. (6) Conduct studies to improve the methods of determining the efficacy of disinfectants against salmonellae. (7) Enlarge the laboratory serotyping facilities to meet the increasing demands of this service.

B. "The Influence of Lairage Conditions on Meat-Borne Food Infections". Roy V. Freestone, Royal Society of Health Journal, Vol. 3, pp. 168-172, 1965.

During the period from July to October 1963, 26 incidents of food poisoning due to Salmonella brandenburg infection occurred in and around the city of Leicester, England. There was a total of 34 cases and additionally 76 asymptomatic excretors. It was established that in all cases but one, the vehicle of infection was a prepared pork meat product and that the infection was being carried into pork factories on the carcasses of dressed pigs. Live pigs awaiting slaughter were also found to be excretors of S. brandenburg.

A thorough investigation of the procedures for handling pigs prior to processing was made, and it became apparent that the products of only two of the four firms slaughtering pigs in Leicester were responsible for the outbreak. These two firms had one significant common factor. They both used lairages belonging to the same commercial firm, and these commercial lairages were used most intensively in the summer and early fall of 1963, during the period of increased numbers of cases.

Bacteriologic surveys were made of fecal specimens taken from market pens housing animals for sale at the Leicester market prior to their arrival at the lairs. Cultures were also obtained from bedding and lair surfaces at the packing plants and the cecal and rectal contents of swine immediately after slaughter. Over the seven weeks of study, only 3 positive cultures were obtained from bedding and lair surfaces,and no positive cultures were obtained from fecal specimens taken at the market pens. However, S. brandenburg was isolated from a number of swine after slaughter. A definite correlation was found between the length of time spent in the lairs and the per cent of swine with positive cultures. Sixty-three specimens were obtained from pigs slaughtered within 24 hours of arrival, and of these only two (3.2 per cent) yielded S. brandenburg. However, of 351 specimens obtained from pigs held in the lairs from 1 to 7 days ,32 (9.1 per cent) were found to be positive.

In order to investigate the source of infection, several things were studied. Attempts to trace pigs with positive cultures to specific livestock markets or farms were nonproductive. Neither could salmonella be isolated from specimens of the feed and water supplied in the lairs to pigs awaiting slaughter. The rat population around the lairs was suspected of being a reservoir of infection, and a number of rats were caught and their intestinal contents swabbed. Negative results were obtained in every case.

The routine swabbings at regular intervals of surfaces and fittings at the commercial lairage commenced in August of 1963. During the week starting January 20, 1964, salmonella organisms were isolated from the walls and floors of some of the lairs. Salmonella brandenburg or S. give were isolated from 85 swabs taken in the lairs during the succeeding 16 weeks. Salmonella organisms were found consistently during

the first 7 weeks after January 20 and then sporadically during the remainder of the 16-week period.

Concurrently on February 6, 1964, a case of food poisoning due to S. brandenburg occurred in the city. During the following 23 weeks, S. brandenburg or S. give was responsible for the illness of 24 persons and was additionally isolated from 5 asymptomatic carriers. This second outbreak was much less clearly defined than the first, but in a high proportion of the cases the food suspected of carrying infection was supplied by manufacturers of prepared meat products which did not use the same commercial lairages. They are situated outside Leicester. Attempts to isolate the organism from prepared meat products originating in the firms utilizing the commercial lairages were successful in only one instance.

It is impossible to arrive at any firm conclusion regarding the original source of the second outbreak, but it is interesting that there was evidence of heavy and recurring salmonella contamination in the commercial lairages in Leicester just prior to the start of the epidemic and that this continued throughout most of the outbreak.

Figure I.

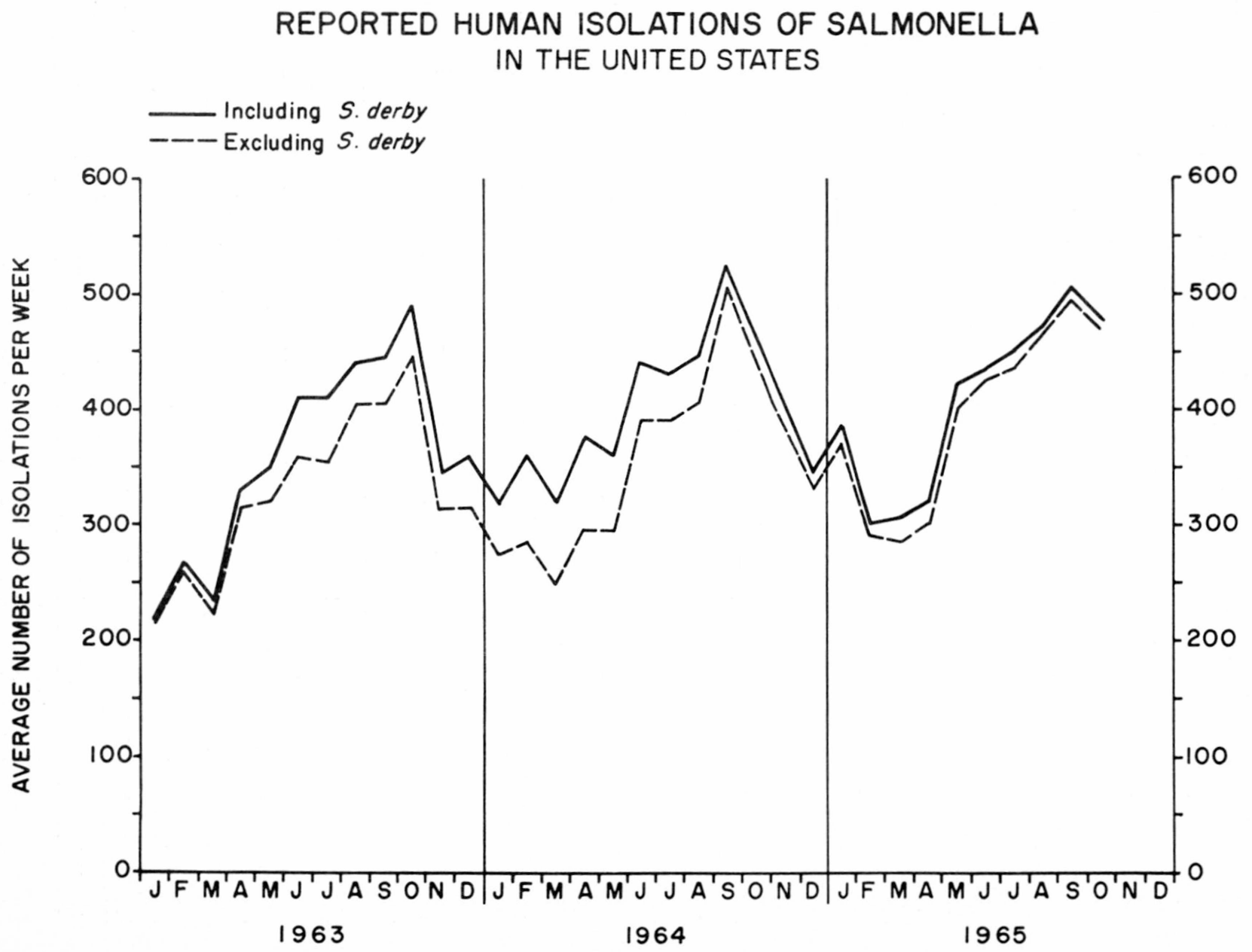

REPORTED HUMAN ISOLATIONS OF SALMONELLA
IN THE UNITED STATES
Including S. derby
Excluding S. derby
AVERAGE NUMBER OF ISOLATIONS PER WEEK
600
500
400
300
200
100
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1963
1964
1965

TABLE I

SALMONELLA SEROTYPES ISOLATED FROM HUMANS DURING **OCTOBER 1965

SEROTYPE	REGION AND REPORTING CENTER																	
	NEW ENGLAND							MIDDLE ATLANTIC						EAST NORTH CENTRAL				
	MAINE	NH	VT	MASS	RI	CONN	TOTAL	NY-A	NY-B*	NY-C	NJ	PA	TOTAL	OHIO	IND	ILL	MICH	WIS	TOTAL
anatum								1	1			1	3			1	1		2
atlanta																			
bareilly																			
berta												1	1					1	1
binza									1				1				1		1
blockley				1		3	4	2	1	2			5	2	2	5			9
braenderup																3	1		4
bredeney				1			1	4					4						
california																			
cambridge																			
chester												1	1				1	1	2
chingola									1				1						
cholerae-suis v kun																	1		1
cubana				1			1										2		2
derby				1		1	2	4	2	7	1		14			2		1	3
eimsbuettel																			
emek																			
enteritidis				17		5	22	4	3	5		6	18	5	4	17	3	2	31
give						1	1	2					2					2	2
hartford																			
heidelberg			1	9		1	11	9	3	7	4	1	24	3	6	16	7	1	33
indiana																1			1
infantis				4		1	5	7		2		5	14	1		3	4	4	12
java						2	2	1					1					1	1
javiana	1						1				2		2		1				1
kentucky									2				2						
litchfield				2		2		2					2				1		1
livingstone																2			2
loma-linda																			
manhattan								1		1			2	2					2
meleagridis						1	1												
miami																			
minnesota																			
mission																			
mississippi																			
montevideo				2			2	2	1	1			4	2		5		1	8
muenchen	1			1			2		1				1			2	1		3
new-brunswick				2			2												
newington				1		1	2									1			1
newport						1	1	2	4	5		3	14	1	1	5	2	1	10
norwich								1					1						
ohio																			
oranienburg				7		1	8	2		1		2	5	5	1	2	1		9
oslo																			
panama						4	4	4					4		1		1		2
paratyphi A																			
paratyphi B				1			1							2			4		6
pensacola																			
poona								1					1						
rubislaw										1			1						
saint-paul				4			4	4	1	3	1	4	13	2		6	2	1	11
san-diego				1			1	1	1	1			3	1			1		2
saphra																			
schwarzengrund																2			2
senftenberg									1				1						
siegburg																			
takoradi										1			1						
tennessee																	1		1
thompson						12	12	5		10			15			4	2		6
typhi				1		2	3					3	3	2		3			5
typhi-murium	1	6	2	56	1	16	82	29	15	23	4	36	107	9	3	24	12	8	56
typhi-murium v cop	1			6		3	10				1		1				1		1
uganda																			
urbana										1			1	1					1
weltevreden																			
westerstede																			
worthington																			
untypable group B														1					1
untypable group C-1					1		1									1			1
untypable group C-2																			
untypable group D																			
untypable group E																			
unknown																		1	1
TOTAL	4	6	3	118	2	55	188	88	38	71	13	63	273	39	19	105	50	25	238

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

*The Beth-Israel Salmonella Typing Center in New York is a reference laboratory and processes many cultures from other states which are assigned to the respective states although reported by N.Y.-B.I. Beth Israel reported a total of 106 isolations for October.

**Includes September late reports.

TABLE I (Continued)
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	TOTAL	SEROTYPE
									2		1				6	2	11	anatum
															1		1	atlanta
																2	2	bareilly
										1							1	berta
															1		1	binza
2						2	4		1				2		4	2	9	blockley
						1	1											braenderup
1							1		1								1	bredeney
											1		1		1		3	california
																		cambridge
3							3									1	1	chester
																		chingola
									1		1						2	cholerae-suis v kun
									1								1	cubana
1						1	2		2	1	1		3		1		8	derby
																		eimsbuettel
																		emek
2		4				1	7		11		2		3		6	1	23	enteritidis
															1	1	2	give
																1	1	hartford
1		1				2	4	1	2		1		7		6	3	20	heidelberg
													2				2	indiana
1						9	10	1	5		4	2	1		3	4	20	infantis
	1	2					3								1		1	java
													1			8	9	javiana
																2	2	kentucky
																		litchfield
																		livingstone
																		loma-linda
													1		1		2	manhattan
																		meleagridis
													1			11	12	miami
																		minnesota
																1	1	mission
													1		1		2	mississippi
									1				1		2		4	montevideo
		1				3	4	1	1				1			4	7	muenchen
																		new-brunswick
																1	1	newington
3						7	10				2		2	1	12	17	34	newport
																		norwich
																		ohio
						7	7		2						2	10	14	oranienburg
																		oslo
2							2								1		1	panama
																2	2	paratyphi A
													1				1	paratyphi B
																		pensacola
																		poona
																		rubislaw
						4	4		4				1		7	15	27	saint-paul
															1	1	2	san-diego
																		saphra
																4	4	schwarzengrund
																3	3	senftenberg
																7	7	siegburg
																		takoradi
2							2		2				2		2		6	tennessee
						1	1		7				1		1	1	10	thompson
						1	1		2				1		6	2	11	typhi
7	6	8	3	2		12	38	1	15	3	7	1	51		25	22	125	typhi-murium
																		typhi-murium v cop
																		uganda
																1	1	urbana
																		weltevreden
									1								1	westerstede
																		worthington
										4				4			8	untypable group B
														1			1	untypable group C-1
																		untypable group C-2
										1							1	untypable group D
																		untypable group E
										1	1						2	unknown
25	7	16	3	2	-0-	51	104	4	61	11	21	3	84	6	92	129	411	TOTAL

TABLE I (Continued)

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
anatum							6		2	8									
atlanta																			
bareilly						2	2			4									
berta						1				1									
binza																			
blockley						1	3			4							1		1
braenderup			1		1														
bredeney							3			3									
california																			
cambridge																			
chester							1			1									
chingola																			
cholerae-suis v kun																			
cubana									1	1									
derby							3			3									
eimsbuettel		1			1														
emek																			
enteritidis		1	2		3						1						1		2
give				1	1		2		1	3									
hartford																			
heidelberg		1	4		5		2		3	5				1		1	3	1	6
indiana																			
infantis			1		1	2	8		6	16		1		2		1	2		6
java		1			1		2	1		3		1							1
javiana		1			1	5	8		20	33									
kentucky							2			2						1			1
litchfield							5			5									
livingstone							1			1									
loma-linda																			
manhattan							1			1									
meleagridis																			
miami									1	1									
minnesota																			
mission																			
mississippi							3			3									
montevideo		2			2		1	1	2	4									
muenchen		1			1		4	1		5									
new-brunswick							1			1									
newington							1			1									
newport		4	2		6	8	17	3	26	54						6			6
norwich								2		2									
ohio																			
oranienburg							1	1	2	4									
oslo																			
panama									2	2						8			8
paratyphi A																			
paratyphi B	2	2			4				4	4			1			1			2
pensacola																			
poona									3	3									
rubislaw																			
saint-paul		2			2	2	5		1	8				1		1	1		3
san-diego																			
saphra									6	6									
schwarzengrund																			
senftenberg								1	2	3									
siegburg																			
takoradi																			
tennessee									1	1									
thompson	1				1		2			2									
typhi	1			1	2	2	1			3				2			1		3
typhi-murium		3	4	1	8	4	37	9	22	72	2	1		10		3	1		17
typhi-murium v cop						1	2			3		1				1			2
uganda							1			1									
urbana																			
weltevreden																			
westerstede																			
worthington							1			1									
untypable group B				2	2										14				14
untypable group C-1															4				4
untypable group C-2				1	1										6				6
untypable group D															3	1			4
untypable group E																			
unknown				1	1	1				1									
TOTAL	4	19	14	7	44	29	126	19	105	279	3	4	1	16	27	24	10	1	86

TABLE I (Continued)

REGION AND REPORTING CENTER						OTHER VI	TOTAL	PERCENT OF TOTAL	TEN MONTH TOTAL	% 1964 10 MOS. TOTAL	1964 10 MOS. TOTAL	% TEN MONTH TOTAL	SEROTYPE
PACIFIC													
WASH	ORE	CAL	ALASKA	HAWAII	TOTAL								
3		3		6	12		36		254		243		anatum
							1		7				atlanta
							6		92		80		bareilly
							4		33		45		berta
		1			1		4		18		18		binza
1		10			11		47	2.5	315	1.8	357	2.0	blockley
							6		68		87		braenderup
		1		3	4		14		124		176		bredeney
							3		16		27		california
2					2		2		2				cambridge
							8		98		63		chester
							1		1				chingola
		2			2		5		31				cholerae-suis v kun
							5		124		51		cubana
		2		4	6		38	2.0	549	3.1	2,223	12.5	derby
							1		2				eimsbuettel
		1			1		1		3				emek
		3			3		109	5.7	897	5.1	609	3.4	enteritidis
		1		1	2		13		102		65		give
							1		18				hartford
5	2	20		1	28		136	7.1	1,346	7.7	1,451	8.1	heidelberg
							3		17		44		indiana
1	2	9		2	14		98	5.1	956	5.5	1,264	7.1	infantis
		15			15		28		155		192		java
		2			2		49		270		210		javiana
							5		13		19		kentucky
		1			1		13		76		53		litchfield
							3		24		8		livingstone
	1				1		1		2		2		loma-linda
				3	3		10		102		156		manhattan
1				1	2		3		139		43		meleagridis
							13		80		42		miami
		1			1		1		12		11		minnesota
							1		12				mission
							5		32		33		mississippi
	1	5			6		30	1.6	390	2.2	423	2.4	montevideo
1		2			3		26		188		225		muenchen
							3		14				new-brunswick
							5		49		29		newington
		14			14		149	7.8	1,016	5.8	842	4.7	newport
							3		20				norwich
		1			1		1		7				ohio
	1	4			5		52	2.7	522	3.0	449	2.5	oranienburg
		1			1		1		14				oslo
		3		1	4		27		203		152		panama
		1			1		1		11		6		paratyphi A
4					4		23		157		145		paratyphi B
							1		4		9		pensacola
							4		40		35		poona
							1		4		15		rubislaw
1		2		2	5		77	4.0	637	3.6	544	3.1	saint-paul
		2			2		10		217		132		san-diego
							6		13				saphra
							6		86		126		schwarzengrund
							7		63		92		senftenberg
							7		12				siegburg
							1		1				takoradi
		1			1		11		163		302		tennessee
2	1	4		2	9		56	2.9	486	2.8	324	1.8	thompson
2	4	8			14		45	2.4	612	3.5	591	3.3	typhi
16	12	61	1	6	96		601	31.5	5,494	31.4	4,767	26.8	typhi-murium
							17		159		167		typhi-murium v cop
							1		2		4		uganda
		2			2		5		29		21		urbana
				2	2		2		29		19		weltevreden
							1		1				westerstede
							1		35		42		worthington
	2				2		27		246		255		untypable group B
		2			2		9		75		73		untypable group C-1
	1				1		8		53		45		untypable group C-2
	1				1		5		33		33		untypable group D
							1		47		13		untypable group E
							5		99		86		unknown
39	28	185	1	34	287		1,910		17,495		17,818		TOTAL

(VI - Virgin Islands)

TABLE I-A
SEROTYPES REPORTED FROM HUMANS PREVIOUSLY DURING 1965
BUT NOT IN OCTOBER

SEROTYPES	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
adelaide	May	NY-A	1
alachua	Mar	Mass(1)	
	Jul	Tenn(1)	
	Jul	Calif(1)	
	Sept	Ill(1)	4
albany	Jan-Feb-Sept	Ill(3)	
	Feb	Conn(1)	
	Aug	Va(1)	
	Sept	Fla(1)	6
allandale	Jul-Sept	Fla	2
amager	Jul	NY-BI	1
arkansas	Jun	Calif	1
belem	Jul	Tex	1
bilthoven	Apr-Jun	Calif(2)	
	May	Mich(1)	3
blegdam	Feb	SD	1
bovis-morbificans	Mar	Calif(1)	
	Apr-Jul-Aug-Sept	Hai(26)	
	May-Jun-Sept	Mass(4)	31
brandenburg	Jun	Ill	1
butantan	Aug	Mich	1
carrau	Jan	La(1)	
	Aug	Fla(2)	
	Sept	Tex(1)	4
chailey	Sept	NY-BI	1
cholerae-suis	Jan-Apr	Ohio(2)	
	Jun	Ind(1)	
	Jul	Calif(2)	
	Aug	Tex(1)	
	Aug	W.Va(1)	
	Sept	Hai(1)	8
colorado	Jan-May-Jun	Hai	3
corvallis	Feb	Hai	1
daytona	Mar	Tenn(1)	
	Sept	La(1)	2
denver	Feb	La	1
dublin	Feb-Mar-Apr	Calif	3
duesseldorf	Jan	Ohio(1)	
	Apr-Jun	La(2)	
	Sept	Fla(1)	
	Sept	NY-BI(1)	5
duisburg	Jul	Ark	1
eastborne	Jun-Aug-Sept	Calif(3)	
	Jul	Ark(1)	4
essen	Jan	Colo(1)	
	Jun	Ariz(1)	
	Aug	Mass(1)	3
fayed	Mar	NC	1
florida	Jan-May	Fla	2
fresno	Mar	Tenn	1
gamanara	Mar	Tex(2)	
	Apr	NY-C(1)	
	Jun	Mass(1)	
	Jun	NY-A(1)	
	Jul-Sept	Fla(5)	
	Sept	La(1)	11
glostrup	Jul	La	1
guinae	Aug	Ill	1
haifa	Sept	NY-BI	1
heilbron	Jan	Mo	1
inverness	May	Calif(1)	
	Jun-Jul-Sept	Fla(3)	
	Aug	Ariz(1)	
	Sept	Mich(1)	6
irumu	Jan-Feb-Mar-Aug-Sept	Mo(18)	
	Feb	Colo(1)	
	Sept	Vt(1)	20
johannesburg	Jun	Minn	1

TABLE I-A - Continued
SEROTYPES REPORTED FROM HUMANS PREVIOUSLY DURING 1965
BUT NOT IN OCTOBER

SEROTYPES	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
kaapstad	Feb-Jun	Colo	2
kottbus	Feb-Sept	NY-A(5)	
	Feb-Sept	Colo(2)	
	Mar	Ind(1)	8
leeuwarden	Jun-Aug-Sept	Tex	3
lexington	Feb	Calif(1)	
	Jun	Ill(1)	2
lindenburg	May	Colo(1)	
	Sept	Kan(1)	2
lomita	May	Ore(1)	
	Jun	Ohio(1)	
	Sept	La(1)	3
london	May	NY-C	1
luciana	Jan	Ariz	1
maastricht	Sept	Ill	1
madelia	Mar	Pa(1)	
	Mar	Fla(1)	2
michigan	Sept	Calif	1
minneapolis	Jul	Conn	1
mishmar-haemek	Feb	Calif(1)	
	May	Tex(1)	2
muenster	Mar	Calif(1)	
	Jun	Ark(1)	
	Jun	Fla(1)	
	Aug-Sept	Mass(4)	
	Sept	Wash(1)	8
nagoya	Jun	Tex	1
nottingham	May	Ark	1
paratyphi-C	Jun	Iowa	1
pomona	Apr	Fla(1)	
	May	Calif(1)	2
reading	Feb-May	NY-A(2)	
	Mar	Ohio(1)	
	May	Va(1)	
	May	Ga(1)	
	May	La(1)	
	Jun	Colo(2)	
	Jun	La (1)	
	Jul-Aug	Wisc(5)	
	Aug	Mich(2)	
	Sept	Conn(1)	17
remo	Mar	Va(1)	
	May	Pa(1)	2
richmond	Jul	Kan(1)	
	Jul	Fla(1)	2
sarajane	Sept	NJ	1
simsbury	Aug	NY-BI	1
stanley	Jan	Kan(1)	
	Apr	Ill(1)	
	Jun	Ariz(1)	
	Jul	Calif(1)	
	Jul	NY-C(1)	
	Aug	NY-A(1)	6
sundsvall	Jun	Calif	1
taksony	Jan	NY-BI	1
tallahassee	Sept	Fla	3
tamale	Aug	Fla	1
thomasville	Jan	NJ(1)	
	Sept	Tenn(1)	2
virchow	Jan	Colo	1
westhampton	Feb	Mass(1)	
	Jun	La(2)	3
yalding	Jun	Tex	1
TOTAL			219

TABLE II

Infrequent Serotypes

Serotype	Center	October	1965*	Total 1963 & 1964**	Comment
S. atlanta	GA	1	7	16	All of the isolations reported to this unit have been from GA.
S. cambridge	WASH	2	2	3	One of the cases related to contaminated headcheese.
S. chingola	NY-BI	1	1	0	First time reported to this unit.
S. eimsbuettel	TENN	1	2	0	Closely related to S. livingstone.
S. emek	CALIF	1	3	1	A common isolate in Israel.
S. hartford	FLA	1	18	27	Involved in an interstate outbreak of unknown source in 1962.
S. loma-linda	ORE	1	2	11	Isolations of this serotype have been restricted to the far western states.
S. minnesota	CALIF	1	12	26	Has fluctuated very little in frequency of reporting from year to year.
S. mission	FLA	1	12	4	Majority of the isolates are from a single county in FLA.
S. new-brunswick	LA,MASS	3	14	10	Reported three times as often during 1965 than in previous years.
S. ohio	CALIF	1	7	4	Reported from CALIF last month also; most nonhuman isolates from Ohio.
S. oslo	CALIF	1	14	14	Reported earlier this year from marmoset monkeys. See SSR #40.
S. paratyphi A	CALIF	1	11	15	Most isolations of this serotype come from CALIF or NY.
S. pensacola	NC	1	4	15	Most human and nonhuman isolates have been from the Southeastern States.
S. rubislaw	NY-C	1	4	29	Most often reported from the Gulf Coast States.

TABLE II (Cont'd)

Serotype	Center	October	1965*	Total 1963 & 1964**	Comment
S. saphra	TEX	6	13	6	All 13 isolates in 1965 from TEX; source unknown (See CURRENT INVESTIGATIONS).
S. takoradi	NY-C	1	1	0	First isolated from a two-foot long, immature, female African python in England; Only previous isolate reported to this unit in 1962, from WASH.
S. uganda	LA	1	2	5	All 5 isolates in 1963-1964 were from LA.
S. westerstede	MD	1	1	2	An infrequent serotype.

* Represents 17,495 human isolations during the first 10 months of 1965.
** Represents 39,762 human isolations of salmonellae during 1963 and 1964.

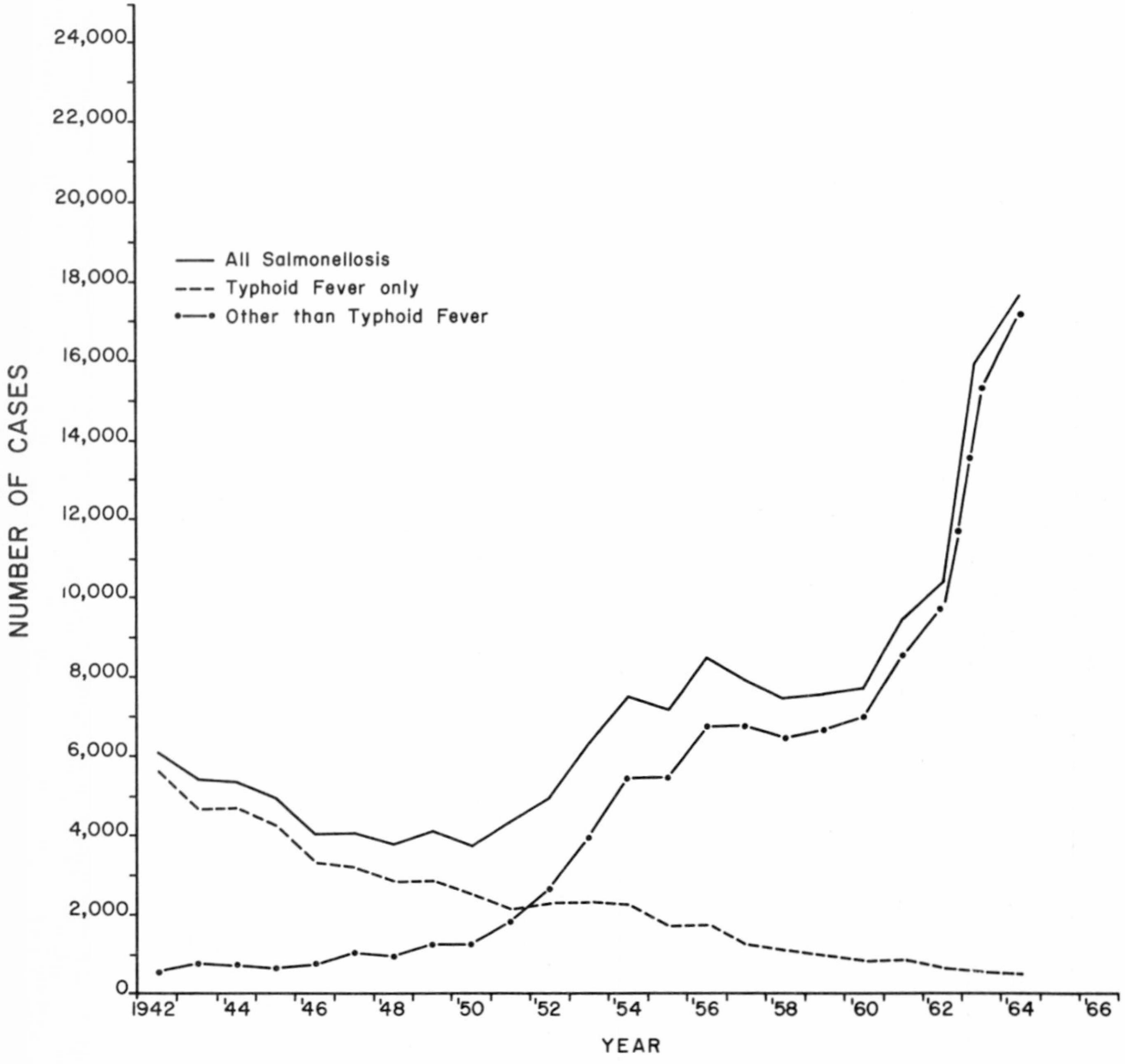
TABLE III

Age and Sex Distribution of 1,857 Isolations of Salmonella Reported for October 1965

Age (Years)	Male	Female	Total	%	Cumulative %
Less than 1	142	116	258	19.5	19.5
1 - 4	190	119	309	23.4	42.9
5 - 9	79	78	157	11.9	54.8
10-19	86	75	161	12.2	67.0
20-29	45	73	118	9.0	76.0
30-39	29	56	85	6.4	82.4
40-49	27	41	68	5.2	87.6
50-59	34	36	70	5.3	92.9
60-69	22	30	52	3.9	96.8
70-79	15	12	27	2.1	98.9
80+	6	9	15	1.1	100.0
Unknown	272	265	537		
Total	947	910	1,857		
% of Total	51.0	49.0			

Figure 2.

REPORTED INCIDENCE OF HUMAN SALMONELLOSIS
UNITED STATES, 1942-1964



Source: Morbidity and Mortality Weekly Report, Annual Supplements, 1951, 1954, and 1964

TABLE IV

REPORTED NONHUMAN ISOLATES BY SEROTYPES AND SOURCE, OCTOBER, 1965

Serotype	Poultry unspecified	chicken	turkey	pigeon	laurakeet	pheasant	quail	chukar	avain	equine	bovine	ovine	porcine	domestic farm animal, unknown	canine	feline	mouse	guinea pig	monkey	raccoon	beaver	mink	opossum	deer	powdered egg	frozen egg	egg products	turkey meat	noodles	headcheese	bone meal/ meat scraps	animal feed, unknown	fish meal	tankage	turtle	snake	alligator	lizard	turtle environment	sewage	drinking water	turtle water	turtle tank	stuffed easter ducks & chicks	sink drain	unknown	Total	10 Mos. Total	Serotype
anatum		6	12								3		1				1		5						1					1								1								33	207	anatum
bareilly																			1											2																3	28	bareilly
bern																							1																							1	1	bern
berta			1																																										1	18	berta
binza		1				3	2																																							6	45	binza
blockley		21	2																			1				1	1																	1	2	31	164	blockley
braenderup		2							1				1						1																											1	5	21	braenderup
bredeney		3	1																											1				4		1									11	76	bredeney
california		1	1																																										2	47	california
cambridge																													1																	1	2	cambridge
cerro																										3				3																6	56	cerro
chester			21						1		1		1																																	24	161	chester
cholerae-suis v kun													8																																	8	94	cholerae-suis v kun
corvallis																			1																											1	1	corvallis
cubana			1																						1							1														3	19	cubana
derby		5	3										1																		2								1						12	86	derby
dublin											2																																			2	36	dublin
eimbuettel		1																												5	5		1												12	51	eimbuettel
enteritidis		2	1						1				1					1	1																											7	44	enteritidis
gallinarum	1	2																																												3	28	gallinarum
give		1	1				1	1																																	2	1			6	86	give
heidelberg		21	60								1																									5			1						89	640	heidelberg
indiana		1	1																																										2	33	indiana
infantis		26	1						2		1		1												1						1				1			1					1	1	37	318	infantis
inverness																				1																									1	3	inverness
java																											1																		1	13	java
javiana																																		1							1				2	10	javiana
kentucky																														1															1	35	kentucky
lexington																														1		1													2	6	lexington
litchfield																																		4											4	16	litchfield
livingstone																										1				2																4	74	livingstone
manhattan		1	2																																										3	38	manhattan
meleagridis																														1															2	64	meleagridis
miami		1					1																																						2	9	miami
minneapolis															1																														1	1	minneapolis
minnesota																								1						1																2	28	minnesota
montevideo		3											2		1	1										2				2	3														14	183	montevideo
muenchen										1																								4								1			6	47	muenchen
muenster													1						1																											2	8	muenster
newington		1	2																																										3	26	newington
newport			7							2	6						1		1															49			1	1		1				69	165	newport
oranienburg		1									1															1				2	2			3		1				1				12	152	oranienburg
panama			2																																								1		3	22	panama
poona																																				2									2	13	poona
pullorum		4	1																																										5	193	pullorum
saint-paul		6	25						1		4																							2										38	196	saint-paul
san-diego		2	14																															1											17	107	san-diego
schwarzengrund			17													1														1			1												20	114	schwarzengrund
senftenberg		1	15																											1	1														18	106	senftenberg
siegburg														1	1																															2	8	siegburg
stockholm																														1															1	1	stockholm
tennessee		1	1																					6										1										9	98	tennessee
thompson		3																								2			15					7								1		28	157	thompson
tuindrop																							4																						4	4	tuindrop
typhi-murium		15	18	4	1				1	9	35	1	2		1	1										2								6					1	3	6			1	107	807	typhi-murium
typhi-murium v cop		5	14	2						3			2		1	1					1	1																							30	241	typhi-murium v cop
urbana																																		22												22	29	urbana
wassenaar																																				2										2	4	wassenaar
weltevreden																																														1	1	welte9reden
worthington		1	2																																										3	69	worthington
typhi-C1																																														1	1	typhi-C1
untypable group B		1								2		1				2							1																							4	12	untypable group B
untypable group C2																																														3	5	untypable group C2
untypable																									1	1	1																			1	1	untypable
unknown																								1																						3	8	unknown
TOTAL	1	139	226	6	1	3	4	1	7	17	55	1	21	1	7	4	2	1	11	1	1	2	6	1	10	6	9	1	15	2	15	24	1	3	105	1	8	3	2	12	3	11	6	1	1	3	761	5,512	TOTAL

Source: National Animal Disease Laboratory, Ames, Iowa, Weekly Salmonella Surveillance Reports from Individual States, and US-FDA-Div of Microbiology, Washington, D. C.

TABLE V
REPORTED NONHUMAN ISOLATES BY SEROTYPE AND STATE OCTOBER 1965

Serotype	Ala	Ariz	Ark	Calif	Colo	Conn	Fla	Ga	Ill	Ind	Iowa	Kan	Ky	La	Md	Mass	Mich	Minn	Miss	Mo	Neb	NH	NY-A	NY-BI	NY-C	NC	Ohio	Okla	Ore	Pa	RI	SC	Tenn	Tex	Utah	Vt	Va	Wash	Wisc	Total	10 mos. Total	Serotype
anatum			1	7		2		3		1	1	1						1		5			1				3	1	1			1		2				2		33	207	anatum
bareilly									1																		2												3	28	bareilly
bern																		1																					1	1	bern
berta																									1														1	18	berta
binza								1												5																			6	45	binza
blockley			1	1				6	3	3		2						1		1			3			2	1					3					2	2	31	164	blockley
braenderup						1										1				1				2															5	21	braenderup
bredeney			2									4	1					1											1				1				1	11	76	bredeney
california																		1															1					2	47	california
cambridge																																					1	1	2	cambridge
cerro											3																3											6	56	cerro
chester			1							3		5						5		1	1						1											7	24	161	chester
cholerae-suis v kun	1									6				1																								8	94	cholerae-suis v kun
corvallis									1																													1	1	corvallis
cubana				2																					1														3	19	cubana
derby				4				2						1				1	2								1	1										12	86	derby
dublin				2																																		2	36	dublin
eimbuettel								4	1	1						2		3	1																			12	51	eimbuettel
enteritidis								1	1								2	1						1					1									7	44	enteritidis
gallinarum	1		1											1																								3	28	gallinarum
give									1							1				2																		6	86	give
heidelberg		2	1	24				14			4	5					1	22								1			2	1			1	10			1	89	640	heidelberg
indiana										1								1																				2	33	indiana
infantis		3	1	15				1	2	4		1		1		2	1		1	1							2	1	1									37	318	infantis
inverness														1																								1	3	inverness
java				1																																		1	13	java
javiana												2																										2	10	javiana
kentucky								1																														1	35	kentucky
lexington								1		1																												2	6	lexington
litchfield												4																										4	16	litchfield
livingstone				1																							3											4	74	livingstone
manhattan				1														1	1																			3	38	manhattan
meleagridis				1				1																														2	64	meleagridis
miami							1	1																														2	9	miami
minneapolis																	1																					1	1	minneapolis
minnesota																						1					1											2	28	minnesota
montevideo				2					1							1		2									5			3								14	183	montevideo
muenchen				1								5																										6	47	muenchen
muenster									1									1																				2	8	muenster
newington				1														1																			1	3	26	newington
newport				15			1					50					1						1															1	69	165	newport
oranienburg								1				3				2	1	1									3									1		12	152	oranienburg
panama												1				1	1																					3	22	panama
poona												2																										2	13	poona
pullorum	1		1																											1			2					5	193	pullorum
saint-paul		4	4							1	3				6	5		3															1	1			10	38	196	saint-paul
san-diego			3	2							1	1						1											6					3				17	107	san-diego
schwarzengrund				8							1							5		1													1	3		1		20	114	schwarzengrund
senftenberg								1	1							1		15																				18	106	senftenberg
siegburg							1										1																					2	8	siegburg
stockholm																											1											1	1	stockholm
tennessee	1			1								6																					1					9	98	tennessee
thompson							1					7	15			1																		2	1	1			28	157	thompson
tuindrop																		4																				4	4	tuindrop
typhi-murium	1		2	36				6	1	3	1	14	2			3	10	6	1	5						1	1		3	1			2		1	5	2	107	807	typhi-murium
typhi-murium v cop			1		1	5			1	1			3			3		11		2					1								1					30	241	typhi-murium v cop
urbana												22																										22	29	urbana
wassenaar												2																										2	4	wassenaar
weltevreden				1																																		1	1	weltevreden
worthington																		2																1				3	69	worthington
typhi-C1				1																																		1	1	typhi-C1
untypable group B				4																																		4	13	untypable group B
untypable group C2																	3																					3	5	untypable group C2
untypable				1																																		1	1	untypable
unknown																									1		1											1	3	8	unknown
TOTAL	5	9	19	132	1	8	4	44	15	25	14	132	26	4	7	23	22	91	6	24	1	1	5	3	2	6	28	3	11	8	1	5	2	7	24	1	2	14	26	761	5,512	TOTAL

(NY-A - New York - Albany, NY-BI - Beth Israel)
Source: National Disease Laboratory, Ames, Iowa, weekly Salmonella Surveillance Reports from Individual States and US-FDA-Div. of Microbiology, Washington, D. C.

TABLE V -A
SEROTYPES REPORTED FROM NONHUMAN SOURCES
PREVIOUSLY DURING 1965 BUT NOT IN OCTOBER

SEROTYPES	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
alabama	Aug	Ind	1
alachua	Jan-Apr-Jul-Aug	Calif(5)	
	Feb-Sept	Ind(2)	
	Feb-Aug	Minn(5)	
	Feb	Tex(1)	
	Feb	Utah(2)	15
albany	Feb	Tex(1)	
	Mar	Ind(1)	
	Jul-Aug	Miss(2)	
	Sept	Md(1)	5
bonariensis	Sept	Kan	1
brandenburg	Jan	NC	1
carrau	Apr	Ind	1
cholerae-suis	Sept	Ala	1
drypool	Jul	Fla(1)	
	Aug	Wisc(1)	2
duesseldorf	Apr	Mass(1)	
	Jun	Me(1)	2
florida	Jan	Ill	1
gaminara	Aug	Ind	1
gatow	Jul	Pa	1
goerlitz	Jan	Wash	1
grumpensis	Jul	Miss	1
hartford	Apr	Minn	1
illinois	Mar-Jul	Minn(2)	
	May	Md(1)	
	Jul	Ind(2)	
	Sept	Iowa(1)	6
johannesburg	Mar	Utah(1)	
	Jul	Ga(4)	
	Aug	Ind(1)	
	Aug	Miss(1)	7
lindenburg	Jun	La	1
madelia	Sept	Minn	2
manila	Apr	Tenn(1)	
	Jul	Ind(1)	
	Aug	Dela(2)	4
menston	Mar	Va(1)	
	Apr-Jun	Wash(2)	3
mikawashima	Mar	Ind	1
mission	Jan	Ark(1)	
	Jan	SC(1)	
	Jul	Miss(1)	3
norwich	Feb	NC	1
ohio	Jul	Ind	5

TABLE V -A - Continued
SEROTYPES REPORTED FROM NONHUMAN SOURCES
PREVIOUSLY DURING 1965 BUT NOT IN OCTOBER

SEROTYPES	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
orion	Jan	Miss(1)	
	Jan	Mont(1)	
	Mar	Minn(2)	
	Sept	Utah(1)	5
oslo	Mar-Apr-Sept	Ill(5)	
	Jun	Calif(6)	11
paratyphi-B	Mar	Tex(1)	
	May	Pa(2)	
	May	NY-BI(1)	
	Jun	Md(1)	
	Aug	Wash(1)	6
pomona	Apr-Aug	Mich	2
reading	Jan	Ark(1)	
	Jan-Feb-Mar-Apr-May-Aug	Calif(23)	
	Mar-Apr-Sept	Minn(4)	
	Mar-Sept	Mo(2)	
	Jun-Jul	Ala(6)	
	Aug	Iowa(1)	
	Aug	Mass(1)	
	Aug	Utah(1)	
	Sept	Wash(1)	40
rubislaw	Apr	Mont(1)	
	Jul-Aug	Kan(4)	5
ruiru	Apr	Md(1)	
	Aug	Dela(1)	2
simsbury	Jul	Ark(1)	
	Jul	Fla(2)	
	Jul	Iowa(1)	4
taksony	Aug	Dela	1
tallahassee	Jan	Fla	1
thomasville	Mar-Apr	Md(4)	
	Apr-Sept	Minn(3)	
	Aug	Dela(1)	
	Sept	Mo(1)	9
typhi-suis	Feb	Calif	1
westerstede	Jan	Miss	2
westhampton	Feb	Mass(1)	
	Jun	La(1)	
	Jul	SC(1)	3
TOTAL			160