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COMMUNICABLE DISEASE CENTER

SALMONELLA

SURVEILLANCE

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For the Month of November 1964

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

During November, 1,595 human isolations of salmonellae were reported. The average number of isolations per week was 399, a decrease of 63 from the figure for October (Figure 1).

For the past three months the percentage of S. derby recoveries of all isolations reported has leveled off at slightly over 4 per cent (Table VII).

A total of 470 nonhuman isolations were reported in November, for a decrease of 73 from last month.

II. REPORTS OF ISOLATIONS FROM THE STATES

A. Human

During November, 1,595 human isolations of salmonellae were reported. The average number of isolations per week (399) represented a decrease of 63 from October and an increase of 144 over November, 1963 (Figure 1).

The seven most commonly reported serotypes during November were:

Rank	Serotype	Number	Per Cent	Rank Last Month
1	S. typhi-murium & S. typhi-murium var. copenhagen	430	27.0	1
2	S. infantis	123	7.7	2
3	S. heidelberg	117	7.3	4
4	S. newport	107	6.7	3
5	S. enteritidis	78	4.9	7
6	S. derby	69	4.3	5
7	S. oranienburg	60	3.8	9
Total		984	61.7	

Total salmonellae isolated (November) 1,595

The seven most frequently reported serotypes accounted for 61.7 per cent of all isolations this month while representing only 10 per cent of the 70 different types reported. This is consistent with past experience.

The family case to total case ratio during November was .201, consistent with past experience (Table II). The age and sex distribution is consistent with past experience (Table IV).

B. Nonhuman

There were 470 nonhuman isolations in November. This is a decrease of 73 from the previous month when 543 were reported, and the lowest incidence since June of this year when 441 cases were reported. There were 46 serotypes identified among those submitted from 33 States.

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

No.	Serotype	Number	Per Cent	Standing Last Month
1	S. typhi-murium var. copenhagen	92	19.6	1
2	S. heidelberg	33	7.0	2
3	S. montevideo	30	6.4	Not Listed
4	S. tennessee	27	5.7	Not Listed
5	S. infantis	22	4.7	4
6	S. oranienburg	20	4.3	3
7	S. newport	20	4.3	5
		244	52.0	

These seven types accounted for 52.0 per cent of the total.

The four species from which most of the isolations were obtained in order of frequency are: chickens 126 (26.8 per cent); turkeys 103 (21.9 per cent); cattle 56 (11.9 per cent); swine 21 (4.5 per cent). These isolations comprised 65.1 per cent of the total reported.

The appearance of S. tennessee and S. oranienburg in this list of the 7 most common types resulted from a special study on powdered eggs being conducted by an Indiana investigator.

The reported isolation of S. chester from turkeys in Minnesota and Wisconsin in 1964 has received attention of investigators and is reviewed elsewhere in this report.

I. CURRENT INVESTIGATIONS

A. A New York City Outbreak of Hospital-Associated Salmonellosis Due to Salmonella saint-paul. Reported by Tibor Fodor, M.D., Leo Buchner, M.D. Bureau of Preventable Diseases, New York City Health Department, and Richard N. Collins, EIS Officer, CDC.

The outbreak took place in a 1,350 bed general hospital with both private and semi-private accommodations. The hospital consists of a complex of buildings covering several city blocks. The staff includes 1,400 nursing personnel, 250 residents, interns, and fellows and approximately 130 dietary employees. Medical and nursing students also take part in patient care.

In early July 1964, several student and registered nurses were seen in the employee health service with gastroenteritis, and Salmonella saint-paul was isolated from stool specimens in each instance. Shortly thereafter, several isolations of S. saint-paul were recovered from symptomatic patients in several areas of the hospital. Over the next three and one half months a total of 45 symptomatic cases of salmonellosis due to S. saint-paul occurred among patients, employees and staff at this hospital. An additional 26 isolations were discovered on surveys of asymptomatic persons in various areas of the hospital for a total of 71 isolations of S. saint-paul. Illness among symptomatic cases was generally mild, consisting of diarrhea, low-grade fever, and abdominal cramps, usually lasting two to three days. Salmonellosis due to S. saint-paul was listed as a contributing cause of death in one patient in this outbreak, a three-year-old child with severe congenital biliary disease.

Investigations

The epidemic curve of symptomatic cases is shown in Figure II. The earliest cases were among student nurses, employees, and patients in widely scattered areas of the hospital. In several instances, two nursing school roommates became ill one week apart suggesting person-to-person spread. Informal conversations with nurses and other members of the staff indicated that there had been a good deal of diarrheal illness among the staff during August and early September, most of which had been mild, self-limiting and unreported. Chiefs of Staff, and nursing supervisors were alerted and asked to report all diarrheal illness among patients and staff.

When possible food histories were obtained but no common epidemiological ties, other than the fact that all had eaten meals within the hospital, were found. The cases were spread out over such a period of time that no more than two persons could have been infected at any given meal. Thorough inspection of food services was undertaken. All food was prepared in the central kitchen and transported to patient care areas and to a large cafeteria and coffee shop where employees and staff were fed. The main food area was sanitary but toilet facilities were unclean and inadequate and kitchen employees rarely, if ever, washed their hands. On initial survey of 36 main food handlers in the kitchen undertaken in late August and early September, 11 persons (31 per cent) had stool cultures positive for S. saint-paul. Regrettably, due to a delay in the processing and reporting of isolations, an average of 10 to 12 days occurred between the time when the specimen was obtained and the time a positive employee was relieved of work. Only one of the 11 positive food handlers admitted to symptoms of gastrointestinal illness. In late September a second culture survey was done on the previously negative food handlers in the main kitchen and other employees in the cafeteria, coffee shop, and tray service. Six new individuals were found to be excreters of S. saint-paul. These cultures were processed at the hospital by a CDC team and positive employees were notified and relieved of duty within 48 hours of the time the specimen was obtained. The total

attack rate for dietary (17 out of 130) employees in the hospital was 13.1 per cent. Since only 1 of the 17 positive food handlers admitted to symptoms it is not possible to construct a meaningful epidemic curve for these persons. It is likely that several of the food handlers suppressed or denied symptoms of diarrhea, fever, or abdominal pain because of fear of loss of employment.

Samples of raw chicken, duck, turkey, beef, cold cuts, sausages, cake mixes, and fresh whole eggs were obtained and were negative on culture. Powdered eggs and frozen whole eggs and egg whites had been discontinued at this hospital following the S. derby outbreak of 1963, but in the spring of 1964, frozen whole eggs and egg whites were re-instated and soft-boiled eggs were again served to patients and staff. No raw eggs were served in the hospital. Core samples from containers of frozen whole eggs and egg whites were obtained on October 5 and culture revealed S. oranienburg and S. typhi-murium respectively. Remaining stocks of these items at the hospital were destroyed and an embargo placed on their further use.

While the investigation was in progress it became apparent that several hospital-acquired cases among patients were clustered in two areas of the hospital: the pediatric building (consisting of wards X, Y, Z, and CH 1) and one semi-private adult medical ward (2N). An intensive survey of these areas was undertaken for the purpose of (1) determination of the asymptomatic attack rate for S. saint-paul among patients in these areas, and (2) identification of asymptomatic excreters of S. saint-paul among nurses, aids, and doctors attending patients in this area.

Five symptomatic hospital-acquired cases of gastroenteritis due to S. saint-paul had been reported from the pediatric building. On October 8 and 9, the entire 83 patients on census in this area were cultured, but no new isolations of S. saint-paul were found. Five symptomatic cases among the staff in the pediatric building had previously been identified. Survey of 98 nurses, aids, and doctors revealed four new asymptomatic positives including one pediatric intern.

Four symptomatic cases had been reported from the adult medicine ward 2N. Survey of the 37 patients on census on October 12 disclosed four additional asymptomatic cases for an over-all attack rate of 22 per cent for the ward. Two student nurses with positive cultures for S. saint-paul had previously been identified but no new cases were found on survey of 25 nurses, aids, and physicians on ward 2N.

A program for control and continuing surveillance of infection with S. saint-paul was established at the hospital. Emphasis was placed on open communication between the bacteriology laboratory, personnel health clinic, hospital administration, and the New York City Health Department. Over-all co-ordination of the program was under the direction of field epidemiologists from the New York City Health Department and the CDC. Toilet facilities for kitchen employees were improved and several wash stands with monitors were set up in the kitchen area. All employees

found to have positive cultures for S. saint-paul were taken off duty and treated with a variety of medications. Two consecutive negative stool cultures were required prior to return to work with the understanding that additional specimens would be required at regular intervals thereafter.

Discussion

A total of 27 isolations of S. saint-paul were reported from patients in this outbreak. Five of these had symptoms compatible with salmonellosis on admission to the hospital and were thought to be community-acquired. For the past several years S. saint-paul has consistently been among the ten most common serotypes isolated from both human and nonhuman sources. In 1963 this serotype accounted for 3.1 per cent of human and 3.8 per cent of nonhuman isolations.[1] Thus, the occurrence of 5 community-acquired infections of S. saint-paul during this 4-month period is not unexpected. The epidemiological characteristics of the remaining 22 hospital-acquired cases are shown in Table VIII. It is of interest that many of the patients had pre-existing diseases which are known to be associated with salmonellosis: leukemia, malignancy, hemolytic anemia, liver disease, and gastrointestinal surgery. Six of the patients (27 per cent) were on long-term antibiotic therapy prior to the onset of symptoms of salmonellosis. Although no adequate control group exists for comparison, it is of interest in view of the current speculation in the field of experimental salmonellosis that pre-treatment with antibiotics may increase the susceptibility to salmonella infection.

The epidemic curve (Figure II) with cases spread over a considerable period of time suggests initial common source infection of a number of food handlers, doctors, nurses, and employees with extensive secondary spread to patients and other employees. Undoubtedly many mild and asymptomatic infections occurred among employees and staff and went unreported. The high attack rate among kitchen employees (13 per cent) indicates that contaminated food was probably the major vehicles of spread early in the outbreak. It is surprising that no explosive hospital-wide food-borne outbreak occurred during this period. Food coming out of the kitchen to patient care areas during this period, however, may have been only sporadically and lightly contaminated. This, combined with probably low virulence of the organism, may have resulted in significant illness only among the most susceptible individuals.

There is considerable evidence to support the hypothesis of secondary spread from staff to patients in this outbreak. During the period prior to the onset of symptoms, many of the patients were on clear fluids, intravenous feedings, or on diets, such as milk and maalox, skim milk, and infant formula, which could not have been contaminated in the main kitchen. In the area of clustering of patient cases -

1. Salmonella Surveillance Report Annual Summary for 1963.

pediatrics (CH 1, X, Y, Z) and adult medicine (2N), close contact with nurses, aids, and doctors shown to have had symptomatic or asymptomatic infection with S. saint-paul was documented by review of charts and nursing notes. In most instances, symptoms among staff anteceded those patients in their care area.

The means by which S. saint-paul was originally introduced into the hospital remains speculative. Under-cooked eggs, custard and pastry items prepared from stocks subsequently shown to be contaminated with salmonella organisms may have been consumed by a number of food handlers, staff, employees, and patients early in July. It is of interest that while the investigation was in progress, recovery of S. saint-paul from frozen eggs was reported from egg samples obtained in New York City, but not from a source that supplied this hospital. It is of further interest that several States throughout the country doing routine surveys of frozen egg samples frequently report isolation of S. saint-paul. Observations of the eating habits of food handlers at this hospital, who frequently ate under-cooked items and shared various foodstuffs with one another while preparing food, in part may explain the high attack rate in this area. Subsequent institution of a hospital-wide hygiene program (hand washing) with particular emphasis on the kitchen and pediatric areas, combined with a program of rapid processing of stool cultures and prompt removal of positive employees, was probably important in controlling more extensive or serious spread of this infection within the hospital.

There was no evidence of other outbreaks of hospital-acquired infection with S. saint-paul in New York City at this time.

Summary

An outbreak of gastroenteritis due to Salmonella saint-paul occurred in a large general hospital in New York City. A total of 45 symptomatic cases occurred among patients, professional staff and employees. An additional 26 isolations were made from asymptomatic persons. Investigation revealed a pattern of initial common source exposure with extensive secondary spread to patients in high-risk groups. There was one associated death. Frozen whole eggs and egg whites may have been important vehicles in introduction of the infection into the hospital.

B. Investigation of Salmonellosis in Navaho Indians. Reported by Gordon Doran, D.V.M., Epidemiologist, New Mexico State Health Department, Jack Ellis, M.D., Physician in Charge, Crown Point Indian Hospital, Read McGehee, M.D., EIS Officer, CDC.

On October 6, 1964, a 10-month old Navaho child became ill with copious diarrhea, fever and dehydration. A salmonella organism of unknown type was isolated from his stool, and he improved rapidly with treatment.

On October 24, 1964, the mother of the above infant was seen in the Indian Hospital at Crown Point, New Mexico with diarrhea, fever and vomiting. She was 6 months pregnant. On October 27, she delivered a 4-pound premature boy who died of meningitis on November 1. Salmonella panama was isolated from both patients.

From November 1 to November 4, two full-term infants and the physician who delivered the premature baby developed severe diarrhea, but all recovered with prompt treatment. It was assumed that all the cases were related; however, cultures from the last three cases revealed S. saint-paul.

At this point it was unclear just how great the problem in the hospital was, so a culture survey was performed on all employees and patients. Of the 110 cultures, only 2 additional cases were found; one in a janitor and one in a field nurse.

Investigation of the Indian family revealed very primitive living conditions. There were 6 members of the family living in a one-room hogan which had a dirt floor. No other illness was reported in the family, and cultures from 5 of the 6 members were negative. One member, a grandmother, refused culture.

Control measures in the hospital consisted of discussing the problem with the entire staff and alerting them to the potential dangers of salmonellosis. The high risk in the population group with whom they worked was pointed out and sanitary measures, such as hand washing, were heavily stressed.

Editor's Comment: This limited hospital outbreak was surprising in that two different serotypes were isolated from patients from whom epidemiological data suggested a common source.

Salmonella panama has been frequently implicated as a causative agent of meningitis in newborns and infants. Salmonella meningitis is an unusual occurrence but carries a high morbidity and mortality. Additional case reports and references are found in SSR #4 and #23.

C. Outbreak of a Gastrointestinal Illness in a University. (Preliminary Report) Reported by William J. Dougherty, M.D., M.P.H., Epidemiologist, New Jersey State Department of Health, Carl Ruch, M.D., Health Infirmary Physician, Rutgers University, and Jonas A. Shulman, M.D., EIS Officer, Investigations Section, CDC.

An outbreak of gastrointestinal disease involving more than 500 students at Rutgers University, New Brunswick, New Jersey, began on November 12, 1964. The illness was characterized by marked vomiting, nausea, and abdominal cramps, followed by mild diarrhea and headache. The majority of patients had fever less than 100°F., and in general, the students began feeling better in about 12 hours. Treatment was symptomatic and

no antibiotics were employed. The greatest number of cases occurred on November 12 and 13, but the incidence of gastrointestinal illness has remained elevated above the level usually seen. A common source food-borne outbreak is suspected.

Seven stool specimens obtained between November 17 and 20 from patients with diarrhea were negative on culture for salmonella and shigella. On November 24, 30 rectal swabs were obtained from students that had been ill. Three of these specimens showed Salmonella heidelberg. In addition, 4,000 questionnaires were distributed to students and faculty at Rutgers to obtain more epidemiologic data including food histories. A rectal culture survey of 100 students that had been ill, 100 students that had not been ill, and all food handlers, was performed on December 4. Results of the complete investigation will be reported in a subsequent issue of the Salmonella Surveillance Report.

REPORTS FROM STATES

A. Alabama

Outbreak of Gastroenteritis Due to Salmonella javiana. Reported by W.H.Y. Smith, M.D., M.P.H., Director, Bureau of Preventable Diseases, Alabama Department of Public Health.

On September 30, 1964, an outbreak of diarrhea occurred in one of the city schools of Montgomery, Alabama. The outbreak involved 114 students and teachers, all of whom ate a roast beef luncheon served in the school cafeteria at noon on September 30. The incubation period was 9 to 12 hours and the illness was mild in all cases, with the complaint of diarrhea and stomach cramps, followed by weakness. There was no nausea or vomiting. A total of 800 persons were served during the noon day meal.

Samples of the roast beef and buttered peas with carrots were the only menu items available for investigation. The roast beef was positive for Salmonella javiana. The carrots and peas were negative.

The beef was frozen U.S. Commodity that was thawed on September 28 and left in the refirgerator. It was cooked on September 29, cooled to room temperature, and refrigerated again. On September 30 at 7:30 AM, it was taken from the refrigerator, sliced by hand, heated on a range and placed on preheated steam tables with hot gravy as needed to supply the food line. Fourteen beef roasts with an average weight of 10 pounds were served during the lunch. Subsequent investigations indicated that the refrigerator used to store the beef was not operating effectively. The area in which it was located was extremely hot and the doors had been opened frequently.

The temperature of the electrically operated steam table was not accurately obtained, but is thought unlikely that the required 140-150°F. temperature was maintained.

Editor's Comment: In this outbreak there is bacteriological evidence that the roast beef was the major vehicle of infection. The question of whether the beef was contaminated prior to arrival at the school or subsequently contaminated during the process of thawing and cooking, remains unresolved. Cultures from the involved persons as well as interrogation and stool cultures survey of those food handlers involved in the processing of this item would have helped to clarify the situation.

B. California

Review of Hospital-Acquired Salmonellosis in California. Prepared by Philip K. Condit, M.D., Chief, Graham Kemp, D.V.M., and George Perlstein, M.D., EIS Officer assigned to Bureau of Communicable Diseases, California State Department of Health.

To date, in 1964, nine outbreaks of hospital-acquired salmonella infection have been recognized in California. Each outbreak, as described below, represents a different hospital and an individual outbreak, although in the several instances of Salmonella derby infection, inter-hospital spread of infection has not been ruled out entirely. The descriptions that follow are presented for the purpose of stimulating general awareness and interest in this problem as it relates to both hospital-acquired infections and specifically to salmonellosis. These summaries have been taken from reports contributed by city and county health departments and the U.S. Public Health Service, and investigations performed by members of this Bureau.

1) During mid-July, an explosive outbreak of gastroenteritis affecting 121 of 545 intermediate care patients occurred at a large Veterans Administration Hospital (SSR #28). Sixty-five of those ill became symptomatic within twenty-four hours following the first case. More than fifty cultures obtained from patients with characteristic symptoms yielded S. heidelberg. The number of asymptomatic excretors was not determined.

The acute onset of the outbreak and the involvement of a well-defined population suggested a common source outbreak. After medications and water were ruled out as possible sources, food remained the likely source. Dietary histories were reviewed, and those foods served to more than 80 per cent of those ill were felt to be the most probable means whereby the organism was introduced into the patient population. The manner of preparation of these foods was studied, and foods for which the preparation assured temperatures that would kill salmonella were removed from consideration. The suspect food remaining was tapioca pudding.

The technique of preparing the tapioca pudding allowed ample opportunity for contamination with S. heidelberg. Eggs, both yolks and unheated whites, were used in large quantities, and, on epidemiological grounds, were felt to be the source of the outbreak. Interestingly, the one egg distributor supplying the hospital during July obtained eggs from

forty-five farms and six major distributors. Frozen eggs from two of these six distributors were implicated epidemiologically and bacteriologically during a recent epidemic of S. heidelberg which occurred in the State of Utah.

2) During early August, fourteen newborns admitted to the nursery of a hospital serving a large metropolitan area became infected with S. newport. (SSR #31) Twelve of the fourteen were symptomatic, and one death occurred in an infant with stigmata of glycogen-storage disease. Eight of the fourteen manifested symptoms of an enteric illness within seventy-two hours of birth, suggesting that contamination took place during the first or second day of life. The attack rate of those at risk was estimated to be approximately 10 per cent. The extent of this outbreak was such that it was deemed necessary to completely vacate the maternity ward and nursery in order that a thorough disinfection could be accomplished. Because the times of possible exposure were spread over a one-week period, it was concluded that exposure to the organism was a repeated one.

Epidemiological and bacteriological studies suggested that the index case was contaminated at birth by the mother (subsequently discovered to be excreting S. newport). During the period of time when symptomatic, the index case contaminated a nurse assistant, who at one time or another cared for the remaining thirteen cases prior to the onsets of their illnesses. During the investigation, one of four stool specimens submitted by the nurse assistant yielded S. newport. It was also felt that crowding in the nursery was a contributory factor.

Follow-up information provided by the local health department indicates that five cases of S. newport infection have developed among parents and siblings of known cases.

3) Over a nine-month period, thirteen cases of S. derby infection occurred in association with hospitalization at a large community hospital. Twelve of the thirteen cases were children less than eighteen months old. The remaining case was an adult female with a peptic ulcer. In an attempt to define the differences between the population at risk and the remainder of the patients admitted to the pediatric ward and other hospital services, the investigation proceeded along several lines, including examinations of (1) personnel, (2) drugs and diagnostic and therapeutic procedures, and (3) diet. Stool specimens from all personnel involved in the care of the affected age group were cultured. None were found positive for S. derby. The second area investigated was also unrewarding.

The remaining area of concern, the diet, was of interest. Although it did, of necessity, vary with age, the primary dietary constituents for those less than eighteen months of age were formula, jello, commercial cereals and baby foods, and raw eggs. Although eggs were distributed to the entire hospital population, raw eggs were fed only to that age group (with the one exception) in which S. derby infections occurred.

In the light of the aforementioned S. derby outbreak in the East, it was advised that this practice be discontinued. No new cases among hospitalized infants have appeared.

Two additional cases occurred among parents and siblings.

4) Eight newborns, admitted to a hospital nursery over a seven-day period, were infected with S. bareilly. Six of those affected were asymptomatic. No source was defined bacteriologically, although the mother of the index case was noted to have mild diarrhea during labor. It was observed that the nursery population and staff work load increased significantly just prior to and during the early phase of the outbreak. It has been suggested elsewhere that an increased work load contributes to a relaxation of isolation techniques, increasing the hazard of cross-contamination.

Follow-up data by the local health department revealed that one infant continued to excrete S. bareilly for a minimum of two months after the outbreak. Subsequently, three cases of S. bareilly among parents and siblings have occurred.

5) Hospital-acquired S. derby infections occurred in two elderly gentlemen two weeks after hospital admission. Both were in their seventies, and, in one, pre-existing gastrointestinal disease was present. Three other cases of S. derby enteritis could be termed hospital-acquired only with reservations. The source of infection, and mode of spread was not defined.

6) Similarly, from December of 1963 through June of 1964, seven cases of hospital-acquired S. derby infection were noted in adult patients at another institution. The ages ranged from 29 to 36. In four instances where medical information was available, two patients were admitted for surgery of an undetermined nature, and two had pre-existing gastrointestinal disease. Again, the source was not defined.

7) As above, five adults were infected with S. derby 10 to 110 days after hospital admission. In three cases, pre-existing gastrointestinal disease was present and in two of these, surgery was performed. Interestingly, two of the cases presented signs of an acute urinary tract infection confirmed to be due to S. derby.

8) A fourth hospital was unfortunate in having four cases of S. derby infection, three of which were hospital-acquired. The pattern here was similar to the situations described above.

9) In February 1964, two adults, both of whom had gastrointestinal surgery for peptic ulcers, developed a diarrheal illness within 36 hours after discharge from a hospital. Both of them must be regarded as hospital-associated. No additional hospital-acquired cases have been recognized, but one family member of one of the cases became ill with S. derby enteritis.

Summary

Thus, approximately 170 cases of salmonellosis associated with hospitalization have come to attention in California through September of this year. Nine institutions and four salmonella serotypes have been involved. It is felt that this is but a small portion of the problem, and that many more cases are occurring but are unrecognized. As with many other infectious diseases, the problem of the asymptomatic carrier plays a major role in understanding this difficult situation.

A brief review of all reported instances of salmonella infection occurring within one county during 1962 and 1963 indicated that at least 5 to 10 per cent of these cases were hospital-acquired, as either part of an outbreak or as sporadic cases.

The above descriptions illustrate the variety of outbreaks, which have occurred, including the explosive common source types, and those which can extend over a longer period of time. In some instances, the chain of infection has been well-defined, and in others the mode of spread has remained in doubt. In evaluating any case of hospital-acquired salmonellosis, attention must be paid to dietary constituents and their relation to raw animal products however obscure, to equipment and materials utilized in both diagnostic and therapeutic procedures, and to any and all personnel in contact with patients. The hospital population is, in part, comprised of many individuals highly susceptible to infections of any sort, and the complications of these problems are frequently serious. As noted in the several instances above the problem does not remain confined to the hospital environment but extends into the community as the disease spreads to involve extra-hospital contacts of those infected with salmonella.

C. Minnesota

Infection of Turkey Flocks with Salmonella chester. Reported by Dr. H. R. Olson, Poultry Diseases, Minnesota Livestock Sanitary Board.

There have been 6 flocks investigated during 1963 and 1964. The ages of the turkeys at the time the isolations were made were 5 days, 6 days, 4-1/2 weeks, 7 weeks, 8 weeks and 26 weeks. The mortality experienced in the flock at 5 days of age was 1100 out of 10,000; the 6-day-old flock, 750 out of 16,000; 8 weeks of age flock, 875 out of 16,000 and 26 weeks of age flock 100 out of 700. The turkey flocks originated from 4 different hatcheries, one from out of state. S. chester was isolated from 2 breeder flocks involving one of the hatcheries but neither one of them were involved directly with the poults in which S. chester was isolated. No information is available concerning common sources that could be associated with Minnesota flock infection and Wisconsin or other adjacent states.

Editor's Comment: The opportunity to determine source exposures to animal species often requires contact with states having similar episodes with specific serotypes. By selecting serotypes that have unusual frequency in certain parts of the country definitive studies on such items as sources of animal (hatchery, feeding farm, etc.), feeds or feed ingredients common to both, and other common entities would aid in describing the most important links in the chain of transmission resulting in the establishment of an effective means of control.

D. Rhode Island

Institutional Outbreak of Gastroenteritis Due to Salmonella typhi-murium. Reported by Joseph E. Cannon, M.D., M.P.H., Director of Health, State of Rhode Island Department of Health, and Beryl Rosenstein, M.D., EIS Officer assigned to the Rhode Island Department of Health.

During September and October an increase in the incidence of diarrheal disease was noted in a state institution for nonambulatory, severely retarded children. Stool cultures from 9 patients revealed Salmonella typhi-murium. Investigations were subsequently undertaken to identify, if possible, the source of the organism and the mode of transmission. All cases occurred in a single building containing two floors. Stool specimens and/or rectal swab specimens were obtained from all nursing personnel in the involved area and these were negative for salmonella. All food was prepared in a central kitchen and transported to the individual buildings on metal hot trays. Discussion with the dietician revealed that the children were receiving a variety of dietary items. The relationship of cases and various dietary items are summarized below.

(A) All patients with diarrhea

	Persons who ate specified food				Persons who did not eat specified food			
Food	ill	not ill	total	attack rate(%)	ill	not ill	total	attack rate(%)
Kitchen	15	11	26	58	6	52	58	10
Raw eggs	11	34	45	24	10	29	39	25
Soft boiled	8	22	30	27	13	41	54	24

(B) Only patients with positive cultures

	Persons who ate specified food				Persons who did not eat specified food			
Food	ill	not ill	total	attack rate(%)	ill	not ill	total	attack rate(%)
Kitchen	8	18	26	31	1	57	58	2
Raw eggs	7	38	45	16	2	37	39	5
Soft boiled	2	28	30	7	7	47	54	13

The kitchen formula contained a high-protein nutrient, commercial preparation, raw eggs, Karo syrup, cream and milk, and has been in use for several years. The use of raw eggs in cereal and fruit, however, began only in mid-September. All ingredients in the kitchen formula as well as personnel in the diet kitchen were cultured, but no salmonella organisms were recovered. The use of raw eggs was discontinued. All children with positive cultures were isolated and treated with antibiotics until clinically well. There have been no new cases of diarrhea reported since October 15.

Editor's Comment: In this outbreak, epidemiologic investigation seemed to indicate the kitchen formula as a common source. Of the ingredients in this item, raw eggs are suspected as being the source of infection on the basis of previous experience. Raw eggs, however, had been used widely throughout the institution without any reported cases of diarrhea outside the children's area. This suggests the possibility that the eggs were only lightly and sporadically contaminated. The possibility that the infection was introduced into the kitchen formula by a food handler remains a possibility and is not excluded by the negative culture survey.

E. Wisconsin

Infection of Turkey Flocks with *Salmonella chester*. Reported by Dr. E. D. Baker, Animal Health Division, Madison, Wisconsin.

Recent studies have indicated that the majority of isolation of *S. chester* were from flocks of turkeys ranging in age from 1 day to 38 weeks of age. Isolations were obtained from the intestinal tract of 95 per cent of the cases involving 30 farms in 1964. The disease problem varied with the age of the bird and perhaps was not the major cause of morbidity but may be secondarily involved. The flocks were generally large, ranging from 1400 to 26,000.

The morbidity and mortality rates varied with the age of the turkeys. One flock of 10,000 infection at 6 days of age had approximately 50 per cent morbidity and 15 per cent mortality. In other flocks of older birds, morbidity and mortality were less than 1 per cent.

The majority of turkey cases came from a large integrated organization which maintained hatcheries and breeding flocks. Attempts were made to determine if infections were occurring from hatchery exposure but culture of hatching eggs and newly hatched poults were negative for salmonellae. Possible explanations for the spread and persistance of *S. chester* in flocks was the movement of turkeys, people and material from farm to farm which provided an opportunity for cross-contamination. In at least 7 of the flocks, the poults were under 12 days of age which would not completely negate a possible hatchery type exposure.

V. SPECIAL REPORTS

A. Recent Pertinent Resolutions and Recommendations of the Association of State and Territorial Health Officers (ASTHO). Adopted November 12, 1964 at Washington, D.C. meeting of ASTHO.

Item 1

The Association strongly endorses pasteurization of all liquid, frozen and dried egg products as the only known scientific method of assuring a pathogen-free egg product for human consumption.

The Association recommends that each state health department take such steps as are necessary to implement such pasteurization of egg product in its state.

Item 2

The State and Territorial Health Officers recommend:

(1) That the Public Health Service confer with the Food and Drug Administration, Department of Agriculture and other appropriate Federal agencies in order to implement pasteurization of all liquid, frozen and dried egg products, as the only known scientific method of assuring a pathogen-free egg product for human consumption.

(2) That the Public Health Service continue its Salmonellosis Surveillance to identify and study comprehensively salmonellosis outbreaks.

(3) That the Public Health Service explore means by which manufacturers of animal and poultry feeds may be required to produce a salmonella-free product, thus, controlling this significant route of infection.

Item 3

The Conference recommends:

(1) That the Public Health Service sponsor a meeting to develop plans for a National Conference on Food Protection. Such a Conference should include representatives from health agencies, food industry (producers, processors, distributors) and consumers; should study and identify current food protection problems, and develop recommendations for undertaking a systematic approach to their early resolution.

(2) That the Public Health Service establish a grant-in-aid program to fortify State Health Department food protection programs, including the area of epidemiological study of foodborne diseases.

(3) That a national "monitoring" network be established in coordination with the F.D.A., Department of Agriculture, and Department of Interior to maintain surveillance to protect food against bacterial, chemical and physical contaminants potentially harmful.

(4) That the Public Health Service conduct necessary research and develop program guides which can be uniformly applied by State and local health agencies and by industry to assure the sanitary control of commercially processed fish.

B. Transmission of Salmonellosis to Chicks Fed Contaminated Feed. Reported by Zoonoses Investigation Unit and Veterinary Public Health Laboratory, CDC.

Feed contamination with salmonellae is considered an important source of infection to poultry and other animals. Several publications have revealed the isolation of the same serotypes from infected animals and their feed (1, 2, 3). Definitive studies to determine how readily poultry exposed to contaminated food become infected with various serotypes and the degree of contamination in the feed necessary to produce infection have not been reported.

An experiment was conducted to observe the effects of feeding meat scraps proved to be contaminated with salmonella organisms, to newly hatched chicks. The meat scrap was combined with sterilized corn meal to make up the feeding ration.

The significant features of the experiment and the results are briefly presented.

Method:

(1) Embryonated eggs were hatched in an egg incubator in the Veterinary Public Health Laboratory. Twenty-one chicks were killed and cultured for salmonellae immediately after hatching. Unhatched eggs and surface swabs of the interior area of the hatcher were also cultured. Cloacal swabs were cultured from all chicks used in the experiment. No isolations of salmonellae were obtained.

(2) Forty chicks were placed individually in stainless steel containers with filter paper placed over the air vents to minimize exposure to the outside environment and fed the contaminated feed. Fifteen control chicks fed sterilized feed were placed in similar containers in the same room.

(3) Cloacal swabs were taken from exposed chicks and control at intervals listed in Table X.

(4) Between the 4th and 29th days the viscera was cultured from chicks that died or were killed.

(5) The number of salmonellae in the contaminated feed was established by the most probable number (MPN) method of enumeration. By this method the feed was found to contain an MPN of 14 salmonella organisms per 100 grams. Fifty colonies were picked and identified as to serotype (Table IX).

Results:

(1) Frequency of salmonella serotypes isolated from feed, necropsied chicks, and cloacal swabs were compared (Table IX). Four of the 6 serotypes identified in the feed were also identified from the chicks. Two serotypes isolated from the feed were not isolated from the chicks and two serotypes isolated from the chicks were not isolated from the feed.

(2) The infections appeared in chicks within 4 days of exposure with the percentage increasing rapidly by the 14th day. Of the chicks that survived past the 14th day, only 1 remained negative throughout the experiment. One control chick became infected. The results of isolation are presented in Table X.

Conclusions:

(1) Transmission from contaminated feed was readily demonstrated in 32 of 39 chicks found positive for salmonellae by culturing visceral organs of those that died or were killed between the 4th and 29th days of exposure.

(2) One control chick which died was cultured on the 14th day of the experiment and was positive for S. meleagridis, however, 9 others which died were cultured at various times and were negative indicating that cross infection from one container to another was minimal. Heavy mortality occurred in both control chicks and exposed chicks excluding the possibility that deaths were associated with salmonella infection. The cause of death in these birds was not determined.

(3) Multiple serotype infections occurred in 11 chicks.

(4) Of the two organisms, S. livingstone and S. alachua, isolated with highest frequency from the feed, S. alachua predominated as the most frequent serotype from chicks. Two other types, S. minnesota and S. senftenberg, not found in the feed were isolated from chicks. The inability to identify these isolates in feed is probably related to an insufficient number of colonies picked and number of samples tested. To detect all types of salmonella in a given specimen, all of the sample would have to be examined. As the number of days of exposure increased, the number of serotypes recovered from the chicks also increased.

References

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2. Boyer, C. I., Jr., Narotsky, S., Bruner, D. W., and Brown, J. A. Salmonellosis in Turkeys and Chickens Associated with Contaminated Feed. Avian Dis. 6:43-50, 1962.
3. Griffin, C. A. A study of Prepared Feeds in Relation to Salmonella Infection in Laboratory Animals. J. Amer. Vet. Med. Ass. 124:120-121, 1952.

INTERNATIONAL

Salmonella Serotypes Isolated in Hong Kong. Abstracted from an article by C. T. Huang and C. H. Chan-Toeh in the Journal of Tropical Medicine, 67:95-99, 1964 (April)

During the period 1953 to 1962, 43,264 clinical specimens comprising peripheral blood, bone marrow, sputum, urine, feces, cerebrospinal fluid, pus and exudate were received for bacteriological exmination by the Department of Pathology and Bacteriology, University of Hong Kong. A total of 330 strains of salmonellae were isolated from 300 patients. (An organism recovered from the same type of specimen from a patient more than once was counted as one strain. However, if the same organism was isolated from the same patient but from a different type of specimen, it was counted as a separate strain). Of the 330 strains isolated, S. typhi was found 198 times (60 per cent). Salmonella cholerae-suis, recovered 40 times (12 per cent), was second most common. Blood and bone marrow specimens were the most common sources for the salmonellae recovered (190) while stool specimens, accounting for 65 isolations, were second most common. The proportion of all specimens accounted for by each type of specimen was not indicated. A summary of the recoveries made (by serotype and type of specimen) appears in Table XI.

Table XII demonstrates the relationship of serotypes to clinical manifestations of patients.

One hundred and eighty-six strains (56.4 per cent) were isolated from male patients. Of the 330 strains recovered, 146 (44.2 per cent) were from patients less than 20-years-old.

FOOD AND FEED SURVEILLANCE

Rendering Plant Studies. Reported by James B. Nichols, D.V.M., Director, Division of Veterinary Public Health, N. J. Schneider, Ph.D., Director, Bureau of Laboratories, Florida State Board of Health, Jacksonville, Florida, and John Orthoefer, D.V.M., EIS Veterinary Officer assigned to Florida State Board of Health, in co-operation with the Zoonoses Investigations Unit and the Veterinary Public Health Laboratory, Communicable Disease Center.

Rendered animal by-products used in animal feeds are known to be heavily contaminated with salmonellae; they have been incriminated in the chain of transmission of salmonellae from feed to animal to man. This study was designed to determine if salmonellae could be reduced or eliminated from such rendered products by continued use of reasonable sanitation measures in the plant. Necessary arrangements were made with the management of a plant of typical design. The processing plant and the storage area were in separate buildings about 50 feet apart, connected by an underground auger. There was little physical separation between the raw material area and the processing area.

Swab samples were collected from the environment of the raw material area, processing area, and storage area, and bulk smaples were collected in the processing and storage area. Open jars of tetrathionate were placed in each area. Surveys were made in February, March, May and November 1964. Although partial cleaning was undertaken in the plant between the second and third surveys, this was not considered adequate and further efforts to obtain more thorough cleaning were postponed due to renovations being made in the plant in which new equipment was being installed.

Results:

Salmonellae were found to be widely distributed throughout the entire plant on each of the four surveys by all methods of sampling (Table XIII). Identification of 17 of the salmonellae isolated during the fourth survey has not been completed, however, at least 25 serotypes have been found. These serotypes and their frequency are given in Table XIV. Seven types have persisted during the study, including S. montevideo, S. binza, S. oranienburg, S. senftenberg, S. anatum, S. derby and S. havana.

I. Special Bulletin

Interstate Outbreak of Salmonellosis Related to Commercially Prepared Dietary Supplement. (preliminary report)

In June 1964, an outbreak of salmonellosis in an institution for mentally deficient children and adults in the State of Tennessee was investigated by the Tennessee State Department of Health (SSR #29). Epidemiologic investigation at that time suggested that a food supplement was the vehicle of infection, and this was subsequently confirmed when salmonellae were isolated from the product in question. The product, prepared from 14 raw ingredients, is distributed in nine States in the northeast, southeast, and southwest, primarily for use in institutions for mentally retarded children and adults. Extensive investigations by the Federal Food and Drug Administration and the Salmonella Surveillance Unit, of CDC, have established that this product, under its present methods of production, is contaminated with salmonellae. Additionally, an investigation of four institutions in two States receiving and using this product has revealed some 20 to 40 per cent of patients consuming this item to be infected with salmonellae. Preliminary indications are that the vast majority of these patients have had minimal clinical illness or have been asymptomatic carriers.

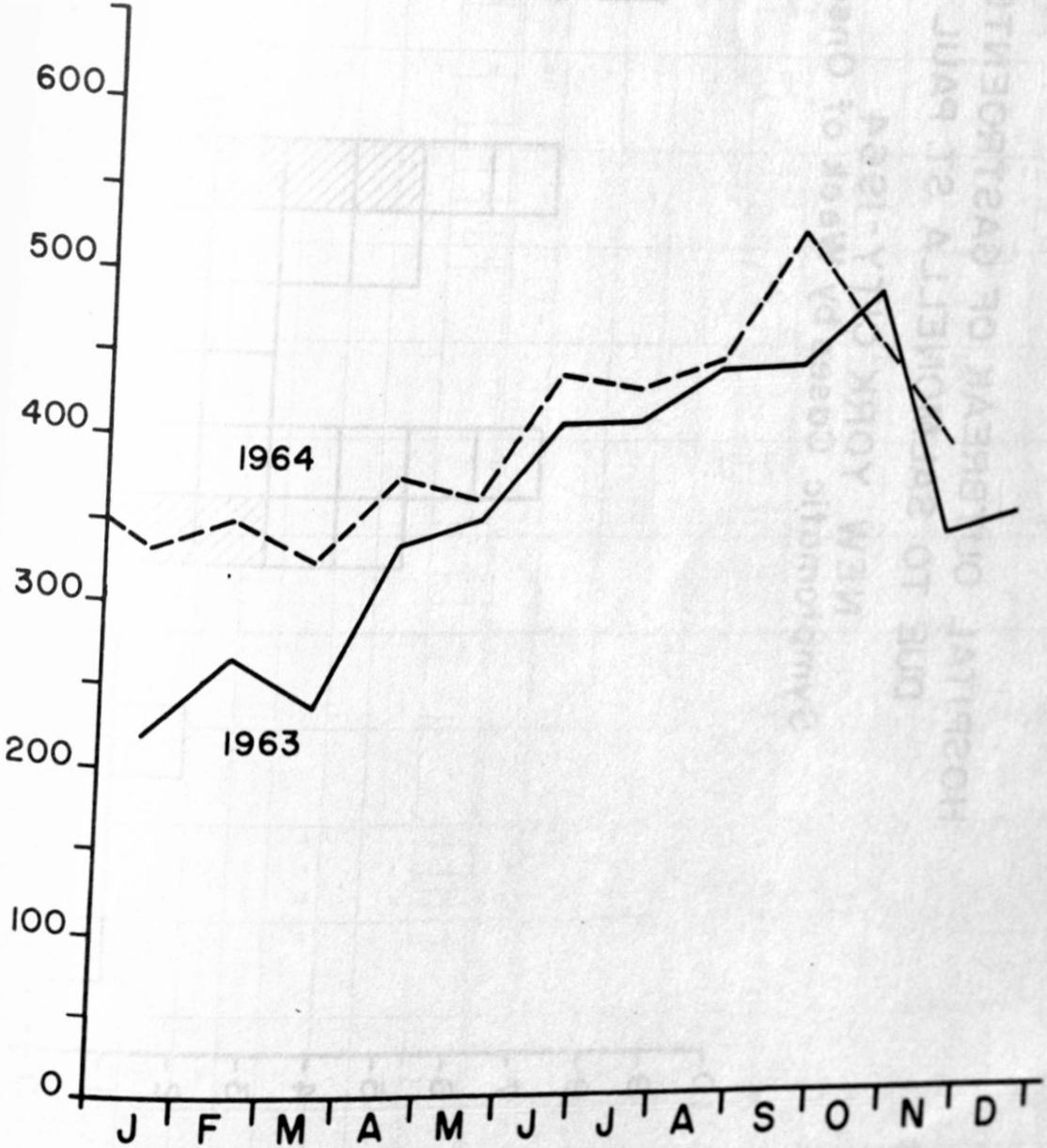
Five salmonella serotypes have been consistently recovered from both the product, some of the raw ingredients, and patients. In relative order of frequency they are as follows: S. schwarzengrund, S. montevideo, S. tennessee, S. simsbury, and S. cubana.

Under the suggestion of the Federal Food and Drug Administration, the manufacturer of this product issued a recall on December 24, 1964, of all the product presently in use or in storage by his consignees. The FDA has notified all appropriate State Food and Drug Administrations. Additional information has been sent to epidemiologists in each of the States involved. A complete report of this investigation will be included in the next issue of the Salmonella Surveillance Report.

Figure 1

REPORTED HUMAN ISOLATIONS OF SALMONELLAE IN THE UNITED STATES

1963 - 1964



Symptomatic Cases by Week of Onset

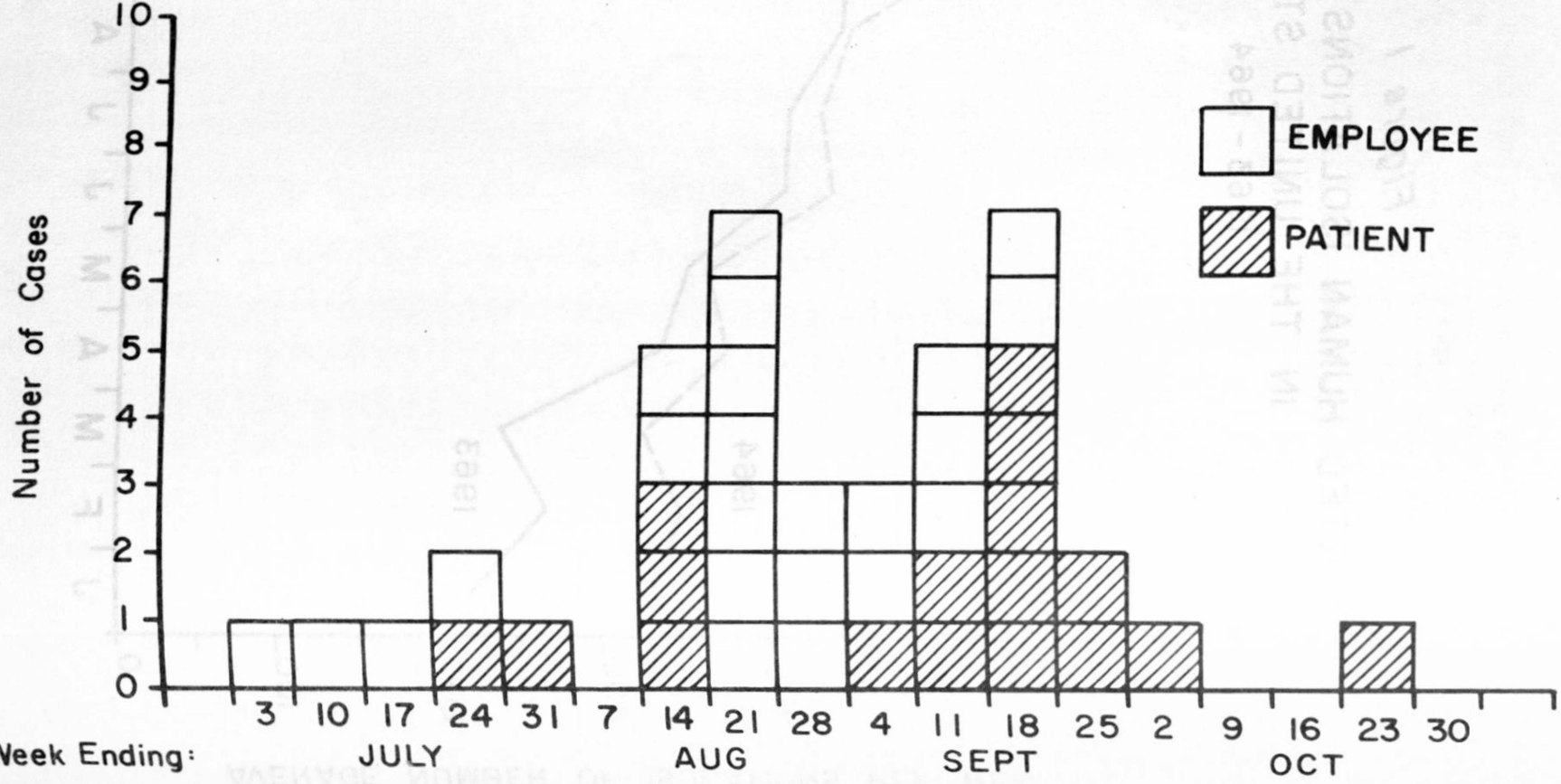


TABLE I

SALMONELLA SEROTYPES ISOLATED FROM HUMANS DURING NOVEMBER, 1964

SEROTYPE	REGION AND REPORTING CENTER																	
	NEW ENGLAND							MIDDLE ATLANTIC						EAST NORTH CENTRAL				
	MAINE	NH	VT	MASS	RI	CONN	TOTAL	NY-A	NY-BI*	NY-C	NJ	PA	TOTAL	OHIO	IND	ILL	MICH	WIS	TOTAL
alachua										1			1						
albany										1			1						
anatum				3			3	1				1	2	1					1
bareilly				2		3	5					1	1			1			1
berta														1					1
binza																			
blockley				5			5		3			3	6	1		1	1		3
bovis-morbificans												2	2					1	1
braenderup																			
brandenburg																			
bredeney								1	1			1	3				2		2
california																			
cerro																2			2
chester														1					1
cholerae-suis																			
coquilhatville																			
cubana								1					1	1				1	2
derby	1			5		9	15	9	6	2	2	7	26	1		1	2		4
dublin																			
duesseldorf																			
enteritidis				9		3	12	14	1	4	1	3	23	7		7	8		22
essen								1					1						
fayed														1		1			2
give						1	1										1		1
grumpensis																			
heidelberg				7		1	8	1	8	5	5	7	26	5		3	9	2	19
indiana									1			1	2						
infantis				6		4	10	5	3	3		24	35	4		11	3	4	22
irumu																2		1	3
java						1	1	1					1						
javiana				1			1												
kentucky											1		1						
litchfield																			
loma-linda														1			1		2
manhattan								1					1						
manila																			
meleagridis																			
miami																			
minnesota																			
mississippi																			
montevideo				1		1	2	5	1	1		6	13	3		1			4
muenchen												1	1				3		3
muenster									1	1			2						
newington								1		1		5	7	1			2		3
newport				3			3												
norwich								4		2		1	7	1		2	3		6
oranienburg				1			1												
oslo									4	1			5			3		1	4
panama				1			1												
paratyphi A																			
paratyphi B				3			3		1		1	2	4	1			4		5
poona									1				1						
reading																			
rubislaw														2	1		6	2	11
saint-paul						2	2	5	2	4		2	13						
san-diego										1			1	2			1		3
schwarzengrund									1	1		1	3	1		1	1		3
senftenberg														1		2			3
[illegible]burg										1			1						
simsbury																			
tennessee				1			1		1	1			2			3		4	7
thomasville																2			2
thompson				2		1	3	2	2	3		1	8	4		2	1		7
typhi		1			2		3	1	1				2	4		1			5
typhi-murium	5		1	16		5	27	27	8	19	8	27	89	14	1	23	23	14	75
																	1		1
typhi-murium v cop											2		2					1	1
uganda				8			8												
urbana																			
weltevreden																			
worthington																			
Untypable Group B								1					1						
Untypable Group C-1																			
Untypable Group C-2																			
Untypable Group D		2					2												
Untypable Group E																			
Untypable Group G																			
Unknown																			
TOTAL	6	3	1	74	2	31	117	81	46	52	20	96	295	58	2	69	72	31	232

(New York A - Albany, BI - Beth Israel, 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.

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	TOTAL	SEROTYPE
																1	1	alachua
		1					1		1				1		5		7	albany
																		anatum
											1						1	bareilly
																		berta
2							2		1		2					2	2	binza
																	3	blockley
									1				1	1			3	bovis-morbificans
													3				3	braenderup
																		brandenburg
																5	5	bredeney
													1				1	california
															2		2	cerro
											1					1	2	chester
															2		2	cholerae-suis
																		coquilhatville
																		cubana
								3	2			1				3	9	derby
																		dublin
																1	1	duesseldorf
12							12	1	2	1							4	enteritidis
																		essen
											1						1	fayed
																1	1	give
																		grumpensis
1		1				1	3			1			1		3	2	7	heidelberg
21	1	3	1				26		1				2				2	indiana
		1					1						1		3	1	6	infantis
									1									irumu
																1	2	java
						3	3				2				3	2	7	javiana
1																		kentucky
							1									1	1	litchfield
						1	1											loma-linda
																		manhattan
													1				1	manila
															1		1	meleagridis
																1	1	miami
																		minnesota
															1		1	mississippi
									2							5	7	montevideo
																1	1	muenchen
													1				1	muenster
			1			2	3		2		4		1		6	21	34	newington
																		newport
	1					11	12									11	11	norwich
																		oranienburg
																		oslo
																		panama
																		paratyphi A
						3	3	1									1	paratyphi B
																		poona
1																		reading
							1											rubislaw
													1		3	1	5	saint-paul
										1						1	2	san-diego
													1				1	schwarzengrund
																		senftenberg
																		seigburg
																		simsbury
	1						1		1	2	2						5	tennessee
		1																thomasville
		2					1											thompson
13	3	4		1		3	2		5	4	10		6		1	3	10	typhi
							24						8		20	19	66	typhi-murium
1																		typhi-murium v cop
							1											uganda
											1							urbana
																	1	weltevreden
																		worthington
										4							4	Untypable Group B
																		Untypable Group C-1
																		Untypable Group C-2
																		Untypable Group D
																		Untypable Group E
																1	1	Untypable Group G
52	6	13	2	1	-0-	24	98	5	19	13	24	1	29	-0-	51	88	230	Unknown / 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
alachua																			
albany							1		2	3									
anatum							2		2	4									
bareilly																			
berta																			
binza																			
blockley							3	1	2	6									
bovis-morbificans																			
braenderup																			
brandenburg																			
bredeney							7			7						2			2
california																			
cerro																			
chester																			
cholerae-suis																			
coquilhatville																			
cubana		1			1				1	1						2			2
derby						1	5		1	7									
dublin																			
duesseldorf																			
enteritidis							1	2		3							1		1
essen																			
fayed																			
give						1	4			5									
grumpensis																			
heidelberg							4		6	10		1		2		3	8	1	15
indiana														1					1
infantis									3	3									
irumu																			
java																			
javiana			1		1		5		3	8									
kentucky									2	2									
litchfield																			
loma-linda							1			1									
manhattan																			
manila									1	1									
meleagridis																			
miami									1	1									
minnesota																			
mississippi			2		2														
montevideo	1				1		6	8	1	15				3		2			5
muenchen							1		9	10						1			1
muenster														37					37
newington																3			3
newport		1			1	1	12		16	29									
norwich							1	1		2						3			3
oranienburg		1			1		1	1	10	12									
oslo							4			4									
panama									2	2									
paratyphi A																			
paratyphi B									1	1						1			1
poona		1			1														
reading							3			3				1			1		2
rubislaw							1		2	3									
saint-paul			1		1														
san-diego							1		1	1									
schwarzengrund										1									
senftenberg																			
siegburg																			
simsbury		1			1														
tennessee									1	1									
thomasville							6		5	11									
thompson			1		1	1		2	6	9	1			4	1	2	6	2	15
typhi		1			1	3	6	2	8	25									
typhi-murium	1	4	1		6											2			2
typhi-murium v cop							9			9									
uganda							1			1									
urbana																			
weltevreden															21				21
worthington															2				2
Untypable Group B				6	6	1				1									
Untypable Group C-1						2				2					5				5
Untypable Group C-2				1	1										2				2
Untypable Group D																			
Untypable Group E	1			1	2														
Untypable Group G																			
Unknown			1		1														
TOTAL	3	10	7	8	28	10	85	23	86	204	1	1	-0-	48	31	21	16	3	121

TABLE I (CONTINUED)

REGION AND REPORTING CENTER						OTHER VI	TOTAL	PERCENT OF TOTAL	11 MONTH TOTAL	PERCENT OF 11 MO. TOTAL	11 MO. 1963 TOTAL	% OF 1963 11 MONTH TOTAL	SEROTYPE
PACIFIC													
WASH	ORE	CAL	ALASKA	HAWAII	TOTAL								
							2		5		9		alachua
							1		6		3		albany
		2			2		19	1.2	262	1.3	201	1.2	anatum
							11		91		54		bareilly
							2		47		62		berta
							2		20				binza
				1	1		26	1.6	383	2.0	331	1.9	blockley
				1	1		1		7				bovis-morbificans
		1			1		7		94		51		braenderup
							3		4				brandenburg
		3			3		22		198		135		bredeney
							1		28		10		california
		1			1		3		8				cerro
	1				1		5		68		185		chester
							3		15		19		cholerae-suis
				3	3		3		3				coquilhatville
							7		58		35		cubana
1		6		1	8		69	4.3	2,292	11.8	1,445	8.4	derby
		1			1		1		3				dublin
							1		4				duesseldorf
		1			1		78	4.9	687	3.5	743	4.3	enteritidis
							1		2				essen
							1		1				fayed
		1			1		10		75		58		give
				2	2		3		7				grumpensis
1		25		3	29		117	7.3	1,568	8.1	1,430	8.3	heidelberg
							4		48				indiana
1	1	7		11	20		123	7.7	1,387	7.1	882	5.1	infantis
							1		5		78		irumu
		6		2	8		15		207		164		java
				2	2		20		230		155		javiana
							2		21		55		kentucky
							5		58		64		litchfield
		2			2		2		4				loma-linda
				9	9		14		170		164		manhattan
							1		1				manila
		1			1		3		46				meleagridis
							1		43		63		miami
							1		12		13		minnesota
							3		36		26		mississippi
		8			8		55	3.4	478	2.5	448	2.6	montevideo
		2			2		18		243		247		muenchen
							1		6				muenster
							39		68		43		newington
		24			24		107	6.7	949	4.9	991	5.7	newport
							2		12		11		norwich
		6		1	7		60	3.8	509	2.6	503	3.9	oranienburg
				1	1		1		8				oslo
				3	3		17		169		132		panama
		1			1		1		7				paratyphi A
							15		160		148		paratyphi B
							7		42		47		poona
		1			1		1		34		45		reading
							3		18		13		rubislaw
		4		1	5		43	2.7	587	3.0	547	3.2	saint-paul
1		1			2		6		138		109		san-diego
		3		3	6		15		141		137		schwarzengrund
		1		1	2		7		99		31		senftenberg
							1		2				siegburg
		2			2		3		5				simsbury
				1	1		18		320		135		tennessee
							2		3				thomasville
	1	3			4		38	2.4	362	1.9	300	1.7	thompson
	1	10			11		45	2.8	637	3.3	683	4.0	typhi
20	1	49	1	11	82		408	25.6	5,174	26.7	5,051	29.3	typhi-murium
							22		189		156		typhi-murium v cop
							1		5				uganda
							1		22		28		urbana
				1	1		2		21		43		weltevreden
							1		43		26		worthington
		2			2		33		288		276		Untypable Group B
							4		77		64		Untypable Group C-1
							3		48		46		Untypable Group C-2
			8		8		7		40		72		Untypable Group D
							12		25				Untypable Group E
							1		2				Untypable Group G
							1		87		70		Unknown
24	5	174	9	58	270	-0-	1,595		19,413		17,262		TOTAL

TABLE I-A
HUMAN SEROTYPES REPORTED PREVIOUSLY DURING 1964 BUT NOT IN NOVEMBER

Serotype	Month(s)	Reporting Center(s)	Number of Isolations
aberdeen	Sep	NY-BI	1
abony	Jan	NY-C	1
adelaide	Jan	Pa(1)	
	Mar	Calif(2)	
	Apr	Ohio(1)	
	Oct	NY-BI(2)	6
amager	Jan-Mar	La(8)	
	Sep	Okla(1)	
	Oct	Mo(1)	10
amsterdam	Apr	Colo	1
ardwick	Apr	Ill	1
arechavaleta	Jun	Okla	1
atlanta	Apr-May-Jun-Jul	Ga	5
banana	Jul	Ariz	1
birkenhead	Sep	Hawaii	1
bonariensis	Sep	Kan	1
bradford	Jul	Mo(1)	
	Sep	NJ(1)	2
brancaster	Jul	Ind	1
bristol	Aug	Tex	1
cambridge	Jan	Ill	1
caracas	Sep	Tex	1
carrau	Jul	Mich(1)	
	Sep	Fla(1)	2
cholerae-suis v kun	Jan-Jul-Aug	NC(3)	
	Jan-Mar-May-Aug	Fla(7)	
	Jan-Feb-Apr-Jun-Jul	Va(5)	
	Jan	NJ(1)	
	Feb	Mo(1)	
	Mar-Sep	La(2)	
	Apr-Jul	Mich(2)	
	May-Jul-Aug	Ga(4)	
	Jun	Tex(1)	
	Jul-Sep	Ill(2)	29
	Aug	Minn(1)	2
colorado	Jan-Jun	Hawaii	
concord	Feb	Colo(1)	
	Oct	Tex(1)	2
denver	Apr	Calif	1
eastborne	Oct	NY-BI	1
emek	Jul	Calif	1
florida	May-Sep	Fla(2)	
	Oct	Tex(4)	6
galiema	Apr	Colo	1
gallinarum	Jul-Sep	Miss	3
gaminara	Jul	La	1
gatuni	Jan	Fla	1
georgia	Oct	Kan	1
goettingen	Jul	NC	1
halle	Jun	Mass	1
halmstad	Apr	Mich	1
hartford	Feb-Mar-Apr	Fla(3)	
	Mar-Jun	Ill(2)	
	Apr	La(1)	
	Apr	Dela(1)	
	May	Ala(1)	9
	Sep	Mo(1)	1
hato	Mar	Colo	
johannesburg	Apr	Calif(1)	2
	Apr	NY-A(1)	

TABLE I-A (CONTINUED)
HUMAN SEROTYPED REPORTED PREVIOUSLY DURING 1964 BUT NOT IN NOVEMBER

Serotype	Month(s)	Reporting Center(s)	Number of Isolations
kottbus	Jun	NY-A	1
lexington	Aug	Tex	1
livingstone	Apr	Ark(1)	
	May-Sep	Md(2)	
	Aug-Sep	Calif(3)	
	Sep	La(1)	
	Oct	Hawaii(1)	8
lomita	Sep	La	4
london	Feb-Jun	Va	3
luciana	Jan	Ariz	1
madelia	Feb	Wisc	1
manchester	May-Jun	Tex(2)	
	Sep	Va(1)	3
michigan	Apr-Jun	Calif	2
mission	Aug	Fla	1
new-brunswick	Mar	Ill(1)	
	Apr-Jul	Calif(2)	
	Jul	Ga(1)	4
new-haw	May	Ida	1
ohio	Mar-Aug	Calif	3
orion	Feb	Mass(1)	
	Aug	Mo(1)	
	Sep	Fla(1)	3
othmarschen	Jan	Tex	1
pensacola	Jun-Jul	Mass(3)	
	Jul	Ind(1)	
	Aug	NY-A(1)	
	Sep	Va(1)	
	Sep	NC(1)	
	Oct	Ga(1)	
	Oct	Ala(1)	9
pullorum	Mar	Ga	1
redlands	Mar	Ga	1
richmond	Sep	Kan(1)	
	Oct	Tex(1)	2
salinatis	Sep	Calif	1
saphra	Sep	Tex	1
senftenberg v newcastle	Sep	NY-BI	5
shipley	Jan	NY-C	1
stanley	Feb	NJ(1)	
	Jun-Jul	NY-A(2)	
	Aug	Ariz(1)	
	Sep	NY-BI(1)	
	Oct	Fla(1)	6
sundsvall	Feb	Ariz	1
tallahassee	Jul	Fla(1)	
	Jul	NJ(1)	2
travis	Oct	Tex	1
virchow	Jan	Wash(1)	
	Sep	Ill(1)	
	Oct	Dela(2)	4
weslaco	Jul	Tex	1
westerstede	Sep	Tex	1
westhampton	Mar	Hawaii	1
TOTAL			176

TABLE II

Number of Salmonella Isolates from Two or More Members of the Same Family - November 1964

Reporting Center	Total Number of Isolates Reported	Number of Isolates From Family Outbreaks
Alabama	7	1
Alaska	9	0
Arizona	21	1
Arkansas	10	1
California	174	38
Colorado	48	11
Connecticut	31	4
Delaware	5	0
Dist. of Col.	13	5
Florida	88	17
Georgia	51	9
Hawaii	58	6
Idaho	1	0
Illinois	69	11
Indiana	2	0
Iowa	6	2
Kansas	24	9
Kentucky	3	0
Louisiana	85	25
Maine	6	5
Maryland	19	0
Massachusetts	74	9
Michigan	72	27
Minnesota	52	5
Mississippi	8	3
Missouri	13	1
Montana	1	0
Nevada	3	0
New Hampshire	3	2
New Jersey	20	2
New Mexico	31	9
New York - A	81	16
New York - BI	46	5
New York - C	52	11
North Carolina	29	7
North Dakota	2	0
Ohio	58	4
Oklahoma	23	5
Oregon	5	1
Pennsylvania	96	18
Rhode Island	2	0
South Dakota	1	0
Tennessee	10	1
Texas	86	15
Utah	16	2
Vermont	1	0
Virginia	24	9
Washington	24	5
West Virginia	1	0
Wisconsin	31	19
Totals	1,595	321

TABLE III

Infrequent Serotypes

Serotype	Center	November	11 Month Total*	1963 Total**	Comment
S. alachua	FLA - NY-C	2	5	10	Isolated 1952 in Alachua County, Fla; all subsequent Fla. isolates from this county.
albany	NY-C	1	6	3	All reported nonhuman isolates from poultry.
bovis-morbificans	HAI	2	5	4	1.9 per cent of the human isolates in the Netherlands in 1962.
brandenburg	N.C.	3	4	4	Reported from a family outbreak associated with turtles.
cerro	CALIF - GA	3	8	6	5.4 per cent of isolates from animal feed and fertilizer in 1963.
S. coquilhatville	HAI	3	3	0	First time reported to this unit; first isolated from human feces in the Belgian Congo.
S. dublin	CALIF	1	3	2	Most common animal isolate reported in Germany in 1959.
S. duesseldorf	FLA	1	4	3	Rare human and nonhuman isolate; the nonhuman isolates recorded prior to 1964 are all from poultry in Va.
S. essen	NY-A	1	2	0	Second isolations reported to this unit; first in September 1964 from Colo.
S. fayed	VA	1	1	3	Of three previous isolates reported to this unit, two were from Va., one from Fla.

TABLE III (cont'd)

Serotype	Center	November	11 Month Total*	1963 Total**	Comment
S. grumpensis	HAI - MICH	3	7	3	1.3 per cent of the isolates reported from Hai. for the first 10 months of 1964.
S. loma-linda	CALIF	2	4	6	Associated with hypo-gamma-globinemia in three of six isolates in 1963.
S. manila	N.C.	1	1	0	First human isolate reported to this unit; last year isolated from fertilizer in Texas.
S. minnesota	TEX	1	12	13	All 1963 isolates from mid-West and East.
S. oslo	HAI	1	8	5	One per cent of isolates reported in 1963 and first 10 months of 1964 from Hai.
S. paratyphi A	CALIF	1	7	8	Majority of cases reported to this unit from Calif.; common in Far East; see International Reports, this issue.
S. siegburg	NY-C	1	2	0	First reported from Germany in 1953; non-human isolates have been from poultry and eggs.
S. simsbury	CALIF - TENN	3	5	6	Involved in a current investigation of a dietary supplement used for incapacitated individuals.
S. uganda	LA	1	5	0	First outbreak in this country to the knowledge of this unit; occurred in Kan. in 1961 involving 4 out of a family of 23 members.

TABLE III (cont'd)

Serotype	Center	November	11 Month Total*	1963 Total**	Comment
S. muenster	N.C.	1	6	5	Nonhuman isolates prior to 1964 were from a horse and insects.
S. norwich	LA - OKLA	2	12	13	First isolated 1951 in England from mesenteric lymph nodes of swine healthy at slaughter.

*Represents 19,413 human isolations of salmonellae during the first eleven months of 1964.

**Represents 18,649 human isolations of salmonellae during 1963.

TABLE IV

Age and Sex Distribution of 1,595 Isolations of Salmonella Reported for November 1964

Age	Male	Female	Total
Under 1	95	70	165
1-4 yrs.	125	112	237
5-9 yrs.	67	48	115
10-19 yrs.	50	57	107
20-29 yrs.	49	58	107
30-39 yrs.	37	37	74
40-49 yrs.	23	37	60
50-59 yrs.	27	33	60
60-69 yrs.	26	30	56
70-79 yrs.	16	20	36
80+	8	11	19
Unknown	272	233	505
Total	795	746	1,541
% of Total	51.6	48.4	

BY BY BY BY BY BY BY BY BY BY BY BY THE NATIONAL DISEASE LABORATORY AND STATE REPORTING CENTERS BY SEROTYPE AND SOURCE, NOVEMBER, 1964

SEROTYPE	chicken	turkey	pigeon	crane	quail	avain	equine	bovine	ovine	porcine	canine	lab mouse	guinea pig	rabbit	monkey	mink	fox	egg	egg yolk	egg albumen	powdered egg	frozen egg	frozen egg albumen	powdered egg albumen	egg product	egg shell	chicken	duck	diet-all	poultry feed	bone meal/ meat scraps	animal feed unknown	tankage	Total	11 Mos. Total	SEROTYPE
amager	1																											1					1	3	amager
anatum		12					1			1									1													1		16	241	anatum
blockley	7	3																																11	109	blockley
braenderup	3																																	3	18	braenderup
bredeney	1	3																																4	103	bredeney
california		6																												1				6	26	california
cerro																														1				1	40	cerro
chester	3	12								1																				1				16	180	chester
cholerae-suis										5																								1	32	cholerae-suis
cholerae-suis v kun																																		5	99	cholerae-suis v kun
cubana								1																						1	1			1	33	cubana
derby	1	11		1				1		2																								18	212	derby
dublin								7				3	1																					7	32	dublin
enteritidis										3																								7	83	enteritidis
gallinarum	7																																	7	62	gallinarum
give	3																					2					4			1		2	1	3	38	give
heidelberg	10	10	1					1		1	1																				2	1		33	441	heidelberg
illinois																														1				3	11	illinois
infantis	13	1					2			1	1							1			1	1								1	2		1	22	330	infantis
inverness																																		1	2	inverness
java		1																																1	3	java
kentucky	1																	3													2		1	6	34	kentucky
livingstone	3	3																																7	51	livingstone
manhattan		1					1									1										6								3	46	manhattan
meleagridis	4								1																									11	47	meleagridis
minnesota		1																7			1	6	1		1									1	11	minnesota
montevideo	11							1	2		1		1																					30	211	montevideo
muenchen	1																				1													3	86	muenchen
newington	2																																	3	37	newington
newport	1	5						14																										20	154	newport
oranienburg	1																	1		4	10	2		1							1			20	142	oranienburg
orion					1																										1			2	15	orion
panama		2						1																										3	27	panama
pensacola						1				1												1												1	1	pensacola
pullorum	9																																	11	192	pullorum
saint-paul	4	5								1																1								10	185	saint-paul
san-diego		1																											1		1			2	83	san-diego
schwarzengrund	3	2																		1										1				7	103	schwarzengrund
senftenberg	4	1				1																									1		4	12	85	senftenberg
siegburg																														1				1	5	siegburg
simsbury																													1					1	9	simsbury
tennessee	1							3																					1				1	27	112	tennessee
thompson	5	3												1				5	2	1	18	6				2						1		22	125	thompson
typhi-murium	15	15	1			1	2	27	2	3	4	1			1		1		1															75	884	typhi-murium
typhi-murium v cop	9	5	1									1				1																		17	149	typhi-murium v cop
typhi-suis										2																						1		2	6	typhi-suis
westhampton																																		1	1	westhampton
worthington	2										1																							2	58	worthington
untypable group B	1																															1		2	7	untypable group B
untypable group E																																		1	1	untypable group E
TOTAL	126	103	3	1	1	3	6	56	5	21	8	5	2	1	1	2	1	17	4	6	31	18	1	1	3	7	4	1	3	4	12	7	6	470	5,179	TOTAL

Includes late October report

TABLE VI

NON-HUMAN ISOLATES REPORTED BY THE NATIONAL ANIMAL DISEASE LABORATORY AND STATE REPORTING CENTER BY SEROTYPE AND STATE NOVEMBER 1964

SEROTYPE	Ala	Ariz	Ark	Calif	Colo	Fla	Ga	Ill	Ind	Iowa	Ky	Md	Mass	Mich	Minn	Miss	Mo	NH	NJ	NY-BI	NC	Ohio	Okla	Ore	Pa	SC	Tenn	Texas	Utah	Va	Wash	Wisc	Wyo	Total	11 Mos Total	SEROTYPE
amager			1																															1	3	amager
anatum				4				1	1											1		1						8						16	241	anatum
blockley	6																1					1								1	2		11	109	blockley
braenderup																					3												3	18	braenderup
bredeney				2			1								6														1				4	103	bredeney
california																																	6	26	california
cerro															1																		1	40	cerro
chester															9		2															5	16	180	chester
cholerae-suis																						1											1	32	cholerae-suis
cholerae-suis v kun									5																								5	99	cholerae-suis v kun
cubana				1																													1	33	cubana
derby				1				1			1		6		1								4		2				1		1		18	212	derby
dublin				7																													7	32	dublin
enteritidis					1			3																					3				7	83	enteritidis
gallinarum			7																														7	62	gallinarum
give				3																													3	38	give
heidelberg			1	10			7	1					1		2						1	1			1				3		5		33	441	heidelberg
illinois										1					2																		3	11	illinois
infantis				2		1	6		1												1	2		2			1		1		2	2	22	330	infantis
inverness						1											1																1	2	inverness
java															1																		1	3	java
kentucky				3			3					3			3							1												6	34	kentucky
livingstone				1		1			1							4	1									6								7	51	livingstone
manhattan				1																													3	46	manhattan
meleagridis																																	11	47	meleagridis
minnesota				1																													1	11	minnesota
montevideo	9			2			1	1								1						8				1			7				30	211	montevideo
muenchen				1		1												1															3	86	muenchen
newington																																	3	37	newington
newport		1	1	10									2		4							1					1						20	154	newport
oranienburg			1					5	10					4	1														2				20	142	oranienburg
orion																						1											2	15	orion
panama				1										1	1													2					3	27	panama
pensacola																										1							1	1	pensacola
pullorum	4																					1				3							11	192	pullorum
saint-paul			1	2			2		1			1		1	2							1											10	185	saint-paul
san-diego															1							1											2	83	san-diego
schwarzengrund				3			1								2																		7	103	schwarzengrund
senftenberg										1					2							1				4						4	12	85	senftenberg
siegburg																		1															1	5	siegburg
simsbury																										1							1	9	simsbury
tennessee				1					19													2				3		3	6				27	112	tennessee
thompson			5																			7				1				9			22	125	thompson
typhi-murium			1	19	5	1			2			1	3	9	5	3	1					1	1	3		2						3	75	884	typhi-murium
typhi-murium v cop								1	1				1		2	5	4			2	2				2			2				2	17	149	typhi-murium v cop
typhi-suis													2				1																2	6	typhi-suis
westhampton															1																		1	1	westhampton
worthington			2																														2	58	worthington
untypable group B				1																													2	7	untypable group B
untypable group E																																	1	1	
TOTAL	19	1	20	75	6	5	22	12	41	2	1	5	15	15	49	13	11	1	1	3	7	30	5	6	5	17	7	16	24	9	9	15	3	470	5,179	TOTAL

Includes late October report

N.Y.-BI (New York-Beth Israel)

TABLE VI-A
SEROTYPES REPORTED FROM NONHUMAN SOURCES
PREVIOUSLY DURING 1964 BUT NOT IN NOVEMBER

Serotype	Month(s)	Reporting Center(s)	Number of Isolations
adelaide	Jan	Mich	2
alachua	Feb	Ohio(1)	
	Jun	Minn(1)	
	Jul-Sep	Calif(2)	
	Sep-Oct	Mass(2)	
	Sep	Ill(1)	7
albany	Jan	Ky(1)	
	Sep	Md(1)	
	Oct	Tex(1)	3
bareilly	Jan	Mo(2)	
	Jan-Oct	NJ(5)	
	Mar	Ala(1)	
	Mar	Ind(1)	
	Apr-Jul	Calif(4)	
	Jul	Ga(1)	
	Jul	Mass(1)	
	Aug-Sep	Ohio(2)	
	Sep-Oct	Utah(3)	
	Oct	Kan(4)	
	Oct	Minn(1)	25
belem	Mar	Mich	1
berta	Mar-Jul	NC(2)	
	May	Mo(1)	
	Jul	Ga(2)	
	Aug	Calif(1)	6
binza	Jan-Jul-Aug	Ill(7)	
	Feb-Mar	Miss(3)	
	Mar-Jun-Jul-Aug-Sep	Calif(11)	
	Mar	Md(1)	
	Mar-Oct	Minn(2)	
	Apr-Jun	Ind(4)	
	Jul	Mo(2)	
	Aug	NJ(1)	
	Sep	NY-A(4)	
	Oct	Mass(1)	
	Oct	Mich(1)	37
blukwa	Mar-Apr	Mich	2
cambridge	Jul	Ind	1
duesseldorf	Sep	Ind	1
gaminara	Jun	Ind	1
grumpensis	Aug	Mich	1
indiana	Feb-Sep	Minn(2)	
	Feb	NC(1)	
	Apr-Aug-Sep	Ill(7)	
	Apr-May-Jun-Jul-Aug-Sep	Ind(8)	
	Jun	Mo(1)	19
javiana	Feb	La	1
johannesburg	Feb	Ala(1)	
	May	Mo(2)	3

TABLE VI-A (CONTINUED)
SEROTYPES REPORTED FROM NONHUMAN SOURCES
PREVIOUSLY DURING 1964 BUT NOT IN NOVEMBER

Serotype	Month(s)	Reporting Center(s)	Number of Isolations
lille	Sep	Ind(1)	
litchfield	Sep	NJ(1)	2
	Mar-May-Sep	Calif(3)	
	Jun	Me(1)	
	Jun	SC(1)	
	Sep	Kan(6)	
	Oct	Ala(1)	
	Oct	SD(1)	13
madelia	Oct	Fla	1
manila	Jan	Mo	2
miami	Jun	Mich(1)	
	Sep	Fla(1)	2
minneapolis	Jan-Aug	Ill	2
mission	Jan	Mo	2
muenster	Jun	Minn	1
new-brunswick	Sep	Va	1
new-haw	Jul	Miss	1
ohio	Feb-Mar-Aug-Oct	Ohio	12
oslo	Sep	Kan	9
paratyphi B	Aug	Pa	1
pomona	Jul-Aug	Mich	3
poona	Feb-Oct	Mich(2)	
	Mar-Oct	Calif(2)	
	Oct	Kan(1)	5
reading	Jan	Ind(1)	
	May-Jun-Jul	Iowa(4)	
	May	Va(1)	
	Jun-Aug-Sep	Wash(4)	
	Aug	Ill(2)	12
rubislaw	Jul	Iowa	1
stanley	Feb	Calif(2)	
	May-Aug	Mich(3)	
	Jun	Pa(1)	
	Jul	Ga(1)	
	Aug	Iowa(1)	
	Sep	La(1)	9
taksony	Jun	Calif	1
tallahassee	Apr	Fla	1
thomasville	Jun	Ga	1
uganda	Oct	Kan	1
urbana	Aug	Ill(1)	
	Sep	Kan(6)	7
wandsbek	Jan	Mich	1
wassenaar	Sep	Kan	1
zehlendorf	Apr	Mich	1
TOTAL			203

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
1964	January	1,601	213	13.3
	February	1,442	301	20.9
	March	1,279	290	22.7
	April	1,882	399	21.2
	May	1,545	277	18.0
	June	1,758	195	11.1
	July	2,159	217	10.1
	August	1,777	151	8.5
	September	2,624	109	4.2
	October	1,848	85	4.6
	November	1,595	69	4.3

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

TABLE 8

HOSPITAL ACQUIRED INFECTION DUE TO SALMONELLA ST. PAUL IN PATIENTS AT A GENERAL HOSPITAL

NO.	SEX	AGE (YEARS)	SERVICE	WARD	BASIC DIAGNOSIS	SX*	DATE OF SX OR 1st ⊕ CULTURE	DIET	COMMENT
1	F	3	P	X	biliary atresia	+	7/18	NPO	Salmonellosis contributing to death on 8/2. On Steroids & antibiotics before sx
2	M	55	S	Q	chronic pancreatitis	+	7/24	NPO	G-I surgery 7/9. On antibiotics before sx.
3	M	53	S	4	peptic ulcer	+	8/19	milk & maalox	Gastric Surgery 7/30.
4	M	6	P	CH I	Fracture Elbow	+	8/10	regular	
5	F	75	M	3S	hepatitis parox. noct. Hemoglobinuria	+	8/11	low salt	On long term Steroid therapy
6	F	50	M	2N	acute leukemia Hemolytic anemia	+	8/29	regular	Steroid therapy.
7	F	26	S	2	cholecystitis	0	9/2	low fat	
8	M	75	S	Q	diabetes	+	9/3	diabetic diet	On antibiotics two weeks before sx.
9	M	4	P	X	histiocytosis X	+	9/5	regular	On Steroids and antibiotics
10	M	8 mos.	P	Y,Z	congenital cataracts	+	9/9	skim milk	
11	F	10 mos.	P	Y,Z	head trauma	+	9/10	skim milk	
12	M	40	M	2N	lymphoma	+	9/13	low salt	
13	F	2	P	Z	muscle atrophy 2° polio	0	9/14	regular	
14	F	53	M	G3	arteriosclerosis	+	9/15	low salt	
15	F	18 mos.	P	Y,Z	congenital cataracts	+	9/15	infant formula	
16	M	77	M	2N	arteriosclerosis	+	9/18	low salt	
17	M	66	M	3S	polycythemia vera	+	9/22	regular	
18	M	15	M	2N	acute leukemia	+	9/27	regular	Steroid therapy
19	F	35	M	2N	myasthenia gravis	0	10/12	regular	Long term antibiotics
20	F	29	M	2N	myasthenia gravis	0	10/12	regular	Long term antibiotics
21	F	61	M	2N	aortic stenosis	0	10/12	low salt	
22	M	67	M	2N	metastatic colon cancer	+	10/21	regular	

* = Usually included fever, diarrhea, abdominal pain.

KEY

SERVICES	DIET
S=Surgery	NPO=Nothing by mouth
P=Pediatrics	
M=Medicine	

TABLE IX

Frequency of Salmonella Serotypes in Feed, Necropsied Chicks, and Cloacal Swabs

*TYPE	FEED	NECROPSIED CHICKS	CLOACAL SWABS
S. livingstone	20	2	4
S. alachua	13	20	35
S. derby	7	0	0
S. meleagridis	4	4	12
S. oranienberg	3	1	2
S. montevideo	3	0	0
S. minnesota	0	6	4
S. senftenberg	0	1	6

*Multiple types found in same chicks in 11 instances

TABLE X

Salmonellae Isolated from Chicks Fed Contaminated Feed

SPECIMENS	EXPOSURE DAYS	NO.	POS.	SEROTYPES (NO.)
Cloacal Swabs	4	24	6	S. alachua (2); S. meleagridis (2); S. senftenberg (2)
Cloacal Swabs	7	23	8	S. alachua (4); S. meleagridis (2); S. senftenberg (2)
Cloacal Swabs	10	23	12	S. alachua (6); S. meleagridis (3); S. senftenberg (1); S. minnesota (1); S. oranienberg (1)
Cloacal Swabs	14	21	18	S. alachua (10); S. meleagridis (3); S. minnesota (1); S. livingstone (1); S. oranienberg (1); S. minnesota and S. livingstone (1); S. alachua and S. senftenberg (1)
Cloacal Swabs	19	17	16	S. alachua (10); S. meleagridis (1); S. livingstone (1); S. minnesota (1); S. minnesota and livingstone (1); S. alachua and S. meleagridis (1); S. alachua and S. senftenberg (1)
*Dead Chicks (Heart, liver caecum, colon)	4-15	18	12	S. alachua (7); S. meleagridis (3); S. livingstone (1); S. alachua and S. livingstone (1)
" "	16-27	15	15	S. alachua (9); S. minnesota (3); S. meleagridis (1); S. oranienberg (1); S. alachua and S. senftenberg (1)
Chicks killed at termination of exp. (Heart, liver, caecum, colon)	0-29	6	5	S. minnesota (3); S. alachua (1); S. alachua and S. minnesota (1)

* One chick not cultured.

6	-
3	-
3	-
1	-
1	-
8	1
21	2
-	-
-	-
-	-
-	-
140	-

10,000		1,598	13,360	43,264	
4	8	-	10	28	8.6
1	8	-	2	14	4.2
-	3	-	-	6	1.8
-	-	-	-	1	0.3
-	1	-	-	2	0.6
1	1	2	2	15	4.6
1	3	2	11	40	12.1
-	-	-	1	1	0.3
-	1	-	-	1	0.3
-	3	-	-	3	

	Salmonella infection	suppurations
S. paratyphi A	12	8
S. paratyphi B	11	2
S. typhi-murium	6	--
S. stanley	1	--
S. derby	2	--
S. paratyphi C	7	5
S. cholerae-suis	15	17
S. birkenhead	--	--
S. potsdam	1	--
S. [illegible]hompson	3	--
S. [illegible]irchow	1	--
S. [illegible]yphi	149	20
S. [illegible]endai	1	3
S. [illegible]legdam	--	2
S. [illegible]berta	2	--
S. (9, 12 : a-)	1	1
S. [illegible]eleagridis	1	1
S. [illegible]anatum	1	--
S. [illegible]senftenberg	1	--
S. bovis morbificans	1	

...plication in patients with debilitating diseases	Asymptomatic carriers	Total number of cases
2	--	22
--	--	13
--	--	6
--	--	1
--	--	2
1	--	13
6	--	38
1	--	1
--	--	1
--	--	3
--	--	1
2	3	183
--	--	4
--	--	2
--	--	2
--	--	2
--	1	3
--	--	1
--		

TABLE XIII

RESULTS OF SALMONELLA ISOLATED FROM DIFFERENT TYPES OF SAMPLES AND AREAS OF RENDERING PLANT

	TYPE OF SAMPLE	AREA	SURVEY NO. 1	2	3	4	TOTAL
I.	SWAB	RAW	6/60*	7/32	8/32	12/32	33/156
		PROCESSING	16/32	12/31	4/31	8/31	40/125
		STORAGE	6/10	3/10	5/10	4/10	18/40
II.	BULK	PROCESSING	5/10	4/10	0/10	5/10	14/40
		STORAGE	13/19	13/19	18/19	15/19	59/76
III.	AEROSOL	ALL AREAS	1/15	2/15	8/15	5/15	16/60
		TOTAL	47/146	41/117	43/117	49/117	180/497

*NO. POS./NO. SAMPLES

TABLE XIV

FREQUENCY OF SALMONELLA SEROTYPES ISOLATED FROM RENDERING PLANT DURING 4 SURVEYS

SEROTYPE	SURVEY PERIOD I	II	III	IV	TOTAL
S. montevideo	53	28	12	19	112
S. binza	16	34	5	4	59
S. oranienburg	5	17	9	14	45
S. senftenberg	13	5	3	3	24
S. alachua	2	0	1	19	21
S. anatum	1	10	1	6	18
S. derby	5	2	3	5	15
S. havana	6	4	3	1	14
S. infantis	0	11	1	2	14
S. livingstone	4	5	0	0	10
S. meleagridis	0	3	6	0	9
S. cerro	0	0	2	7	9
S. canoga	1	5	0	2	8
S. menhaden	0	6	0	0	6
S. muenster	0	1	0	3	4
S. new-brunswick	3	0	0	0	3
S. california	3	0	0	0	3
S. saint-paul	0	2	0	0	2
S. newport	0	2	0	0	2
S. orion	0	0	2	0	2
S. minnesota	0	0	1	1	2
S. worthington	0	1	0	0	1
S. typhi-murium	0	0	1	0	1
S. kentucky	0	0	0	1	1
S. cubana	0	0	0	1	1
incomplete	0	0	0	17	17
Total	112	136	50	105	403