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COMMUNICABLE DISEASE CENTER

SALMONELLA

SURVEILLANCE

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For the month of August 1966

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:

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I. SUMMARY

This issue of the Salmonella Surveillance Report includes a discussion of the June 1966 interstate epidemic caused by smoked whitefish contaminated with Salmonella java and a report of contamination of carmine dye with Salmonella cubana. A discussion of the use of ampicillin in the treatment of salmonella carriers and a follow-up report from the Food and Drug Administration concerning salmonellae in drug substances of animal origin are included in Special Reports.

In August there were 2,408 isolations of salmonellae reported from humans, an average of 482 isolations per week. This number represented an increase of 74 (18.1 percent) over the weekly average during July 1966 and an increase of 10 (2.1 percent) over the weekly average of August 1965. The cumulative total of reported isolations for the first 8 months in 1966 (12,915) represents a 1.2 percent decrease from the total reported for the same period in 1965 (13,067).

There were 863 nonhuman isolations of salmonellae in August, an increase of 352 from July.

II. REPORTS OF ISOLATIONS FROM THE STATES

A. Human

The seven most frequently reported serotypes during August were:

Rank	Serotype	Number	Percent	Rank Last Month
1	S. typhi-murium and S. typhi-murium var. copenhagen	778	32.3	1
2	S. heidelberg	194	8.1	2
3	S. newport	186	7.7	4
4	S. infantis	125	5.2	5
5	S. enteritidis	107	4.4	3
6	S. thompson	98	4.1	7
7	S. saint-paul	96	4.0	6
	Total	1,584	65.8	
	Total (all serotypes)	2,408		

The age and sex distribution (Table III) has continued as in the past.

B. Nonhuman

Thirty-five states reported nonhuman isolations, represented by 57 different serotypes.

The seven most frequently reported serotypes during August were:

Rank	Serotype	Predominant Source and Number	Number	Percent	Rank Last Month
1	S. typhi-murium and S. typhi-murium var. copenhagen	Chicken (67), Turkey (16), and Bovine (15)	152	17.6	1
2	S. heidelberg	Turkey (43) and Chicken (21)	78	9.0	2
3	S. anatum	Turkey (18), Sewage (7), and Thyroid powder (6)	48	5.6	3
4	S. schwarzengrund	Turkey (44)	47	5.4	4
5	S. tennessee	Powdered milk (32)	44	5.1	5
6	S. derby	Yeast (19), Turkey (4), Sewage (4), and Thyroid powder (4)	38	4.4	Not listed
7	S. thompson	Noodles (22) and Chicken (5)	38	4.4	Not listed
	Total		445	51.5	
	Total (all serotypes)		863		

The most prominent nonhuman sources of salmonellae reported during August were turkeys, 201 (23.3 percent); chickens, 152 (17.6 percent); livestock feed, 61 (7.1 percent); powdered milk, 57 (6.6 percent); frozen eggs, 32 (3.7 percent); and animal feed, 29 (3.4 percent).

III. CURRENT INVESTIGATIONS

A. Salmonella cubana Infections Associated with Carmine Dye.

Reported by David J. Lang, M.D., and Lawrence J. Kunz, Ph.D., Boston, Massachusetts, the California and Massachusetts Departments of Public Health, the Portland City Health Department, Dr. B. Moore, Chief, Public Health Laboratory, Exeter, England, and the U.S. Food and Drug Administration.

An outbreak of Salmonella cubana infections in a Massachusetts hospital has been found associated with carmine dye used for the investigation of gastrointestinal function (MMWR, 1966, Vol. 15, No. 33). Investigation of the outbreak was initiated by the hospital when it was noted that S. cubana accounted for a disproportionate number of salmonella isolations from clinical specimens submitted to the hospital laboratory. From January 1966 to July 1966 there were 23 isolates of S. cubana, comprising 22.9 percent of all salmonella isolates at the hospital. Of the patients with S. cubana infection, 11 had received capsules of carmine dye, 5 were patients on the same ward as those who had taken the dye, and 1 was a nurse on the ward. The remaining patients had no known association with carmine dye.

Seven additional cases related to carmine dye have been reported in the United States. Six cases occurred at a medical center in California and 1 in a hospital in Oregon. In addition, 6 cases of S. cubana infection have been traced to ingestion of carmine dye in Exeter, England.

Carmine is a red dye commonly used in the investigation of gastrointestinal function. It is employed as an aid in the measurement of bowel transit time, collection of timed fecal specimens, and demonstration of fistulae. Carmine was listed in the National Formulary until 1950, when it was dropped. Despite this, the dye is still recommended for diagnostic tests in a number of medical textbooks[1-3].

Salmonellae were cultured from stock bottles of carmine in the hospitals in Massachusetts, California, Oregon, and Exeter, England. In every instance the contaminating serotype was found to be S. cubana.

Intensive investigation has been initiated by the U.S. Food and Drug Administration and the Communicable Disease Center to determine the source of contamination. Carmine dye is produced from the cochineal insect of the species Coccus cacti. The insects live on cactus plants in tropical areas and at present are exported primarily from Peru and the Canary Islands. The dye is then produced in the United States and in several European countries including England, France, and Germany. Group G salmonellae (the group into which S. cubana is classified) have been cultured from shipments of cochineal from Peru and the Canary Islands as well as from manufactured carmine dye in this country and England. At the present time it is not known whether contamination with this uncommon serotype originates with the live insect or occurs at some time during processing.

Though S. cubana is an uncommon serotype, the absolute number and relative frequency of human isolations in this country have been increasing as seen in the table below.

Incidence of Salmonella cubana Among Salmonella Isolates

Year	Total Salmonella Isolates	S. cubana	Percent
1963	18,649	40	0.2
1964	21,113	63	0.3
1965	20,865	145	0.7
1966*	10,507	95	0.9

*January through July 1966.

It has also been observed that S. cubana infections tend to occur in young children as shown below.

Age Distribution of Salmonella cubana Infections Compared with All Salmonella Serotypes, January - July, 1966

	S. cubana		All Serotypes	
Age	Percent	Cumulative %	Percent	Cumulative %
< 1	27.5	27.5	17.1	17.1
1 - 4	33.3	60.8	26.5	43.6
5 - 9	7.8	68.6	13.1	56.7
10 - 19	9.8	78.4	9.2	65.9
20 - 39	9.8	88.2	13.6	79.5
40 - 59	7.8	96.0	11.3	90.8
60 - 79	3.9	99.9	7.7	98.5
80 +	0.0	99.9	1.5	100.0

The extent to which contaminated carmine dye has been responsible for this increase is not known. Epidemiologic investigation of all new cases of S. cubana as well as the 95 cases reported to date this year, would help to determine more clearly the importance of carmine dye as a vehicle for salmonella infections.

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1. Page, Lot B. and Culver, Perry J.: A Syllabus of Laboratory Examinations in Clinical Medicine. Harvard University Press, Cambridge, 1960, p. 374.
2. Cole, Warren H. and Zollinger, Robert M.: Textbook of Surgery, Eighth Edition. Appleton-Century-Crofts, New York, 1963, p. 744.
3. Bockus, Henry LeRoy: Gastroenterology, Volume 2. W. B. Saunders, Philadelphia and London, 1964, p. 493.

B. Interstate Outbreak of Gastroenteritis Due to Contamination of Smoked Whitefish with Salmonella java.
Information compiled by health authorities in New Jersey, New York, Pennsylvania, Canada, and Epidemiology Branch, Communicable Disease Center.

On May 31, 1966, an outbreak of febrile gastroenteritis occurred among guests who had attended a bar mitzvah party in Edison, New Jersey, the previous evening. Illness included symptoms of diarrhea with abdominal cramps, nausea, vomiting, fever as high as 104°, dehydration, and general prostration, and lasted from 2 to 10 days. A few patients were hospitalized; there were no deaths.

The bar mitzvah was catered, and as many as 30 food items had been served, but available information pointed to 1 item, smoked whitefish, as the source of infection.

Attack Rates of Febrile Gastroenteritis As Related to Whitefish Ingestion

Smoked Whitefish	Ill	Not Ill	Total	Attack Rate
Ate	34	11	45	76%
Did not eat	0	69	69	0%

More than 12 similar outbreaks occurred during the Memorial Day weekend, involving over 300 people located in metropolitan areas of New York, New Jersey, and Philadelphia. All cases were among Jewish people who had eaten smoked whitefish at social and religious gatherings. Salmonella java was the organism isolated from stool cultures of involved persons and from the whitefish served at the various affairs.

The contaminated whitefish had been smoked and distributed by a fish processing plant in New York. On April 1, 1966, the plant was seriously damaged by fire. Major plumbing and structural repairs were made from the time of the fire to just before the outbreak, and while repairs were being made, there was some decrease in refrigerator and freezer space.

No known gastrointestinal illness had occurred among the employees of the plant prior to the outbreak, but 2 did become ill at about the time that it began. In addition, stool cultures from 11 of 30 workers sampled after the outbreak were positive for S. java. None of these people were directly involved in processing whitefish, but it was common knowledge that many of the workers ate the product themselves.

Numerous environmental cultures were obtained as part of a complete examination of the plant operation. All of these were negative; however, cultures taken from the skin and flesh of raw unprocessed whitefish from the same lot responsible for the outbreak did yield S. java. Two later shipments of whitefish from the same source, which had arrived in unopened boxes in June and July of 1966, were cultured and yielded S. java. This data indicated that the raw fish were the source of contamination. Salmonellae on the fish may not have been destroyed by routine cooking and smoking processes and might have been allowed to multiply because of inadequate refrigeration and storage facilities after the fire.

The whitefish were obtained from Hay River, Great Slave Lake, Northwest Territory, Canada, where they were dressed, frozen, and shipped. With the assistance of Canadian health authorities, the shipment involved in the epidemic was traced. The fish were caught before December 1965, were dressed (eviscerated and beheaded), and placed in containers. Thirty-one containers, each weighing 75 pounds, were sent to the United States and distributed. Only 4, delivered to the involved processing plant on May 24, were the source of whitefish involved in the outbreak.

The town of Hay River has a population of about 3,000 and is located at the mouth of the river by the same name where it empties into the Great Slave Lake. The town serves as the transportation and communication center for the vast sub-arctic MacKenzie District. The river flows north and bifurcates south of the town forming a west and east channel. There are four fishing companies in Hay River, supplying major markets in the United States and to a lesser extent in Canada. Two of the 3 shipments of contaminated whitefish received by the New York plant from Hay River, including the shipment responsible for the 3-state epidemic, were traced to a company located on the shore of the east channel of the Hay River. The third shipment was traced to one of three other companies located along the west channel.

There is no central sewage disposal system in the town, and provisions for sewage disposal are inadequate. Numerous drains run into the river carrying contaminated material. Much of the water supply for the town is obtained from the lake into which the river channels flow, 40 ft. below the surface of the water, but this system has been in operation for only a few months. The only other sources of water are the river and the lake shore. At the time of the investigation, the water supply was not chlorinated.

Although there had been no recent outbreaks of salmonellosis in Hay River, 3 epidemics of enteritis due to Salmonella paratyphi B had occurred in different communities on Great Slave Lake in 1950, 1951, and 1952. It is conceivable that these were actually Salmonella java, as the differentiation of the two organisms depends on a single biochemical test.

The fish processing operations vary with the season of the year. In all seasons, the fish are packed in ice which comes from river or lake water. In the spring, the fish are washed directly with the river water after being dressed.

Efforts were made to find a common factor which would explain contamination of fish with the same organism from two different companies physically separated by several miles and on separate branches of the river. The processing of fish in each plant was reviewed. Numerous ice, water, and other environmental cultures were obtained from all plants, and all available personnel from one of the companies were cultured by rectal swabs. All bacteriologic cultures were negative for salmonellae except for one water sample near the intake hose of a company in the west channel, which was positive for S. typhi-murium. High coliform counts had been found in water from the river in the past and from samples during the current investigation.

One common factor which could explain contamination may be the use of raw, untreated river water for washing fish after dressing and for making ice used in packing. The possibility exists that S. java may have contaminated this water at a point before the bifurcation of the river, possibly due to sewage from the town. This possibility could not be documented.

Though the exact source of contamination could not be determined, health authorities have made the following recommendations. It was suggested that the town water supply be piped to all of the fish companies and that all water used in washing and icing fish be chlorinated. It was also recommended that hand-washing and toilet facilities at each of the four plants be improved.

C. Salmonella typhi-murium Contamination of Barbecued Chickens - Spokane, Washington.
Reported by Dr. Ernest A. Ager, Washington State Epidemiologist; Mr. Jack Allard, Assistant Epidemiologist, Washington State Department of Health; Dr. S. Ben Werner, EIS Officer; Dr. Hampton H. Trayner, Spokane City Health Department; and Mr. Roy Olsen, Sanitarian Supervisor, Spokane City Health Department.

An outbreak of gastroenteritis involving 107 persons in eastern Washington occurred during July 1966. The outbreak included 29 different family groups and resulted in hospitalization of 29 persons and the deaths of 2 elderly patients. Salmonella typhi-murium was isolated from 74 individuals in this outbreak.

Most of the 107 patients were acutely ill, and 79 sought treatment from physicians. The symptoms reported during the illness included the following:

Diarrhea	94%	Chills	74%
Cramps	90%	Nausea	71%
Fever	83%	Headache	68%
Myalgia	75%		

One hundred eighty-three people from the various family groups were interviewed. Food histories revealed an association with eating barbecued chickens in all but one family. A Spokane supermarket was the source of the barbecued chickens in most instances and in addition had sold ice cream to one family which had not eaten chicken. Of the 106 that had consumed barbecued chicken, 88 became ill and 5 others had S. typhi-murium isolated although they were asymptomatic.

Barbecued Chickens	Ill	Not Ill	Total	Attack Rate
Ate	88	18	106	83%
Did not eat	16	50	66	24%
Total	104	68	172	

Only 16 of the 66 who did not eat barbecued chicken became ill. Three children in this group had eaten ice cream dipped by the same employee who cooked and sold the barbecued chickens at the supermarket. Many of the others seemed to have been secondary cases related to family members who had eaten chicken and became ill.

Salmonella typhi-murium was obtained from chicken leftovers obtained from 6 families and also from 3 packaged chickens ready for sale at the supermarket.

Investigation of the food handling operations and practices at the involved store revealed many deficiencies. The barbecuing oven was found to bring the internal temperatures of the chicken to only 150°. The holding oven (warmer) for cooked chickens kept them at temperatures of only 110° instead of 150°. The barbecued chickens were placed on the same surfaces as uncooked ones, and unpurchased birds were refrigerated and warmed again for sale the next day.

As a result of these findings, the barbecuing operations at supermarkets throughout Spokane have been temporarily suspended by the Spokane City Health Department. Meetings are being scheduled with the manufacturers and distributors of the barbecuing machines, and an educational program will be drawn up for those using these machines.

D. Progress Report - Interstate Outbreak of Salmonellosis Related to Nonfat Dry Milk.
Compiled by the Salmonella Unit from reports received from State Departments of Agriculture and Health, U.S. Department of Agriculture, and the Food and Drug Administration.

Since August 15, 1966, 3 isolations of Salmonella new-brunswick from humans have been reported to the Salmonella Unit.

Isolation No.	Age	Sex	State	Exposure to INFDM
1	10 mo.	M	Alaska	Yes
2	9 mo.	M	New York	Yes
3	28 yr.	M	New York	Yes

The following table summarizes the results of investigations of dried milk products and companies since August 15, 1966.

Serotype	Source	Location of Plants	Reporting Agency
S. alachua and S. tennessee	Environment	Indiana	FDA
S. alachua	NFDM with sugar added	Indiana	FDA
S. cubana	NFDM	Minnesota	FDA
S. cubana	NFDM	Oklahoma	FDA
S. cubana	NFDM	Washington	Washington State Health Department
S. oranienburg	NFDM	New York	FDA
S. tennessee	Chocolate drink mix	Minnesota	FDA
None isolated	NFDM	Multiple plants	Alabama State Health Department
None isolated	NFDM	Multiple plants	Indiana State Health Department
Untyped Salmonella	NFDM	Nebraska	FDA

The Dairy Division, Consumer and Marketing Service, United States Department of Agriculture, has included testing for salmonellae as part of their detailed inspection of milk-drying plants. From April through August 31, 1966, 2,741 samples from 156 plants located in 23 states were tested for salmonellae. A total of 34 samples of nonfat dry milk (not instantized) and 27 environmental samples were positive.

The plant survey for salmonella includes taking 15 samples of nonfat dry milk from each plant's current production and 5 samples of environmental material. The environmental samples are nonfat dry milk spilled on the floor, vacuum cleaner wastes, tailings from the sifter, dried material in milk-drying equipment, air intake filter, and dust from the roof and various areas inside the plant. When a plant has positive samples, recommendations are made to the plant manager, who is urged to make the necessary changes as soon as possible and to apply for a recheck of his plant as a provision of maintaining plant approval. Recheck samples taken to date indicate that clean-up procedures have been very successful. The results of testing by the U.S. Department of Agriculture are summarized in the following table.

Location of Plants	No. of Plants Surveyed	Number of Positive Samples and Source	Serotype
Arizona	1	None	None
California	10	None	None
Connecticut	1	None	None
Idaho	4	6 NDM	Not serotyped
Iowa	18	3 plant environment	S. schwarzengrund
		2 plant environment	S. tennessee
		2 plant environment	S. newport
		7 NDM	Not serotyped
		1 plant environment	Not serotyped
Kansas	3	None	None
Kentucky	2	None	None
Maryland	1	None	None
Massachusetts	1	None	None
Michigan	1	None	None
Minnesota	56	1 NDM	S. montevideo
		1 NDM	S. oranienburg
		2 plant environment	S. cubana
		1 plant environment	S. typhi-murium var. copenhagen
		2 plant environment	S. anatum
		2 plant environment	S. worthington
		1 plant environment	S. schwarzengrund
		1 plant environment	Not serotyped
		11 NDM	Not serotyped
Missouri	3	1 plant environment	S. worthington
Nebraska	3	None	None
New York	13	None	None
North Dakota	1	1 plant environment	Not serotyped
Ohio	4	None	None
Oklahoma	1	2 plant environment	S. kentucky
Pennsylvania	4	None	None
South Dakota	5	1 plant environment	Not serotyped
		1 NDM	Not serotyped
Vermont	3	1 plant environment	Not serotyped
Virginia	1	None	None
Washington	9	1 NDM	Not serotyped

Location of Plants	No. of Plants Surveyed	Number of Positive Samples and Source	Serotype
Wisconsin	37	1 plant environment	S. tennessee
		1 plant environment	S. infantis
		6 NDM	Not serotyped
		2 plant environment	Not serotyped

IV. REPORTS FROM THE STATES

A. Georgia

Salmonella heidelberg Outbreak in a Newborn Nursery.
Reported by Robert A. Hatcher, M.D., Epidemic Intelligence Service Officer.

A Salmonella heidelberg outbreak occurred in the newborn nursery of a Georgia hospital in August 1966. The first case was a premature infant who became febrile July 30, 1966, 2 days after birth. A stool culture obtained from the infant on August 1, 1966, revealed S. heidelberg. The child's mother had had diarrhea without fever 4 days prior to the birth. On July 31, 1966, the mother was discharged from the hospital only to return that evening with a temperature of 103°. She subsequently became quite ill, and on August 6, 1966, a culture of her blood produced S. heidelberg.

Three additional premature infants in the same nursery developed diarrhea early in August, 2 to 5 days after the onset of the case described above. Stool cultures from 2 of the 3 infants contained S. heidelberg. The 14 other infants in the newborn nursery did not develop salmonella infection.

As soon as the outbreak was apparent, all of the nurses working in the newborn area submitted stool cultures. Salmonella heidelberg was isolated from one nurse, who was on temporary duty (July 29 to August 5) in the newborn area and worked primarily with the premature infants.

The following precautions were instituted when the outbreak started and undoubtedly reduced its extent:

1. Infants with infection were removed from the newborn area and placed in isolation.
2. No new patients were admitted into the newborn unit until all patients present at the time of the outbreak had been sent home.
3. No new patients were admitted to full-term nursery (adjacent to the newborn nursery) until all patients present at the time of the outbreak had been discharged.
4. All newborn infants were placed in a separate newly established area.
5. Strict hand-washing techniques were enforced.

There were no new cases of S. heidelberg diarrhea after August 6, 1966. It was felt that the mother of the first infant was the index case and infected her premature infant at the time of delivery. The transmission within the nursery was thought to have been effected by the nurse working with the infants from whom S. heidelberg was isolated.

Editor's Comment: The extreme susceptibility of young children to salmonella infection makes any such infection in a nursery quite a serious occurrence. This is one situation where person-to-person transmission is probably quite important.

B. New York

Hospital Outbreak of Salmonella enteritidis.
Reported by Paul D. Ellner, M.D., and C. R. Wise, M.D., New York.

Forty cases of gastroenteritis occurred in employees and patients at a New York hospital between July 5 and 10, with the majority (29) taking place between 2 P.M., Wednesday, July 6, and 11 A.M., Thursday, July 7. Symptoms included abdominal cramps, nausea, vomiting, chills, and fever and persisted for several days. Stool cultures were positive for Salmonella enteritidis in 37 of the cases.

Hospital authorities reasoned that the usual incubation period in salmonella gastroenteritis is 12 to 24 hours. They extrapolated back approximately 18 hours from midnight Wednesday and concluded that the infections most probably had occurred during the Wednesday morning meal. Their suspicions were verified when food histories showed that 33 of the 34 people who had become ill between July 6 and the morning of July 8 had eaten scrambled eggs for breakfast in the hospital cafeteria on Wednesday. Twenty-two of these individuals had eaten their breakfast at counter #1, 10 at counter #2, and 1 person was unable to remember. Furthermore, the server on counter #2 had "run out of scrambled eggs" that morning and had "borrowed about 10 portions" from counter #1 while waiting for the supply to be replenished. Representative batches of the shipment of eggs that had been used were cultured and were negative for salmonella. Stool cultures were obtained from all food handlers, and 1 individual was positive for S. enteritidis, the same person who had been serving scrambled eggs at counter #1 on the morning of July 6.

It seems likely that the outbreak was due to a common source contamination of the scrambled eggs. No further cases have occurred since early July.

Editor's Comment: While it is not possible to document whether the original contamination came from infected eggs or the food handler, it is much more common for such epidemics to originate with contaminated food. It would be difficult for the server to contaminate the eggs at the serving line so heavily as to infect so many people. Therefore, the raw eggs must be suspected as the original source of contamination.

V. SPECIAL REPORTS

A. Progress Report - Salmonella Contamination of Drug Substances of Animal Origin.
Reported by the Food and Drug Administration.

Since the initial report of salmonella contamination of thyroid powder, pancreatic, adrenal cortical, lymphatic substances (SSR #51), additional serotypes have been isolated and reported by the Food and Drug Administration. These isolations were obtained from bulk material originating in several states and from Italy, Canada, Argentina, Denmark, and Uruguay. Salmonellae were also isolated from one lot of thyroid tablets, which have been subsequently recalled from the market. The list of serotypes isolated to date include the following:

Thyroid Powder:

- S. anatum
- S. bareilly
- S. bovis-morbificans
- S. derby
- S. heidelberg
- S. infantis
- S. manhattan
- S. newport
- S. oranienburg
- S. senftenberg
- S. typhi-murium

Pancreatic Substance:	S. anatum	Adrenal Cortical Substance:	S. derby
	S. newington		
	S. tennessee	Lymphatic Substance:	S. concord
			S. newport
Pancreatic, N.F.:	S. urbana		
		Glandular Pepsin:	Group B Salmonella

Editor's Comment: It is hoped that cases of salmonella infection in patients taking these medications will be thoroughly investigated in order to help determine the public health importance of their contamination.

B. Ampicillin in the Treatment of Salmonella Carriers

Carriers of salmonella, particularly Salmonella typhi, constitute a threat to the health of their family members and the community. Consequently, numerous attempts have been made to find a means of adequately treating the salmonella carrier. Though many antibiotics have been useful in treating more serious manifestations of salmonella infection, antibiotics have not been generally successful in eliminating these organisms from the gastrointestinal tract[1]. In the last 4 years, because of its excellent in vitro activity against salmonella organisms, alpha-aminobenzyl penicillin (ampicillin) has been used for the treatment of carriers in a number of clinical trials and has been widely used by practicing physicians. It is the purpose of this article to review some of the results of these trials. The first studies to be discussed will be those concerned with carriers of salmonella, excluding S. typhi.

Salmonellae, other than S. typhi, are seldom excreted in the stool for periods longer than a few weeks to a few months[2]. Because of this, and because the duration of the carrier state will depend to some extent on the age and general health of the patient, it is important that any clinical trial be carefully controlled by the comparison of a treated and untreated group. Unfortunately, most of the clinical trials with ampicillin have not been controlled and include only small numbers of patients.

One of the first studies was that of Stewart, et al., who treated 6 patients (5 carriers and 1 with active infection) with Salmonella typhi-murium infection[3]. In all cases, the organism disappeared from the stool during treatment but was again cultured immediately after the cessation of therapy. Another uncontrolled trial, which included 11 infants with Salmonella newport infection, had similar results[4]. The newborn infants were treated with substantial doses (50 to 150 mg per kg) of oral ampicillin for 7 to 45 days (mean 20.2 days). All but 1 showed temporary clearing of their stools while on therapy, but 9 of 11 again began excreting S. newport within 1 month after treatment stopped. Ten of the infants then submitted stool specimens periodically over the following 12 months while on no therapy. Only 1 was still excreting the organism after that time.

The only controlled study reported thus far in the English literature is that of Pettersson, et al.[5], who used a combination of ampicillin and neomycin after preliminary trials indicated that ampicillin alone would not terminate the carrier state. Fifty-one patients with acute salmonella gastroenteritis were divided into a treatment group (29 patients) and a control group (22 patients). Therapy with oral ampicillin and neomycin was initiated at least 3 days after the cessation of acute symptoms. Immediately after treatment, 20 of the 29 in the treatment group and 18 of 22 in the control group were still excreting salmonellae. Two months after therapy, 7 of 29 treated patients and 10 of 22 untreated patients excreted salmonellae. The differences are not statistically significant.

Two other trials are reported but include too few patients to be meaningful[6,7]. A single report gave somewhat more favorable results with 10 of 17 patients developing negative stool cultures after ampicillin treatment, but this trial too included no control group[8]. Minor side reactions such as pruritis, urticaria, and gastrointestinal upset were noted by patients in many of the trials, but there were no serious complications of therapy.

There is, therefore, very little evidence indicating that treatment with ampicillin has been successful in curing carriers of salmonella other than S. typhi. When this is viewed with the fact that the carrier state is usually self limiting, that it seldom causes the patient difficulty, and that any antibiotic has a certain incidence of side reactions, it is difficult to recommend this use of the drug.

Somewhat more attention has been devoted to the treatment of carriers of S. typhi, a potentially more dangerous organism and one which is seldom spontaneously cleared from the stool. Ampicillin, as a bactericidal drug which is concentrated in the gallbladder in an active form, seems particularly appropriate for treating typhoid carriers. Early attempts to treat typhoid carriers with ampicillin were unsuccessful, but relatively small amounts were used[9]. In two trials, when low doses were not effective, a higher dose for a longer period of time yielded better results[10,11]. Merselis' studies suggested that ampicillin was less successful in curing patients with clinically demonstrable gallbladder disease[12], whereas among Christie's patients the presence of gallstones or a radiographically non-functioning gallbladder made no difference[13]. The most complete report is that recently published by Simon and Miller[14]. Fifteen long-term typhoid carriers were treated with 50 to 100 mg per kg oral ampicillin daily for a total of at least 28 days. Eleven of the patients had gallbladder disease. Treatment was successful in producing negative stool cultures in 13 of the 15 patients with follow-up period ranging from 7 to 54 months. Ten of the 11 patients with gallbladder disease were among the successful group.

In conclusion, though ampicillin has not been successful in eliminating carriers of other types of salmonella, it may be of real value in the typhoid carrier. If future investigation supports the evidence of these preliminary trials, ampicillin therapy may be an alternative to cholecystectomy in some chronic typhoid carriers.

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VI. INTERNATIONAL

NONE

VII. FOOD AND FEED SURVEILLANCE

A. Progress Report on Pilot Food and Feed Surveillance Program

During August, 191 samples of cake mixes from 8 states were examined by the Veterinary Public Health Laboratory for salmonellae, shigellae, Escherichia coli, and coagulase positive staphylococci. Twenty-four brands were represented. Common constituents of these cake mixes were sugar, flour, cocoa, leavening, nonfat dry milk, dried eggs, fats, whey, spices, and flavoring. One sample was found positive for E. coli, whereas all other samples were negative for these four organisms. Five samples of cocoa mix were also examined for the above organisms and one was positive for E. coli. One package of dog biscuits was examined and found negative for salmonellae.

B. Salmonellosis in Kansas, 1954 - 1965

Reported by G. A. Mullen, Jr., D.V.M., M.P.H., Chief Veterinarian, Food and Drug Division, Flora McKinley, M.S., Chief Bacteriologist, Public Health Laboratories, and Nicholas Duffett, Ph.D., Director, Division of Laboratories, Kansas State Department of Health.

During the 11-year period from July 1, 1954, to June 30, 1965, the Division of Laboratory Services of the Kansas State Department of Health reported 3,032 isolations of salmonella from 103,395 specimens examined.

During the period 1954 to 1960 the isolations were primarily from human sources. The Veterinary Diagnostic Laboratory was organized in the School of Veterinary Medicine at Kansas State University in 1960. Salmonella isolations made from specimens collected at this laboratory are referred to the Public Health Laboratories for serotyping. As a result, more animal isolations have been made in the past 5 years.

In the 5-year period, July 1, 1960, to June 30, 1965, the Kansas Public Health Laboratories examined 58,936 samples and recovered salmonella from 2,605 as follows:

2,173 isolations were from human sources and represented 1,065 infected individuals
354 isolations were from animals and poultry
76 isolations were from food
2 isolations of Salmonella typhi-murium were made from creek water in 1964

A total of 61 different serotypes were recovered from all sources. Of these, 23 were found both in man and in animals or food products. The 10 most common types isolated from human and nonhuman sources are given in the following table.

Ten Most Common Salmonella Types Isolated
In Kansas from Human and Nonhuman Sources
1954-1965

	HUMAN		NONHUMAN	
	Serotype	Number	Serotype	Number
1.	S. typhi-murium	777	S. tennessee	54 (29)**
2.	S. oranienburg	268	S. bredeney	51 (7)
3.	S. typhosa	162	S. newport	42
4.	S. newport	113	S. oranienburg	41
5.	S. newington	113 (7)*	S. muenchen	41
6.	S. muenchen	75	S. infantis	40
7.	S. infantis	75	S. typhi-murium	33
8.	S. thompson	65 (3)	S. litchfield	14 (19)
9.	S. saint-paul	41 (5)	S. blockley	11 (8)
10.	S. paratyphi B	36	S. derby	9 (5)

*Numbers in parentheses are those isolated from nonhuman sources.
**Numbers in parentheses are those isolated from human sources.

Salmonella typhi-murium isolations were highest during the 1962-1963 period when an outbreak occurred in Wichita. After a political dinner attended by over 1,200 persons, over 400 reported illness. It was determined that the turkey and gravy were the source of the S. typhi-murium. The caterer was not equipped to feed this many people. The turkey was cooked at low temperatures over a long period of time. Part of it was cooked at least 2 days ahead of time. The turkeys came from at least three known sources. Samples were taken for culture from equipment, dressed turkeys, and live turkeys on the farm. Although 13 different serotypes of salmonellae were isolated, none were S. typhi-murium. Investigations undertaken by the Wichita-Sedgwick County Health Department revealed that one of the women cooks was carrying S. typhi-murium. It could not be determined whether she was the source of infection or was infected from eating the food.

In August 1963, an outbreak of illness occurred in a nursing home adjacent to the County Hospital in Wichita. Salmonella infantis and Salmonella braenderup were isolated from stools cultured from patients. The source was thought to be raw eggs which were being given the patients in eggnog. Eggs came from two wholesalers, who purchased eggs from three dealers, who in turn purchased eggs from hundreds of farms in the area. Eggs were purchased from some of these sources and cultured in pools representing six farms. Salmonella braenderup was isolated from two pools sampled. At the involved farms, eggs and fecal material from poultry and other livestock were cultured, and S. braenderup was found at two

farms. Feed on the two farms was also checked, but at that time they were not feeding any animal protein, and S. braenderup was not isolated. Neither was this type among the 9 serotypes recovered from samples cultured from rendering plants.

Another recent outbreak involved 12 people near Liberal, Kansas, who were found infected with S. typhi-murium. They had been drinking raw milk from a milk station set up outside the city to evade the city's grade A all-pasteurized milk ordinance. Milk samples taken did not reveal salmonella; however, it was reported that the people operating the milk station had a cow at the Kansas State Veterinary Hospital which had positive stool samples of S. typhi-murium 2 weeks before the human cases occurred.

TABLE I

COMMON SALMONELLA SEROTYPES ISOLATED FROM HUMANS IN THE UNITED STATES DURING AUGUST, 1966

SEROTYPE	GEOGRAPHIC DIVISION AND REPORTING CENTER																															SEROTYPE
	NEW ENGLAND							MIDDLE ATLANTIC						EAST NORTH CENTRAL						WEST NORTH CENTRAL							SOUTH ATLANTIC								
	ME	NH	VT	MASS	RI	CONN	TOT	NY-A	NY-BI	NY-C	NJ	PA	TOT	OHIO	IND	ILL	MICH	WIS	TOT	MINN	IOWA	MO	ND	SD	NEBR	KAN	TOT	DEL	MD	DC	VA	WV	NC	SC	GA	FLA	TOT	
anatum				5		1	6	2				1	3			5		2	7		1	1				1	3							6	3	9	anatum
bareilly									2				2	2			2		4	1							1				12				12	bareilly
berta																										3	3							1	1	berta
blockley				5		2	7	1		3	1	2	7	1	4	1	2		8	2	3						5		2			1		3		6	blockley
braenderup									4	1			5													2	2					4				4	braenderup
bredeney				1			1								1	2	1		4																		bredeney
chester																		2	2		1					1		3			1				4	chester
cholerae-suis v kun															1	1			2															1	1	cholerae-suis v kun
cubana				1			1	1	1		2	1	5	2					2																	cubana
derby				2			2	2	1	1	2	3	9			4	3	2	9	1		1				2		1		2		2		1	1	7	derby
enteritidis				21		3	24	13	6	4	3	2	28	8	3	4	4	2	21	5			1			3	9		10	1	3		2		1	2	19	enteritidis
give								1					1																1							1	give
heidelberg	2			7		15	24	6	6	6	10	12	40	2	10	17	13	4	46	3		2				4	9		10		6		5	10	6	37	heidelberg
indiana								1		1			2																1			1				2	indiana
infantis				3			3	8	1	6		5	20	2	3	11	9	1	26	8	2	1				1	12		1	2	3		2		2		10	infantis
java								1				3	4		1	6	2		9			1				1							2	4	6	java
javiana								1				1	2			1			1							1	1							5	5	javiana
kentucky																																					kentucky
litchfield										2			2		1	1		2	4											2						2	litchfield
livingstone																																					livingstone
manhattan								1				1	2			2	1	1	4	3	1						4		1							1	manhattan
meleagridis																																					meleagridis
miami																	1		1			1					1							2	14	16	miami
mississippi																																		2		2	mississippi
montevideo				1		1	2	7	1	1	1	1	11	3	2	2		1	8	1							1			1	1			2	4	8	montevideo
muenchen									1	1			2	1		1		1	3			1				3	4		1			2		1	2	6	muenchen
newington										1			1							1							1										newington
newport				1		4	5		1	3	2	2	8	4	1	9	4		18	9	1		1	1	5	17				1		5		7	34	47	newport
oranienburg				2			2			1		1	2	2	1	1	1		5	1		2			2	5							4	2	6	oranienburg
panama										1	2		3	1			1		2			2				2	1								1	panama
paratyphi B				1			1	1		1			2	1	1				2											1					1	paratyphi B
poona																																					poona
saint-paul				1			1		2	2	1	1	6	2	1	3	3		9	5	2	1					8		3			1		3	4	11	saint-paul
san-diego				3		1	4			1			1			1			1		3	1					4							1		1	san-diego
schwarzengrund											1		1			1	1		2			1					1								5	5	schwarzengrund
senftenberg																																		1		1	senftenberg
tennessee															1	3			4											1		1				2	tennessee
thompson				3		1	4	7	1	4	3		15	4		13	16	11	44	1	1	1				1	4		1			1		1	1	4	thompson
typhi				1			1	5		2	2		9	7	1		3		11		1					4	5		4			4		1		9	typhi
typhi-murium	2		1	35	7	12	57	97	12	31	20	34	194	20	6	43	24	19	112	11	6	7	3			7	34	1	18	1	14	2	11		17	15	79	typhi-murium
typhi-murium v cop				3		1	4										5		5		1						1										typhi-murium v cop
urbana																	1		1																		urbana
weltevreden																																					weltevreden
worthington																																					worthington
untypable, group B					1		1														1						1		7				3			10	untypable, group B
untypable, group C1					1		1																						1							1	untypable, group C1
untypable, group C2																																1				1	untypable, group C2
untypable, group D																													3							3	untypable, group D
untypable, group E																																					untypable, group E
untypable or unknown																													1			1	1			3	untypable or unknown
Common Total	4	0	1	96	9	41	151	155	39	73	50	70	387	62	37	132	98	48	377	52	24	23	3	2	1	37	142	2	57	17	46	2	43	5	68	104	344	Common Total
Uncommon Total	2	0	0	1	0	0	3	4	0	0	0	3	7	1	0	5	4	0	10	2	0	0	0	0	0	1	3	3	0	1	0	0	2	0	4	10	20	Uncommon Total
Grand Total	6	0	1	97	9	41	154	159	39	73	50	73	394	63	37	137	102	48	387	54	24	23	3	2	1	38	145	5	57	18	46	2	45	5	72	114	364	Grand Total

New York (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 112 isolations for August.

TABLE I (Continued)

COMMON SALMONELLA SEROTYPES ISOLATED FROM HUMANS IN THE UNITED STATES DURING AUGUST, 1966

SEROTYPE	GEOGRAPHIC DIVISION AND REPORTING CENTER																							TOTAL	% OF TOTAL	1966 CUM. TOTAL	% OF 1966 CUM. TOTAL	1965 CUM. TOTAL	% OF 1965 CUM. TOTAL	SEROTYPE
	EAST SOUTH CENTRAL					WEST SOUTH CENTRAL					MOUNTAIN										PACIFIC						OTHER						
	KY	TENN	ALA	MISS	TOT	ARK	LA	OKLA	TEX	TOT	MONT	IDA	WYO	COLO	NM	ARI	UTAH	NEV	TOT	WASH	ORE	CAL	ALAS	HAI	TOT	VI						
anatum			2		2				2	2		1				1			2			1		5	6		40	1.7	213	1.6	183		anatum
bareilly									4	4														1	1		24	1.0	46	.4	69		bareilly
berta																											4	.2	25	.2	24		berta
blockley	2	2			4		4	1		5	1			1					2	2		6		1	9		53	2.2	410	3.2	221	2.1	blockley
braenderup							1			1				2					2								14	.6	66	.5	53		braenderup
bredeney				1	1	1	6	1	2	10												4			4		20	.8	85	.7	89		bredeney
chester											1						1		2		2	2			4		13	.5	80	.6	79		chester
cholerae-suis v kun																											3	.1	18	.1	23		cholerae-suis v kun
cubana																					1	2			3		11	.5	106	.8	105		cubana
derby		1	1		2		2	1	1	4												12		5	17		52	2.2	255	2.0	467	3.6	derby
enteritidis							1			1		1					1		2		1	2			3		107	4.4	796	6.2	638		enteritidis
give							6		2	8												2			2		12	.5	57	.4	83		give
heidelberg		1	5		6	1	4		6	11		1		1			2	1	5	2	2	11	1		16		194	8.1	1,080	8.4	1,017	7.8	heidelberg
indiana																											4	.2	54	.4	27		indiana
infantis		2	2		4	1	2	1	4	8	1	1		7					9	1	2	15		15	33		125	5.2	941	7.3	719	5.5	infantis
java		1			1		1			1												5			5		27	1.1	267	2.0	110		java
javiana		1			1	9	7		10	26												1			1		37	1.5	147	1.1	162		javiana
kentucky							2		1	3												2			2		5	.2	15	.1			kentucky
litchfield									1	1																	9	.4	41	.3	57		litchfield
livingstone														1					1					4	4		5	.2	17	.1	19		livingstone
manhattan									2	2										1		2		1	4		17	.7	69	.5	73		manhattan
meleagridis																													4	.0	135		meleagridis
miami		1			1																						19	.8	50	.4	55		miami
mississippi							2			2																	4	.2	31	.2	22		mississippi
montevideo							3	1	2	6						1			1			6		1	7		44	1.8	212	1.6	303	2.3	montevideo
muenchen							2		2	4		1							1			2			2		22	.9	135	1.0	130		muenchen
newington							1			1												1			1		4	.2	31	.2	39		newington
newport	7	3	3		13	13	8	3	30	54				2		1	1		4		1	12		7	20		186	7.7	772	6.0	698	5.3	newport
oranienburg		1			1		1	1	2	4				1					1			4			4		30	1.2	273	2.1	376	2.9	oranienburg
panama	1				1		6		2	8										1		1		12	14		31	1.3	168	1.3	147		panama
paratyphi B									4	4				1					1	1					1		12	.5	104	.8	116		paratyphi B
poona									2	2						1			1			1			1		4	.2	25	.2	32		poona
saint-paul		1			1	1	6	2	1	10	1	1		8					10	1	26	11		2	40		96	4.0	499	3.9	487	3.7	saint-paul
san-diego									1	1							6		6	3	1	3			7		25	1.0	96	.7	197		san-diego
schwarzengrund							3			3							1		1								13	.5	44	.3	77		schwarzengrund
senftenberg							2	1		3												1			1		5	.2	39	.3	40		senftenberg
tennessee																											6	.2	86	.7	137		tennessee
thompson							3	18	3	24				1					1			2			2		98	4.1	411	3.2	340	2.6	thompson
typhi		1			1	3	8	4	1	16					6	1		1	8		1	15		6	22		82	3.4	473	3.7	487	3.7	typhi
typhi-murium	8	18	6	2	34	4	10	6	36	56	17	3		16		1	3		40	77	4	54		19	154		760	31.6	3,649	28.5	4,086	31.3	typhi-murium
typhi-murium v cop						2	4			6		2							2								18	.8	102	.8	133		typhi-murium v cop
urbana																											1	.0	17	.1	18		urbana
weltevreden																								6	6		6	.2	25	.2	19		weltevreden
worthington									1	1														1	1		2	.1	27	.2	27		worthington
untypable, group B			1	1	2	1	4		2	7					7				7		1	1	2		4		32	1.3	226	1.7	189		untypable, group B
untypable, group C1		1			1										5				5		1				1		9	.4	68	.5	52		untypable, group C1
untypable, group C2				4	4	3				3					3				3								11	.5	33	.3	40		untypable, group C2
untypable, group D				1	1										3				3								7	.3	32	.2	29		untypable, group D
untypable, group E																													7	.0	45		untypable, group E
untypable or unknown						1				1								1	1		1	1			2		7	.3	48	.4	86		untypable or unknown
Common Total	18	34	20	9	81	40	99	40	124	303	21	11	0	41	24	6	15	3	121	89	44	182	3	86	404	0	2,310	95.9	12,475	96.6			Common Total
Uncommon Total	3	1	0	0	4	0	19	1	7	27	0	0	0	1	0	0	0	0	1	1	2	15	0	5	23	-	98	4.1	440	3.4			Uncommon Total
Grand Total	21	35	20	9	85	40	118	41	131	330	21	11	-	42	24	6	15	3	122	90	46	197	3	91	427	0	2,408	100.0	12,915	100.0	13,067		Grand Total

TABLE II
UNCOMMON SALMONELLA SEROTYPES ISOLATED FROM HUMANS DURING 1966

SEROTYPE	REPORTING CENTER																												
	ALA	ALAS	ARI	ARK	CALIF	COLO	CONN	DEL	DC	FLA	GA	HAI	IDA	ILL	IND	IOWA	KAN	KY	LA	ME	MD	MASS	MICH	MINN	MISS	MO	MONT	NEBR	NEV	NH	NJ	NM
aberdeen					1																											
abortus-bovis														2																		
agama																	1															
alachua					1														1													
albany					2					2												2		1								
amager											1																					
arkansas																			1													
atlanta											10																					
austin																										1						
ball					2																											
berlin																																
binza					2					1								1	2					1							1	
boniare					1																											
bonariensis														1																		
bovis-morbificans		1			1					1									1				1									
bradford						2											1														1	
brandenburg											1																					
california					2						2			1	1				2													
carrau																			3													
cerro												2		1			1				1											
chailey					5																											
cholerae-suis						1																1										
coleypark										2																						
colorado																			1													
concord																																
corvallis														1																		
daytona										1																						
dublin					1																											
duesseldorf					1														2													
duisburg																																
eimsbuettel										2																						
fayed																																
gaminara																			5													
garoli																																
glostrup														1							1											
grumpensis																																
habana														1									1									
haifa									1		1																					
hartford					2					7	1			2					1			1	1	1							1	
ibadon																																
inverness														1										1								
irumu						2																										
kaapstad						1																										
kottbus																																
lanka					1																											
loma-linda																																
luciana										1																						
madelia										1																						
manchester						1									1																	
menston																	2															
minnesota					2											1																
mission										1																						
mjimwema																																
molade																																
muenster			1		1					3				2					1												1	
nagoya																																
new-brunswick	1	2			2		2			2	2				1				7		2	5	2	2								
new-haw																																
newlands						1																										
norwich				1		1				2									1													
ohio					6																											
orion																																
oritamerin																																
os																			3													
oslo					4							12					1															
paratyphi-A					1																1											
paratyphi-B v. odense																							2									
paratyphi-C						1																										
pomona																			1							1						
pullorum														9					1													
reading			1		12	2		3		1				16				4		2			3	2			1					
rubislaw					2					3									8			1										
saphra																																
sarajane																																
seremban									2																							
siegburg					2														1				1									
simsbury														1								1										
soahanima																																
stanley										1				2																		
stockholm																																
sundsvall														1																		
tallahassee										2																						
virchow																							3									
wassenaar																			1													
welasco											1																					
westerstede										2																						1
untypable group A																																2
untypable group G										1									1													1
untypable group H																																
untypable group O					2																											
Total	1	3	2	1	56	12	2	3	3	36	19	14	0	42	3	1	6	5	44	2	5	11	14	8	0	2	1	0	0	0	4	4

TABLE II (Continued)
UNCOMMON SALMONELLA SEROTYPES ISOLATED FROM HUMANS DURING 1966

REPORTING CENTER																					AUG. TOTAL	1966 CUM. TOTAL	MONTH LAST REPORTED	STATE LAST REPORTED	TOTAL PREVIOUSLY REPORTED TO SAL. SURV. UNIT 1962 - 1965	SEROTYPE
NY-A	BNY-BI	NY-C	NC	ND	OHIO	OKLA	ORE	PA	RI	SC	SD	TENN	TEX	UTAH	VT	VA	VI	WASH	WV	WIS	WYO					
																						1	1	May 66	Cal	1	aberdeen
																						2	2	Jan 66	Ill	0	abortus-bovis
		1																				1	1	Jul 66	Kan	0	agama
																						3	3	May 66	Cal	21	alachua
																					2	7	7	Aug 66	Cal-Mass	15	albany
																						1	1	Jul 66	Ga	51	amager
																						1	1	Jul 66	La	1	arkansas
																					2	10	10	Aug 66	Ga	25	atlanta
																						1	1	Feb 66	Mo	1	austin
																						2	2	Jun 66	Cal	0	ball
								2														2	2	Aug 66	Pa	0	berlin
1								1														4	10	Aug 66	Cal-La-Pa	54	binza
																						1	1	Apr 66	Cal	0	bonaire
																						1	1	Jun 66	Ill	2	bonariensis
1																		2				4	8	Aug 66	Cal-Wash-Fla-Mich	44	bovis-morbificans
																						4	4	Jul 66	Colo-NJ	2	bradford
																						1	1	Apr 66	Ga	10	brandenburg
															1							2	9	Aug 66	Ga-La	64	california
													1									1	4	Aug 66	Tex	12	carrau
												2										1	7	Aug 66	Kan	28	cerro
																						5	5	Aug 66	Cal	1	chailey
	3				1																	6	6	Jun 66	NY-BI	66	cholerae-suis
																						2	2	Aug 66	Fla	0	coleypark
		1																				1	1	Feb 66	La	8	colorado
																						1	1	Jun 66	NY-C	4	concord
																						1	1	Aug 66	Ill	3	corvallis
																						1	1	Jun 66	Fla	5	daytona
																					1	1	1	Aug 66	Cal	8	dublin
		1																				4	4	Feb 66	NY-C	7	duesseldorf
					2													2			1	4	4	Aug 66	Ohio	8	duisburg
1			2									1										2	6	Aug 66	NC	3	eimsbuettel
			5																				5	Mar 66	NC	6	fayed
													1									2	6	Aug 66	La-Tex	20	gaminara
		1																					1	Mar 66	NY-C	0	garoli
																						1	2	Aug 66	Ill	1	glostrup
																1							1	Apr 66	Va	11	grumpensis
		1																					3	Jul 66	Mich-NYC	0	habana
																						1	2	Aug 66	Ga	3	haifa
					1	1														4		4	23	Aug 66	Fla-Mich	90	hartford
													1										1	Jun 66	Tex	0	ibadon
																						1	2	Aug 66	Ill	13	inverness
4																							6	Jul 66	NYA	108	irumu
																							1	Mar 66	Colo	3	kaapstad
1																						1	1	Aug 66	NYA	14	kottbus
																							1	Apr 66	Cal	0	lanka
							1																1	Jul 66	Okla	17	loma-linda
																							1	Jul 66	Fla	2	luciana
																						1	1	Aug 66	Fla	6	madelia
																							2	Jul 66	Ind	5	manchester
																							2	Jul 66	Kan	14	menston
													1									1	4	Aug 66	Cal	40	minnesota
												2											3	Mar 66	Fla	7	mission
1																							1	Jan 66	NYA	0	mjimwema
																				1			1	Feb 66	Wisc	0	molade
								5												1			15	Jun 66	Fla-La	26	muenster
													1										1	May 66	Tex	1	nagoya
3		1					2	1								2		4		1		4	37	Aug 66	Mich-NYA	32	new-brunswick
																						7	7	Aug 66	La	2	new-haw
																							1	Jun 66	Colo	0	newlands
		1			1	1	1					3	1									3	13	Aug 66	La-Okla-Tenn	51	norwich
					1																		7	Jun 66	Cal	13	ohio
					3																		3	Jul 66	Ohio	7	orion
		1																					1	Mar 66	NYC	0	oritamerin
																							3	Mar 66	La	0	os
																						6	17	Aug 66	Cal-Hai	15	oslo
																							2	May 66	Md	34	paratyphi-A
																							2	Jul 66	Mich	1	paratyphi-B v. odense
																							1	Mar 66	Colo	7	paratyphi-C
																							2	May 66	Mo	4	pomona
																							10	May 66	La	4	pullorum
6							1	15				6						2		2		19	79	Aug 66	Cal-Colo-Del-Ill-Ky Me-Mich-Minn-Ore	102	reading
													2									12	16	Aug 66	Fla-La-Tex	42	rubislaw
													2									1	2	Aug 66	Tex	19	saphra
					2																		2	Jul 66	Ohio	1	sarajane
																						1	2	Aug 66	DC	0	seremban
												2	2										8	Jul 66	La	19	siegburg
																							2	Jul 66	Mass	16	simsbury
													1									1	1	Aug 66	Tex	0	soahanima
			1																				4	Jul 66	Fla-Ill	26	stanley
					1																		1	May 66	Ohio	0	stockholm
													1									2	2	Aug 66	Ill-Tex	4	sundsvall
			1																				3	Jul 66	Fla	14	tallahassee
								1															4	May 66	Ore	16	virchow
																							1	Apr 66	La	0	wassenaar
																							1	Jul 66	Ga	2	welasco
		1																					1	Jul 66	Fla	5	westerstede
																							1	Jul 66	NM		untypable group A
																							4	Jul 66	NM		untypable group G
																							1	Jun 66	NM		untypable group H
																							2	Jan 66	Cal		untypable group O
18	3	9	9	0	12	4	19	9	0	0	0	16	14	0	1	3	0	10	0	9	0	98	440				Total

TABLE III

Age and Sex Distribution of Individuals Reported as Harboring Salmonellae During August 1966

Age (Years)	Male	Female	Unknown	Total	%	Cumulative %
Under 1	145	108	5	258	16.0	16.0
1 - 4	183	145		328	20.4	36.4
5 - 9	95	84		179	11.1	47.5
10 - 19	91	96		187	11.6	59.1
20 - 29	74	86	1	161	10.0	69.1
30 - 39	46	77	1	124	7.7	76.8
40 - 49	52	61		113	7.0	83.8
50 - 59	30	65		95	5.9	89.7
60 - 69	38	57		95	5.9	95.6
70 - 79	18	32		50	3.1	98.7
80 +	7	13		20	1.2	99.9
Child (Unspec.)	21	9	1	31		
Adult (Unspec.)	16	30	1	47		
Unknown	309	351	60	720		
Total	1125	1214	69	2408		
% of Total	48.1	51.9				

TABLE IV

REPORTED NONHUMAN ISOLATES BY SEROTYPE AND SOURCE, *AUGUST, 1966

SEROTYPE	chicken	turkey	duck	pigeon	chicken droppings	canary	pheasant	guinea	equine	bovine	ovine	porcine	farm animal environment	goat	canine	feline	rabbit	monkey	wild mouse	mink	tapir	animal unknown	egg	egg albumen	powdered egg	frozen egg	egg shell	chicken meat	sausage	powdered milk	ice cream	potato salad	noodles	cole slaw	yeast	smoked fish	poultry feed	livestock feed	bone meal/ meat scraps	animal feed, unknown	fish meal	animal protein meal	tankage	turtle	kila monster	sewage	river water	turtle water	pinning knife	factory environmental water	factory environmental swab	environmental swab	sewer	lab stock cultures	thyroid powder	pancreatin powder	carmine dye	unknown	Total	8 MOS. TOTAL	SEROTYPE
alachua	1																													5																												6	23	alachua
albany	1																																																									1	1	albany
anatum	4	18												1																							3		2					7	1								3		6	1		1	48	253	anatum
bareilly																																			2	2	1																6			1	12	23	bareilly
binza		2																																	2	2	1																			1	8	44	binza
blockley	8	8										1							1									4									1																					24	142	blockley
bovis-morbificans																																																									2	3	bovis-morbificans
bredney	3	1																								2													1					1													9	45	bredney
california								2																																					1											3	24	california
cerro	1	1																				1											3											5			1									1	14	46	cerro
chester	2	13					1											1																																							17	93	chester
cholerae-suis												2																																												2	3	cholerae-suis
cholerae-suis v kun												7																																													7	68	cholerae-suis v kun
cubana																							1							10								3																			1	19	71	cubana
derby		4																				1						1						19			1	2			2													1	4			1	38	122	derby
dublin										1																																															1	32	dublin
eimsbuettel	3	1						1																						2						1	10	1	6															2				31	84	eimsbuettel
enteritidis	4	1													1																																										6	73	enteritidis
gaminara															1																																									1	2	gaminara
give		2						1				1				1																																									5	33	give
grumpensis																																					1																				1	5	grumpensis
heidelberg	21	43					2					2											3			4												1																			1	78	446	heidelberg
indiana		7		1																																																				8	32	indiana
infantis	14	2										1											1	3	3	2													1																	1		2	34	207	infantis
java																																			3																						4	38	java
kentucky		3																																			1		3																		9	24	kentucky
livingstone																														1								1			1																3	63	livingstone
madelia																																																									1	2	madelia
manhattan																																																										1	31	manhattan
manila																																					1																				1	3	manila
meleagridis												1																																														1	12	meleagridis
minnesota																																																									4	36	minnesota
montevideo	5	2						1																						2							10	2					1		1											4	28	217	montevideo
muenchen																																																									1	47	47	muenchen
new-brunswick										1																																																	1	77	new-brunswick
newington		1																				2																																					6	54	newington
newport		1								2							1					5																	1																			12		25	94	newport
norwich																														2																												2	4	norwich
oranienburg													1							1										3							5	1	3		1		1		1	1							1			1	20	145	oranienburg
panama	2	4																																																							6	15	panama
pullorum	5																									2																																7	48	pullorum
rubislaw																																							1																			1	4	rubislaw
saint-paul	4	10								2		1				1										7																																25	206	saint-paul
san-diego		3																					1																																			4	75	san-diego
schwarzengrund	1	44																																			2																				47	154	schwarzengrund
senftenberg		10								1					1															1						2	5																			1		2	22	123	senftenberg
seremban																																																									1	1	seremban
siegburg																																						1																				1	4	siegburg
taksony		1																																																							1	4	taksony
teddington																																						1																				1	1	teddington
tennessee		2								1																				32							3															2				2	44	139	tennessee
thomasville												1																									2																				2	24	thomasville
thompson	5	1			1							1			1								2								1		22												1				3							38	143	thompson
typhi-murium	55	10	1	2		1			6	15	1	1			2	1		1								3		11				2		1		1																	1		1	1	1	2	122	619	typhi-murium
typhi-murium v cop	12	6		5			1	1	1			2								2																																							30	147	typhi-murium v cop
urbana																																						1	2																			1	9	urbana
worthington	1																																				6	2	2																		11	53	worthington
untypable group K																								2															1																			3	4	untypable group K
unknown																										1	1																															13	24	unknown
Total	152	201	1	8	1	1	4	6	7	23	1	21	1	1	7	2	1	1	1	3	1	8	9	3	5	32	1	15	1	57	2	2	25	1	19	3	4	61	15	29	1	4	7	4	1	25	2	4	1	3	6	2	7	1	25	15	1	18	863	4,747	Total

Source: National Animal Disease Laboratory, Ames, Iowa, Weekly Salmonella Surveillance Reports from Individual States, and USFDA, Division of Microbiology, Washington, D.C.

*Includes July late reports.

TABLE V

REPORTED NONHUMAN ISOLATES BY SEROTYPE AND STATE, * AUGUST, 1966

SEROTYPE	ALA	ARK	CAL	CONN	DC	GA	IDA	ILL	IND	IOWA	KAN	KY	LA	MD	MASS	MICH	MINN	MISS	MO	MONT	NEB	NJ	NY-A	NC	OHIO	OKLA	ORE	PA	SC	TEX	UTAH	VA	WASH	W.VA	WISC	TOTAL	8 MOS. TOTAL	SEROTYPE
alachua									5									1																		6	23	alachua
albany																		1																		1	1	albany
anatum		1	4		2	1		1		1			2	13				10		2			6			3						1		1		48	253	anatum
bareilly										1				2				2				6									1					12	23	bareilly
binza			2					1						2				2											1							8	44	binza
blockley		1	3			1		1	1					1				1	1	6			2										5		1	24	142	blockley
bovis-morbificans					2																														2	3	bovis-morbificans
bredney			3	2									1					2				1														9	45	bredney
california													1																2							3	24	california
cerro								1	5	1								6										1								14	46	cerro
chester									1			3						2		3															8	17	93	chester
cholerae-suis																			2																	2	3	cholerae-suis
cholerae-suis v kun	1									4										1								1								7	68	cholerae-suis v kun
cubana			2					1					3					1								2							9		1	19	71	cubana
derby		1	1		1				1	1			7		1			1			1	3							1						19	38	122	derby
dublin																														1					1	32	dublin
eimsbuettel		2						1	3	1			16					2								2			4						31	84	eimsbuettel
enteritidis								1	4																						1				6	73	enteritidis
gaminara																													1						1	2	gaminara
give			1			1		1	1					1																					5	33	give
grumpensis													1																						1	5	grumpensis
heidelberg		3	2			21			2	3			1				33		4		1					1				3				4	78	446	heidelberg
indiana									5										3																8	32	indiana
infantis		7	3			1			1								2	1	8			2			1			1		4		2		1	34	207	infantis
java				1																			3												4	38	java
kentucky								2					2				3												2						9	24	kentucky
livingstone																						1			1				1						3	63	livingstone
madelia			1																																1	2	madelia
manhattan																						1													1	31	manhattan
manila													1																						1	3	manila
meleagridis									1																										1	12	meleagridis
minnesota										1			1				1								1										4	36	minnesota
montevideo						3		2					11			1	4	1	1		1	1		1	2										28	217	montevideo
muenchen																	1																		1	47	muenchen
new-brunswick																	1																		1	77	new-brunswick
newington													3									2													1	6	54	newington
newport			2		5			1	1													5	8						2	1					25	94	newport
norwich																										2									2	4	norwich
oranienburg							1			3			6	1		1	1		2			1		3							1				20	145	oranienburg
panama		6																																	6	15	panama
pullorum											1					1	2																	3	7	48	pullorum
rubislaw								1																											1	4	rubislaw
saint-paul			1			2			2								4		2		1						4	1				5		3	25	206	saint-paul
san-diego									2																					1		1			4	75	san-diego
schwarzengrund			41			1							2						1															2	47	154	schwarzengrund
senftenberg			3					1					5	1			9	1				1												1	22	123	senftenberg
seremban											1																								1	1	seremban
siegburg													1																						1	4	siegburg
taksony			1																																1	4	taksony
teddington													1																						1	1	teddington
tennessee					2			2	5				3	9			22										1								44	139	tennessee
thomasville													2				1																		3	24	thomasville
thompson			1					22	3		1			1		4			1					1								3		1	38	143	thompson
typhi-murium			15	40				1	12		2	2	2	1		7	1		7			6	3				2			1		19		1	122	619	typhi-murium
typhi-murium v cop		2		3		6			2					3			3		2	2		1						4						2	30	147	typhi-murium v cop
urbana								1																											1	9	urbana
worthington		1							3	1			6																						11	53	worthington
untypable group K																			2										1						3	4	untypable group K
unknown																						12	1												13	24	unknown
Total	1	24	86	46	12	37	2	40	61	16	5	7	93	18	1	14	115	12	45	2	18	45	10	2	8	6	8	6	2	14	11	3	44	1	48	863	4,747	Total

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

*Includes July late reports.
NYA = New York - Albany

TABLE VI
OTHER SEROTYPES REPORTED DURING 1966
FROM NONHUMAN SOURCES

SEROTYPE	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
abortus-bovis	Mar	La	1
adelaide	Mar	La	1
alagbon	Mar	NJ	2
amagar	May-Jul	Ark	2
amsterdam	Jan	Ohio	1
babelsberg	Jan	Ind	1
berta	Feb	Ga(2)	
	May	Calif(1)	3
birmingham	Jun	La	1
bradford	Jan	NJ	1
braenderup	Jan-Feb	Ark(4)	
	Jan	Calif(1)	
	Jan	Miss(1)	
	Feb	Ala(1)	
	Feb	Tex(1)	
	Mar	Va(1)	
	Apr-Jul	Conn(6)	15
cambridge	Apr	La	1
caracus	Mar	La	1
carrau	Apr	Mass	2
champaign	Mar	La	2
colorado	Mar	NJ	1
corvallis	Apr-Jun	La	2
drypool	Jun	La	2
emek	Jul	Tex	1
eppendorf	Jan	NJ	1
fayed	Apr	La(1)	
	Apr	NC(1)	2
gallinarum	Jan-Mar	Tex(2)	
	Feb-Jul	Calif(2)	
	Feb	Minn(1)	
	Feb	Pa(2)	
	Feb	Wisc(1)	
	Mar	Va(1)	
	May	Ala(1)	
	Jul	Ark(1)	11
habana	Apr	Md	1
halmstad	Mar-Jul	La	4
hamilton	Jan	La	1
hartford	Mar	Fla	1

TABLE VI(Continued)
OTHER SEROTYPES REPORTED DURING 1966
FROM NONHUMAN SOURCES

SEROTYPE	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
illinois	Mar	Minn(1)	
	Jun	La(1)	
	Jul	Calif(2)	4
javiana	Jul	Calif	1
johannesburg	Mar	Mich	1
kaapstad	Mar	La	1
kottbus	Feb	Ga	1
lexington	Jan	Calif(1)	
	Mar-May	La(3)	
	Mar	NJ(2)	
	May	Minn(1)	
	Jun	Wisc(1)	8
lille	Mar	NJ	1
litchfield	Apr	Calif(1)	
	May-Jun-Jul	Fla(13)	
	May	Ga(1)	
	May	Kan(2)	
	Jul	Ohio(1)	
	Jul	Wash(1)	19
miami	Feb	Calif(1)	
	Feb	Tex(1)	
	Jul	Fla(1)	
	Jul	Wash(1)	4
mikawashima	Jul	Ind	2
minneapolis	May	Calif	1
mission	Mar	Ohio(1)	
	May	La(1)	2
mississippi	Mar	La	1
muenster	Mar	Ala(1)	
	Mar-Apr-May-Jun	La(9)	
	Apr	Calif(1)	
	Apr	Fla(1)	
	May	Miss(1)	
	Jun	Ga(1)	
	Jun	Mo(1)	
	Jul	Wash(1)	16
new-haw	Mar	NJ	1

TABLE VI (Continued)
OTHER SEROTYPES REPORTED DURING 1966
FROM NONHUMAN SOURCES

SEROTYPE	MONTH(S)	REPORTING CENTER(S)	NUMBER OF ISOLATIONS
ohio	Feb	Iowa(7)	
	Feb	Minn(1)	
	Jun	NJ(1)	
	Jun	NYA(1)	10
orion	Jan	Miss(4)	
	Jan	Ohio(1)	
	Feb	Wisc(2)	
	Mar	Ill(1)	
	Apr	Ind(1)	
	May-Jun	La(2)	
	Jul	Minn(1)	12
oslo	Jan-Mar-May	Calif	5
paratyphi-B	Mar	Md(1)	
	Mar	Tex(1)	
	Apr-May	Ohio(3)	
	Jul	Minn(1)	6
pharr	Jan	Mich	1
pomona	Mar	NJ	1
poona	Mar-May-Jun	Calif(4)	
	Mar	Md(1)	
	May	La(1)	
	Jun	Ga(1)	7
portland	Jul	Wash	1
reading	Feb-Mar-May	Calif(5)	
	Feb	Utah(1)	
	Mar-Apr-Jun-Jul	Ore(12)	
	May	Minn(2)	
	May	SD(1)	
	Jun	Ind(1)	
	Jun	Iowa(1)	
	Jul	Wisc(1)	24
simsbury	Jan	Ind(1)	
	Feb-Mar-Jun	Calif(4)	
	Mar	NJ(1)	6
stockholm	May	Ohio	1
tournai	Mar	NJ	1
tuebinger	Jan	Mich	1
typhi	Jan	Mo	1
typhi-suis	Feb-Mar	Calif(6)	
	Mar	Minn(1)	7
vejle	Apr	La	1
westhampton	Mar	Kan	1
TOTAL			210

Figure 1.

REPORTED HUMAN ISOLATIONS OF SALMONELLA
IN THE UNITED STATES