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NATIONAL
COMMUNICABLE DISEASE CENTER

SALMONELLA

SURVEILLANCE

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FOR THE MONTH OF JUNE 1968

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE / PUBLIC HEALTH SERVICE
Bureau of Disease Prevention and Environmental Control

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

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I. SUMMARY

This issue of the Salmonella Surveillance Report includes reports of an outbreak of salmonellosis caused by pet Easter chicks and two outbreaks on hospital pediatric wards. The problem of nosocomial salmonellosis and guidelines for its control are discussed.

In June 1968, 1,556 isolations of salmonellae were reported from humans, an average of 389 isolations per week (Tables I, II, and V-A). This number represents an increase of 30 (8.4 percent) over the weekly average of May 1968 and an increase of 21 (5.7 percent) over the weekly average of June 1967.

Reports of 777 nonhuman isolations of salmonellae were received during June 1968 (Tables III, IV, and V-B).

Drs. Andrew Mallory and George Robinson have joined the Salmonellosis Unit, replacing Dr. Steven A. Schroeder, who is now pursuing further medical training at the Boston City Hospital, Boston, Massachusetts.

II. REPORTS OF ISOLATIONS

The ten most frequently reported serotypes during June:

HUMAN				NONHUMAN		
	Serotype	Number	Percent	Rank Last Month	Serotype	Number	Percent
1	typhi-murium*	441	28.3	1	typhi-murium*	118	15.2
2	enteritidis	132	8.5	2	heidelberg	73	9.4
3	heidelberg	119	7.6	3	infantis	56	7.2
4	newport	85	5.5	5	thompson	46	5.9
5	saint-paul	81	5.2	4	blockley	40	5.1
6	javiana	62	4.0	>10	montevideo	39	5.0
7	infantis	53	3.4	6	anatum	33	4.2
8	typhi	45	2.9	9	saint-paul	33	4.2
9	blockley	42	2.7	7	derby	29	3.7
10	thompson	40	2.6	8	oranienburg	21	2.7
					senftenberg	21	2.7
	Total	1100	70.7		Total	509	65.5
	TOTAL (all serotypes)	1556			TOTAL (all serotypes)	777	
	*Includes var. copenhagen	22	1.4		*Includes var. copenhagen	20	2.6

The nationwide increase in reported isolations of Salmonella javiana for the month of June has not yet been explained. As presented in the last issue of the Salmonella Surveillance Report in an S. javiana alert, investigation of cases in California has not provided a solution. Subsequent investigation of cases in Louisiana by the Louisiana State Department of Health has also been without results. However, two cases in children in Colorado were apparently related to contact with a pet turtle; in addition, an isolation of S. javiana was reported from a pet turtle by the

Pennsylvania Department of Health. Although pet turtles did not account for the cases in California, this source should be considered strongly in investigating cases elsewhere in the United States.

The cluster of 26 isolations of S. braenderup in Kansas is related to an outbreak in a restaurant. Details of the outbreak will be presented in a subsequent issue.

III. CURRENT INVESTIGATIONS

An Outbreak of Salmonellosis Due to Pet Easter Chicks

Reported by Grant Skinner, M.D., Chief, Section of Communicable Disease Control, Eleanor Christenson, Enteric Bacteriology Section, and Frank Pauls, Ph.D., Assistant Director, State Laboratory of Hygiene, Wisconsin State Department of Health and Social Services, and F. Marc LaForce, M.D., EIS Officer, Bacterial Diseases Section, Epidemiology Program, NCDC.

Between April 19 and May 12, 1968, the Enteric Laboratory of the Wisconsin State Laboratory of Hygiene identified ten isolates of Salmonella typhi-murium submitted from two hospitals in east-central Wisconsin. Because all of these isolates were dulcitol negative, an epidemiologic investigation was initiated.

All nine families from which dulcitol-negative S. typhi-murium had been isolated were interviewed. The ten cases occurred over a 2½-week period. In addition, three cases of gastroenteritis occurred among family members but were not studied bacteriologically. Thus, of 39 family members, a total of 13 (33 percent) had had a diarrheal illness. All ten family members under 5 years of age had been ill and only three of the cases occurred in persons older than 5 years. All six of the persons less than 3 years of age were hospitalized for 5 to 13 days.

Eight of the families had purchased pet chicks and one a pet duck from a single pet store. A local hatchery, which had supplied chicks to the pet store, also sold 600 chicks from the same lot, but no cases of gastroenteritis could be traced to the chicks sold from the hatchery. Cloacal swabs were taken from 13 chicks which had been sold by the pet shop during the Easter season. Swabs from two chicks yielded strains of dulcitol-negative S. typhi-murium. The droppings from the cages that had housed the chicks in the pet store were also positive for this strain of S. typhi-murium, as well as for S. tennessee and S. muenchen. A sample of the chick feed yielded S. muenchen; the duck feed was negative. Twenty-five environmental swabs at the pet shop were negative for salmonellae, but two swabs taken from a turtle bath yielded S. pomona, S. newington, and an Arizona species.

Although the Easter chicks were the source of infection for this outbreak of salmonellosis, the manner in which the chicks themselves became infected is not clear. Since no cases were traced to chicks from the same lot sold by the hatchery, it would appear that the chicks became infected while at the pet shop. Since S. muenchen was isolated from the chick feed, this would suggest that perhaps a contaminated feed lot used for these Easter chicks was the original source of infection.

EDITOR'S COMMENT: Biochemical reactions can provide a useful epidemiologic marker to identify epidemic strains of salmonellae. In 1966 and 1967, in a selected group of 803 salmonella non-host-adapted strains submitted to the Enteric Bacteriology Unit, Bacteriology Section, Laboratory Program, NCDC, 18 or 2.2 percent were dulcitol negative. Although the occurrence of ten cases of gastroenteritis due to S. typhi-murium might not have aroused concern by itself, the further identification of these isolates by biochemical tests provided the link which stimulated the epidemiologic investigation.

Two additional tools which provide epidemiologic markers for salmonella serotypes are phage typing for S. typhi-murium and antibiotic susceptibility tests. They become extremely valuable for the investigation of seemingly sporadic cases of salmonellosis due to a common salmonella serotype. In a common-vehicle outbreak in which exposure to the contaminated vehicle is intermittent or in a hospital outbreak due to person-to-person spread, biochemical patterns, phage typing, or antibiograms can be extremely useful as a means by which a common source or common strain can be identified.

Salmonellosis spread by chicks and ducks sold as pets around Easter time has been well documented (SSR #2, 1962; #14, 1963; #15, 1963; #16, 1963; #39, 1965). Awareness of this potential source of infection has stimulated publicity in newspapers and magazines. In 1965 and 1966 the Maryland State Department of Health demonstrated that approximately 90 percent of the chicks and ducks sold during the Easter seasons were positive for salmonellae. With these data, the Maryland General Assembly passed a bill restricting the sale of live baby chicks, ducks, and other fowl under 3 weeks of age as pets (SSR #61, 1967).

Easter chicks are generally sold as pets for very young children. As so graphically illustrated by this outbreak, this population is extremely susceptible to salmonella infection, and the resulting infection is frequently more severe than those in older age groups. Unless these pets can be sold "salmonella-free," their sale at Easter should be eliminated.

IV. REPORTS FROM THE STATES

A. NEW YORK

The Spread of Salmonellosis in a Contagious Disease Ward

Reported by Tibor Fodor, M.D., Chief, Division of Epidemiology and Diagnosis, and L. H. Buchner, M.D., Epidemiologist, City of New York Department of Health.

On January 1, 1967, a 3-year-old boy with diarrhea was admitted to a contagious disease ward of a large general hospital in New York City. His stool culture was positive for Salmonella newport. The patient was treated with ampicillin and recovered uneventfully. Over the following 4-week period, 14 of 22 children on the same ward developed febrile gastroenteritis due to S. newport following admission to the ward. In addition to these 14 cases, 2 children admitted with varicella and a nurse and nurse's aide on the ward were all found to be asymptomatic excreters of S. newport. The children, ranging in age from 1 to 10 years, had originally been admitted to the contagious disease ward for a variety of illnesses, including varicella, croup, measles, scarlet fever, and nonbacterial diarrhea. In most instances the patients became afebrile as the primary disease subsided. A secondary spike in temperature or diarrhea heralded the onset of their salmonella infections. Recovery in all instances was uneventful.

A sanitary inspection of the contagious disease ward was made, and many opportunities for person-to-person spread of infection were noted. Effective methods of enteric isolation were not followed in all cases. In addition, insufficient or defective equipment and inadequate physical facilities contributed to spread of infection. The following control measures aimed at correcting major avenues of cross-infection were instituted: (1) enteric precautions, including hand-washing and wearing of gowns, were instituted; (2) patients were isolated in single rooms; (3) the ward was closed to new admissions; and (4) after all children had been discharged, the facilities were thoroughly cleaned. With these measures, the outbreak was terminated, and no further cases have occurred.

B. GEORGIA

An Outbreak of Salmonellosis on a Pediatric Ward

Reported by Andre J. Nahmias, M.D., Associate Professor of Pediatrics and Preventive Medicine, Emory University School of Medicine, John E. McCroan, Ph.D., Epidemiology Branch, Georgia Department of Public Health, and Jonathan L. Adler, M.D., EIS Officer, and Roger L. Anderson, M.S., Microbiologist, Biophysics Section, Epidemiology Program, NCDC.

In April 1968, a 6-month-old boy with an acute respiratory infection and a history of diarrhea 3 weeks earlier was admitted to the general pediatric ward of a large municipal hospital. The respiratory infection responded to therapy with ampicillin; however, on the third hospital day, the patient spiked a fever and diarrhea recurred. A stool culture yielded Salmonella indiana resistant to ampicillin. Between April 15 and May 31, 22 additional cases of salmonellosis due to S. indiana occurred among the 131 infants admitted to the ward during that period, representing an attack rate of 16.8 percent.

The infants had originally been admitted with a variety of medical and surgical problems. They ranged in age from 1 month to 24 months, with an average age of 10.7 months, reflecting the age of the ward population. Onset of illness in all cases occurred after 5 or more days of hospitalization. Eighteen of the 22 infants with positive cultures were symptomatic, with diarrhea and fever. Illness lasted an average of 5 days, and no complications or deaths were attributed to the salmonella infections. Antibiotic susceptibilities performed on each of the isolates of S. indiana were identical to the isolate from the index case.

After the first cases were noted, an epidemiologic investigation was undertaken. With the cases occurring sporadically, the epidemic pattern was that of a cross-infection outbreak, and no common vehicle could be identified. The hospital ward consisted of 12 hospital rooms with a total of 44 beds. Fifteen of the cases had been in the same rooms at the onset of their illnesses with infants already positive for S. indiana.

To identify a possible carrier among the 110 medical and nursing personnel on the ward, a culture survey was undertaken. A nurse's aide, who denied any symptoms of gastrointestinal illness, was positive for S. indiana. She had not had contact with all the cases on the ward and probably acquired her infection from one of her patients.

An environmental culture survey was also performed. S. indiana was isolated from multiple sites, including sinks, tables, bathtubs, cribs, bedside tables, diaper pails, isolettes, thermometer holders, windowsills, and venetian blinds. In addition, the scale on which all patients were weighed at least three times weekly was positive. This scale was not routinely cleaned after use. S. indiana was also isolated from the floor and windowsills of a room following "terminal disinfection" prior to institution of more rigorous cleaning procedures.

Following the initial investigation, control measures designed to curb the spread of infection in the environment were instituted. All cases were isolated together in one room. Infants hospitalized in the same rooms with cases and who might have been in the incubation period of their salmonella infection were also isolated in a "contact-isolation room." When new cases were discovered, they were transferred to the case-isolation room, and their contacts to contact-isolation. Hand-washing with an antiseptic solution dispensed from a foot-operated dispenser was enforced. Gowns were provided at each bedside, gloves were used for diaper changing, and disposable diapers were used. Cases were discharged as soon as medically feasible. Use of common play areas, feeding and bathing rooms, and common toys was discontinued, and efforts were made to keep patients confined strictly to bed. Two additional scales were purchased for use solely in the isolation rooms. The contaminated scale was disinfected. All three scales were covered with fresh paper before each use and wiped with alcohol after

each use. All rooms in which cases had been hospitalized were thoroughly cleaned and disinfected as soon as empty. Repeated conferences with the ward personnel were held to reemphasize the importance of these measures. When these control measures were fully implemented, the outbreak slowed dramatically, and despite a reservoir of cases still on the ward, only 2 new cases occurred during June.

In summary, a large outbreak of salmonellosis involving 22 infants on a general pediatric ward occurred over a 5-week period. The mode of spread of the outbreak was person-to-person spread and person-environment-person spread. The outbreak persisted until control measures which emphasized more rigorous patient isolation and improved cleaning procedures were implemented. This outbreak illustrates the ease with which salmonella infections can be transmitted and perpetuated in the hospitalized infant population. Multiple-bed rooms and the frequent use of common feeding and playrooms for the infants provide ample opportunity for contact between infants with salmonellosis and noninfected infants and thus multiple opportunities for spread of infection in this susceptible group.

EDITOR'S COMMENT: With body defense mechanisms impaired by underlying illness and medical treatment, the hospitalized infant is highly susceptible to salmonellae, and salmonellosis spreads easily through the crowded environment of the hospital pediatric ward. Of 27 salmonella outbreaks in hospitals reported in the Salmonella Surveillance Report between 1963 and 1967, 19 occurred on pediatric wards and nurseries, involving 297 children with 14 deaths. To prevent such outbreaks, a continuous reevaluation of techniques of patient isolation and environmental sanitation is necessary and must be coupled with frequent discussions and seminars among ward personnel to reemphasize these points.

Each hospital should designate one member of its staff to be responsible for the regular, ongoing surveillance of hospital infections. By analyzing infection-reporting forms filled out for every patient, hospital bacteriology reports, and changing patterns of ward infections, the surveillance officer should be able to identify outbreaks of salmonellosis early in their course and institute appropriate control measures.

The two outbreaks reported above demonstrate the ease with which infections can spread through a pediatric ward. They also present guidelines for steps necessary to control this spread. Standard "enteric isolation" procedures and especially hand-washing are required of all hospital personnel who have contact with patients. All known salmonella excreters should be isolated; in addition, patients with diarrhea of unknown etiology must also be isolated until the etiology of the diarrhea can be identified. The early discharge of patients with salmonellosis is also useful as a means of reducing possible foci for further spread of infection.

Nosocomial salmonellosis is a serious problem responsible for significant morbidity among hospitalized patients. Only with persistent vigilance by the entire hospital staff can repeated outbreaks be prevented.

C. LOUISIANA and NEW JERSEY

Two Laboratory "Outbreaks" of Nosocomial Salmonellosis

Reported by Charles T. Carraway, D.V.M., Chief, Section of Epidemiology, Division of Preventive Medicine, Paul Marques, D.V.M., EIS Officer, Louisiana State Department of Health, and Steven Schroeder, M.D., EIS Officer, Epidemiology Program, NCDC, and by Martin Goldfield, M.D., Director, Division of Laboratories, Ronald Altman, M.D., Assistant Director, Division of Laboratories, and Charles Janeway, M.D., EIS Officer, New Jersey State Department of Health.

During 1968, similar outbreaks of suspect nosocomial salmonellosis were investigated in Louisiana and New Jersey. In both instances, contamination of blood cultures in the bacteriology laboratory of the hospital was responsible for the "outbreak," and no actual hospital-acquired cases occurred.

In January 1968, ten isolations of Salmonella typhi-murium var. copenhagen from nine patients were reported from a Louisiana hospital; six patients had positive blood cultures, two had positive stool cultures, and one patient had both a positive stool and blood culture. All isolates had identical phage patterns and antibiotic susceptibilities.

During January, three patients had been admitted to the hospital with salmonella gastroenteritis documented by stool culture on admission, and one of these patients had a positive blood culture as well. Of the six patients with only blood cultures positive for salmonellae, none reported gastrointestinal symptoms and all had recovered without complications from the illness for which they were hospitalized.

Investigation of the laboratory procedures disclosed that all blood cultures were examined visually at 24 hours and subcultured to chocolate agar with a wire loop if bacterial growth was apparent. All other blood cultures were routinely subcultured to chocolate agar at 48 hours, 1 week, and 2 weeks. On January 12, the turbid blood culture from the patient who had had a positive stool culture was subcultured and was positive for S. typhi-murium var. copenhagen. This positive blood culture probably represented genuine bacteremia. However, the next six cultures examined had no visual evidence of bacterial growth but were also positive for this serotype. They were most likely contaminated during the subculturing process, probably because of inadequate flaming of the wire loop used to transfer media. The next 18 blood cultures subcultured on January 12 were all negative. Thus, in the cluster of nine suspect nosocomial infections, three represented community-acquired salmonellosis and six were traced to probable contamination of blood cultures in the hospital bacteriology laboratory.

In May 1968, a hospital in New Jersey reported seven patients with blood cultures positive for S. typhi-murium. Although one patient also had a positive stool culture, none had symptoms compatible with salmonella infection. No epidemiologic association such as location on the same ward or common dietary item linking the patients could be demonstrated. Five of the seven blood cultures contained multiple organisms, including herellea, S. faecalis, and enterococci, in addition to S. typhi-murium. Isolation of multiple organisms in a blood culture strongly suggests contamination either when the blood is drawn or in the laboratory. The equipment used to take blood cultures and the blood culture media itself were cultured for salmonellae and were negative. Stool cultures from the physicians who drew the blood samples and from the bacteriology laboratory technicians who processed the blood cultures were also negative for salmonellae. Since salmonella is not a normal component of the skin flora, it seems most likely that salmonella contamination occurred not when the cultures were obtained but rather during processing in the laboratory. The specific source of contamination within the laboratory could not be determined. Several recommendations were made to improve both the techniques for obtaining cultures and the techniques for processing them, and since that time no further "cases" have occurred.

EDITOR'S COMMENT: These two "hospital" outbreaks of salmonellosis clearly demonstrate the need to correlate clinical and laboratory data in an epidemiologic investigation.

V. SPECIAL REPORTS

A. The Control of Salmonella in Egg Processing -- Pasteurization Methodology

The following is a brief outline of egg pasteurization methodology included in a paper presented by Dr. Dwight H. Bergquist, Henningsen Research and Development Center,

in Washington, D.C., at the 1968 Joint Meeting of the American Oil Chemists Society and American Association of Cereal Chemists, March 31-April 4, 1968.

The objective in pasteurization of egg products is to reduce the hazard of potential pathogenic microorganisms and still retain the physical and functional properties of the raw liquid eggs. In addition to microbiological properties, one must also be concerned about whipping, emulsifying, binding, coagulation, flavor, texture, color, and nutrition. In heating eggs for pasteurization, we attempt to use the highest possible temperatures without impairing these very delicate and sensitive properties, which make egg products so very useful. There is thus a relatively low limit as to how high egg can be heated. Natural egg white liquid, for example, begins to coagulate at 136° F, whole egg at 143° F, and yolk at 145° F. There are a number of egg products, all of which are different in their sensitivity to heat and the ease with which bacteria are destroyed within them.

Three basic processing methods, alone or in combination, are used commercially to pasteurize egg products: (1) heating the liquid egg, (2) heating the dried egg product, and (3) treatment of the liquid egg with hydrogen peroxide. Other methods, including treatment of the dried product with an epoxide such as ethylene oxide or propylene oxide and irradiation of the liquid or dried product with ultraviolet light or ionizing radiation, have proven effective but have not yet received clearance by federal agencies and are not used commercially.

The subject of pasteurizing eggs has recently been reviewed in an informal report entitled "Egg Pasteurization Manual" prepared by the Poultry Laboratory of the Western Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Albany, California.

All of the pasteurization methods given below give a bacterial kill which is equivalent to that obtained by heating whole egg liquid to 140° F and holding it at this temperature for 3½ minutes. The temperatures and holding times are minimums. For almost all strains of salmonellae, the kill is good under these conditions.

Egg White Pasteurization

Several methods for pasteurizing egg white are currently being employed:

1. Heat treatment of plain liquid egg white above 134° F for at least 3½ minutes. Plain white is natural, unprocessed egg white liquid without additives. Commercially broken egg white has a pH of 9.0 ± 0.1. This relatively high pH allows greater destruction of bacteria at a lower temperature than is possible with other natural egg products.

2. Heat treatment of heat stabilized egg white above 140° F for at least 3½ minutes. Heat stabilization is accomplished by adjusting pH to 7.0 with lactic acid and adding aluminum sulfate. The pH adjustment increases the stability of the proteins ovalbumin, lysozyme, ovamucoid, and ovamucin. The aluminum sulfate stabilizes conalbumin.

3. Heat treatment of plain egg white above 125° F in the presence of hydrogen peroxide. Heating of the liquid serves to inactivate the natural catalase and also to make the bacterial killing power of hydrogen peroxide more effective. After treatment, catalase is added to decompose the hydrogen peroxide.

4. Heat treatment of the dried egg white product, often in combination with one of the liquid pasteurization procedures. Dry heat treatment of egg white powder is effective in destroying salmonella at temperatures above 120° F. Dry heat treatment is often accomplished by placing the containers of dried egg white in a room at the desired temperature. Dried egg white, with natural glucose removed, is

quite stable and can be heated for extended periods without noticeable effect on functional properties. A mild "pasteurization" of the egg white liquid followed by heat treatment of the dry egg white results in low total count in the finished product.

Whole Egg and Yolk Pasteurization

Liquid whole egg and yolk products have better natural stability than egg white and can be pasteurized above 140° F without stabilization. USDA requires that egg products be heated to such a temperature and held for a time that will give salmonella destruction equivalent to heating whole egg to 140° F for 3½ minutes. They now recommend the following conditions for egg yolk products: (1) plain yolk -- heated to 142° F and held for 3½ minutes or heated to 140° F and held for 6.2 minutes, (2) sugared yolk -- heated to 146° F and held for 3½ minutes or heated to 144° F and held for 6.2 minutes, (3) salted yolk -- heated to 146° F and held for 3½ minutes or heated to 144° F and held for 6.2 minutes.

The British requirement for pasteurizing whole egg is 148° F for 2½ minutes. These conditions inactivate the natural amylase of egg. Thus, the adequacy of pasteurization can be determined by testing for this enzyme. However, more functional damage is noted with the higher pasteurization temperatures.

Equipment used for pasteurizing liquid eggs is the standard high-temperature-short-time pasteurizing equipment with all of its component parts. This is a continuous process in which the liquid is heated to a specified temperature and held for a specified period of time before it is cooled or dried. Safety features are provided to make sure that these requirements are met.

Batch pasteurizing was one of the first methods to be applied to egg products. This method is again being considered by the industry, especially for small egg processing operations. Temperatures of 132° F for 35 minutes and 135° F for 15 minutes are considered to be equivalent to 140° F for 3½ minutes.

EDITOR'S COMMENT: Salmonella contamination of eggs and egg products continues to constitute a significant health hazard in the United States. Between 1962 and 1967, of 152 foodborne outbreaks reported in the Salmonella Surveillance Report, 40 involving 4,590 persons were caused by contaminated eggs and egg products. Although the U.S. Food and Drug Administration and the U.S. Department of Agriculture issued regulations in 1966 to require pasteurization of egg products moving in interstate commerce, these regulations do not affect intrastate operations. In 1967, a very large outbreak occurred in New York City from a frozen dessert containing nonpasteurized frozen eggs yolk (SSR #61). Following this outbreak, New York City instituted appropriate control measures to prevent similar outbreaks in the future. However, many states still have no requirements for pasteurization of egg products.

Although we do not at present have the ability to eliminate salmonellae completely as a health hazard, there are many areas in which improvements can be made. A detailed manual entitled "Ordinance and Code Regulations for the Processing of Eggs and Egg Products -- 1968 Recommendations" has been prepared by the U.S. Public Health Service and will be published in the near future. Pasteurization of all egg products would eliminate this frequently implicated vehicle as a source of salmonellosis. Regulations requiring pasteurization of egg products should be instituted throughout the country.

B. Recent Articles on Salmonellosis

The following articles on salmonellosis of interest to public health workers and the food industry have been published in recent months.

1. Arata, A. A., et al.: Salmonella and shigella infections in bats in selected areas of Colombia. Am. J. Trop. Med. Hyg. 17:92-95, 1968.

2. Collins, F. M.: Recall of immunity in mice vaccinated with Salmonella enteritidis or Salmonella typhi-murium. J. Bact. 95:2014-2021, 1968.

3. Goepfert, J. M., Olson, N. F., and Marth, E. H.: Behavior of Salmonella typhi-murium during manufacture and curing of cheddar cheese. Appl. Microbiol. 16:862-866, 1968.

4. Howie, J. W.: Typhoid in Aberdeen, 1964. J. Appl. Bact. 31:171-178, 1968.

5. Kaufmann, A. F., et al.: Salmonellosis epidemic related to a caterer-delicatessen restaurant. Am. J. Pub. Health 58:764-771, 1968.

6. Kaufmann, A. F., and Feeley, J. C.: Culture survey of salmonella at a broiler raising plant. Pub. Health Rep. 83:417-422, 1968.

7. Orthoefer, J. G., et al.: Salmonella contamination in a rendering plant. Avian Diseases 12:303-310, 1968.

8. Schulte, W. J., and Tucker, K. R.: Surgical implications in salmonellosis. Arch. Surg. 96:593-598, 1968.

9. Williams, L. P., and Newell, K. W.: Sources of salmonellae in market swine. J. Hyg. 66:281-294, 1968.

C. U.S. Food and Drug Administration Recall of Products Contaminated with Salmonellae, May 20 to July 15, 1968

From May 20 to July 15, 1968, 11 products were recalled by the U.S. Food and Drug Administration because of contamination with salmonellae. These products included human foods and drugs and are listed on the following page.

U.S. Food and Drug Administration Weekly Recall List
Summary of Products Contaminated with Salmonellae
Week Ending May 20 through Week Ending July 15, 1968

Week Ending	Name, Label, Form	Manufacturer, Distributor	Lot No.	Use	Depth of Recall	Product Distribution	Serotype
6/3	Ronzoni Egg Noodles (see below)						
6/17	Nonfat dry milk	Midland Milk Co.	2513	food	consignee	Missouri	meleagridis
6/27	Bulk Pancreatin, Quadruple Strength	Cudahy Laboratories	1797	prescription	repacker	Ariz., Oreg.	poona
	Pancreatin NF 4X Capsules	Kirkman Labs., Inc.	04807	prescription	consignee	Oregon	poona
	Provimalt Protein, Vitamin Mineral Powder	Sheffield Chemical, Div. of National Dairy Products Corp.	7NK26, 7NK30, 8NB23, 8NB26, 8NB28	food	consignee	New York	serotype unknown
	Unflavored gelatin	George A. Hormel & Co.	8813, 8822, 8823, 8824, 8825, 8844, 8849	food	consignee	national, Puerto Rico	montevideo
			OX-138-2	food	wholesale	Ill., Wisc.	
7/1	Rehaptar Liver Protein Fraction	Reheis Chemical Co., Div. of Armour Pharmaceutical Co.	E6402	prescription	consignee	national	montevideo
	Ronzoni Egg Noodles (see below)						
7/8	Bulk tablets for repacking, containing pancreatin	Cudahy Laboratories	16812	prescription	consignee	New Mexico	poona
	Dry yeast	Standard Brands	3461-U, 3478-U	food	primary consignee	national & Canada	senftenberg, cubana, & infantis
7/15	Ronzoni Kitchen Style Egg Noodles, Folded Egg Noodles, Egg Bows, Egg Dainties, Egg Pastina, & Spinach Egg Noodles	Ronzoni Macaroni Co.	all lots, package sizes, & styles	food	retail	est. 99% dist. in N.J., N.Y., & Pa.; remaining 1% in Conn., Mass., Fla., & Calif.	infantis & muenchen
	Spray nonfat dry milk	Milk Producers, Inc.	11885	food	consignee	Phoenix, Ariz.	cubana
	Dried egg yolk	Tranin Egg Products Co.	1757	food	consignee	New Orleans, La.	serotype unknown

VI. INTERNATIONAL

Salmonellosis in Jamaica, 1962-1966

Reported by Louis S. Grant, M.D., Professor of Microbiology, and Alan L. Bisno, M.D., EIS Officer, University of West Indies, Kingston, Jamaica, West Indies.

For the 5-year period 1962-1966, 1,395 salmonella isolates were reported from Jamaica, including 843 isolates of Salmonella typhi and 552 isolates of non-typhoid salmonellae. Of the 36 different salmonella serotypes identified, the 6 most common other than S. typhi are listed in the table below. As in previous years, S. typhi-murium was the most common serotype isolated. However, an increase in isolations of S. infantis has occurred. From 1952 to 1956, only 2.2 percent of the 536 non-typhoid salmonellae were S. infantis; in contrast, from 1964 to 1966, S. infantis comprised 26.9 percent of all isolates. The reason for this trend is not apparent.

As in the United States, the incidence of typhoid fever is declining in Jamaica. Between 1954 and 1960, an average of 531 cases of typhoid fever were reported annually; in contrast, between 1961 and 1966, an average of only 172 cases were reported. Laboratory isolations of S. typhi show a similar decline.

The Six Most Frequently Isolated Serotypes

from Humans, Jamaica, 1962-1966

Serotype	Number	Percent
S. typhi-murium	179	32.4
S. infantis	98	17.8
S. worthington	31	5.6
S. saint-paul	27	4.9
S. derby	19	3.4
S. newport	18	3.3
Total	372	67.4
TOTAL (all serotypes)	552	

36 serotypes

TABLE I. COMMON SALMONELLAE REPORTED FROM HUMAN SOURCES, JUNE 1968

SEROTYPE	GEOGRAPHIC DIVISION AND REPORTING CENTER																														
	NEW ENGLAND						MIDDLE ATLANTIC					EAST NORTH CENTRAL					WEST NORTH CENTRAL							SOUTH ATLANTIC								
	ME	NH	VT	MAS	RI	CON	NYA	NYB	NYC	NJ	PA	OHI	IND	ILL	MIC	WIS	MIN	IOW	MO	ND	SD	NEB	KAN	DEL	MD	DC	VA	WVA	NC	SC	GA	FLA
anatum								1						1											1					4	2
bareilly																	1														
blockley										1	6			5	4	1			2										2	2	1
braenderup				1								1											26								
bredeney				1							3				1																
chester															2																
cholerae-suis v kun																											1				2
cubana																											1				
derby				3				1	1					3		1									3	1			4			
enteritidis				2			1	7	9	8	14	9	1	23	2	1	2	1	1	2	1		1	1	14	3	2		2		3	2
give				1												1															1
heidelberg	1			4		1		5	10		8	3		14	9	1	2	1	1						6	2	5	2	8		1	2
indiana				1										5											1						10	
infantis				1				2	1	2		3	2	4		1	2		1				1		2	1	1				4	3
java																	1		1													
javiana				1							1	1		2	1	1	6			1	1									2	4
litchfield									1					1		1							1									
livingstone																																
manhattan								2			1	1		1											2					1	
miami									1																3					2	3
mississippi																														3	
montevideo				1					1		1	1		2	4														3		
muenchen				1										1	1	1			1										1	1	
newington																			1										1	1	
newport				4		3	1	5	7	2		1	1	6	5	1	1	2	1								10			2	8
oranienburg				4	3				1	1	1						1													2	1
panama									1					1		1															
paratyphi B				4				1					1		2																
reading	1																														
saint-paul				2	3			8		1	4	3	1	17	3	5	1							1	4		1		3	2	2
san-diego				1					1														1								
schwarzengrund																							2				1				
senftenberg																									1					1	
tennessee									1	1																				1	
thompson				4		3				3	1	1		3	1	2			2				1		3		2	1		5	2
typhi						1	2	1		1		4		2					3				2		5	1	1			2	1
typhimurium	4	1	1	17	1	8		22	19	16	21	20	6	32	29	9	9	3	5	1	1		2	1	17	3	3	1	4	2	15	8
typhimurium v cop				1		2	1			3					6									1					2		
weltevreden																														1	
worthington				1																											
TOTAL	6	1	1	55	7	18	5	55	54	39	61	48	12	123	70	27	26	7	19	4	3	–	37	4	62	11	28	4	30	2	65	42
ALL OTHER*	–	15	–	4	–	–	29	–	2	6	1	2	2	6	6	2	1	1	–	–	1	–	–	–	–	16	2	–	1	–	10	–
TOTAL	**6**	**16**	**1**	**59**	**7**	**18**	**34**	**55**	**56**	**45**	**62**	**50**	**14**	**129**	**76**	**29**	**27**	**8**	**19**	**4**	**4**	**–**	**37**	**4**	**62**	**27**	**30**	**4**	**31**	**2**	**75**	**42**

Note: NYA – New York, Albany; NYB – Beth Israel Hospital; NYC – New York City. Beth Israel Hospital laboratory is a reference laboratory and this month serotyped a total of 110 cultures.

* See Table II.

TABLE I – Continued

GEOGRAPHIC DIVISION AND REPORTING CENTER																				TOTAL	% OF TOTAL	CUMULATIVE TOTAL	% OF CUMULATIVE TOTAL	SEROTYPE
EAST S. CENTRAL				WEST S. CENTRAL				MOUNTAIN								PACIFIC								
KY	TEN	ALA	MIS	ARK	LA	OKL	TEX	MON	IDA	WYO	COL	NM	ARI	UTA	NEV	WAS	ORE	CAL	ALK	HAW				
					1													1		3	14	0.9	102	1.3	*anatum*
																		1			2	0.1	23	0.3	*bareilly*
	3	1				1	3				1						1	7		1	42	2.7	230	2.8	*blockley*
																					28	1.8	74	0.9	*braenderup*
					4													1		1	11	0.7	108	1.3	*bredeney*
																	1	2			5	0.3	28	0.3	*chester*
																					3	0.2	16	0.2	*cholerae-suis v kun*
																		1			2	0.1	25	0.3	*cubana*
					3											1		2		4	27	1.7	197	2.4	*derby*
1	4			2	3	1					3			2				4			132	8.5	616	7.6	*enteritidis*
																		1			4	0.3	27	0.3	*give*
1	2	2			16	1	5				1							4		1	119	7.6	566	6.9	*heidelberg*
																					17	1.1	47	0.6	*indiana*
					4	1					1					2		3		11	53	3.4	385	4.7	*infantis*
																		4			6	0.4	87	1.1	*java*
	1			1	1	1	5				3						3	26			62	4.0	126	1.5	*javiana*
1																		1			6	0.4	36	0.4	*litchfield*
																				1	1	0.1	19	0.2	*livingstone*
					2		1											1		3	15	1.0	93	1.1	*manhattan*
	5			4																	18	1.2	41	0.5	*miami*
		1			2		2														8	0.5	18	0.2	*mississippi*
		1		1	4									1				1			21	1.3	100	1.2	*montevideo*
					2													1			10	0.6	70	0.9	*muenchen*
																					3	0.2	18	0.2	*newington*
1	1	1		2	3	2	8											7			85	5.5	438	5.4	*newport*
							3											13			30	1.9	136	1.7	*oranienburg*
	1						1											2			7	0.5	79	1.0	*panama*
																		1			9	0.6	55	0.7	*paratyphi B*
																					1	0.1	15	0.2	*reading*
				1	1	1	9							1		3	1	3			81	5.2	481	5.9	*saint-paul*
																		10			13	0.8	58	0.7	*san-diego*
					1											2					6	0.4	21	0.3	*schwarzengrund*
																					2	0.1	17	0.2	*senftenberg*
							1											2		1	7	0.4	44	0.5	*tennessee*
	1						1		1									3			40	2.6	208	2.6	*thompson*
2					2	1	3										2	9			45	2.9	258	3.2	*typhi*
2	5	5		1	14	7	11			1	10		1	2		1	2	68		8	419	26.9	2,213	27.1	*typhimurium*
	3			1	1												1				22	1.4	138	1.7	*typhimurium v cop*
																				4	5	0.3	45	0.6	*weltevreden*
																					1	0.1	9	0.1	*worthington*
8	26	11	–	13	64	16	53	–	1	1	19	–	1	6	–	9	11	179	–	38	1,382	88.8	7,267	89.1	TOTAL
–	2	–	2	9	7	–	17	1	1	–	–	17	1	–	–	–	2	8	–	–	174		888		ALL OTHER*
8	28	11	2	22	71	16	70	1	2	1	19	17	2	6	–	9	13	187	–	38	1,556		8,155		TOTAL

TABLE II. OTHER SALMONELLAE REPORTED FROM HUMAN SOURCES, JUNE 1968

SEROTYPE	REPORTING CENTER																					
	ARI	ARK	CAL	DC	GA	IDA	ILL	IND	IOW	LA	MAS	MIC	MIN	MIS	MON	NH	NJ	NM	NYA	NYC
alachua			1																	
atlanta					3															
berlin																				
berta			1																	
binza																				
bovis-morbificans										1										
california					1		1													
daytona										1										
dublin			1																	
duesseldorf	1																			
durban							1													
gaminara										1										
hadar												1								
johannesburg											3									
kentucky																				1
kottbus																				
manchester																				
meleagridis										1										
minnesota					1															
muenster					1								1							
nchanga							2			1										
norwich			2																	
oslo			1																	
paratyphi A							1													
poona			1		2		1			1	1	1					4			
rubislaw					1					1										
stanley																	2			
urbana			1		1							1								
TOTAL	1	—	8	—	10	—	6	—	—	7	4	3	1	—	—	—	6	—	—	1
NOT TYPED*	—	9	—	16	—	1	—	2	1	—	—	3	—	2	1	15	—	17	29	1
TOTAL	1	9	8	16	10	1	6	2	1	7	4	6	1	2	1	15	6	17	29	2

* See Table V-A

TABLE II – Continued

REPORTING CENTER													TOTAL	CUMULATIVE TOTAL	SEROTYPE
	NC	OHI	ORE	PA	SD		TEN	TEX	VA	WIS					
													1	7	*alachua*
													3	5	*atlanta*
				1									1	3	*berlin*
							2						3	11	*berta*
					1								1	4	*binza*
													1	1	*bovis-morbificans*
													2	14	*california*
													1	1	*daytona*
													1	8	*dublin*
													1	1	*duesseldorf*
													1	2	*durban*
													1	6	*gaminara*
													1	1	*hadar*
	1												4	5	*johannesburg*
		1											2	10	*kentucky*
									1				1	1	*kottbus*
		1											1	1	*manchester*
													1	1	*meleagridis*
													1	6	*minnesota*
													2	13	*muenster*
													3	6	*nchanga*
													2	6	*norwich*
													1	8	*oslo*
													1	9	*paratyphi A*
									1	2			14	26	*poona*
													2	12	*rubislaw*
													2	4	*stanley*
													3	11	*urbana*
	1	2	–	1	1		2	–	2	2			58	273	TOTAL
	–	–	2	–	–		–	17	–	–			116	615	NOT TYPED*
	1	2	2	1	1		2	17	2	2			174	888	TOTAL

Cumulative Totals include isolations of all serotypes (except those listed in Table I) reported this year.

TABLE III. COMMON SALMONELLAE REPORTED FROM NONHUMAN SOURCES, JUNE 1968

SEROTYPE	DOMESTIC ANIMALS AND THEIR ENVIRONMENT							ANIMAL FEEDS			
	CHICKENS	TURKEYS	SWINE	CATTLE	HORSES	OTHER	SUBTOTAL	TANKAGE	VEGETABLE PROTEIN	OTHER	SUBTOTAL
anatum	4	3			1		8	12		3	15
bareilly							—			1	1
blockley	30	3				1	34	3		1	4
braenderup							—	1			1
bredeney							—	1			1
chester		4					4	1			1
cholerae-suis v kun			3				3				—
cubana						1	1	12		1	13
derby		1	15			1	17	4		2	6
enteritidis	4	1	1				6	1			1
give		2	1			1	4				—
heidelberg	44	22					66	5			5
indiana							—			1	1
infantis	11	3	19				33	3		3	6
java							—				—
javiana							—				—
litchfield							—				—
livingstone	1					1	2	10		2	12
manhattan		1					1				—
miami	2						2				—
mississippi							—				—
montevideo	21						21	5		6	11
muenchen		3				1	4				—
newington		2					2	1			1
newport	2			1	5	1	9				—
oranienburg	1						1	13		6	19
panama			5				5				—
paratyphi B							—				—
reading	1						1				—
saint-paul	8	18					26	1			1
san-diego		1					1				—
schwarzengrund		1					1	7		1	8
senftenberg							—	11		7	18
tennessee						1	1	2			2
thompson	24	1				4	29				—
typhi							—				—
typhimurium	13	7	6	10	3	9	48	10			10
typhimurium v cop	12		3		1		16				—
weltevreden			1				1				—
worthington	8	2					10	2		2	4
TOTAL	186	75	54	11	10	21	357	105	—	36	141
ALL OTHER*	16	2	4	2	—	—	24	30	—	28	58
TOTAL	202	77	58	13	10	21	381	135	—	64	199

* See Table IV

TABLE III – Continued

WILD ANIMALS AND BIRDS	REPTILES AND ENVIRONMENT	HUMAN DIETARY ITEMS						MISCELLANEOUS	TOTAL	CUMULATIVE TOTAL	SEROTYPE
		EGGS AND PRODUCTS	POULTRY	RED MEAT	DAIRY PRODUCTS	OTHER	SUBTOTAL				
					10		10	10	33	330	*anatum*
	1					1	1	1	4	20	*bareilly*
							–	2	40	111	*blockley*
							–		1	10	*braenderup*
							–	11	12	58	*bredeney*
						1	1		6	29	*chester*
							–		3	49	*cholerae-suis v kun*
	1				2		2		17	202	*cubana*
1						2	2	3	29	137	*derby*
1	1						–		9	78	*enteritidis*
1	1						–		6	32	*give*
1		1					1		73	363	*heidelberg*
							–		1	5	*indiana*
1		3				11	14	2	56	214	*infantis*
							–		–	–	*java*
2							–	1	3	7	*javiana*
							–		–	1	*litchfield*
							–		14	68	*livingstone*
							–		1	4	*manhattan*
							–		2	7	*miami*
							–		–	–	*mississippi*
		4			2		6	1	39	255	*montevideo*
						2	2		6	24	*muenchen*
					1	1	2		5	37	*newington*
1	3						–	7	20	100	*newport*
							–	1	21	109	*oranienburg*
							–	1	6	25	*panama*
							–	2	2	6	*paratyphi B*
							–		1	14	*reading*
	1						–	5	33	227	*saint-paul*
							–		1	20	*san-diego*
							–	1	10	51	*schwarzengrund*
1					1	1	2		21	133	*senftenberg*
					6		6	1	10	91	*tennessee*
2		15					15		46	144	*thompson*
							–		–	–	*typhi*
8	12					7	7	13	98	550	*typhimurium*
3							–	1	20	128	*typhimurium v cop*
							–		1	5	*weltevreden*
	1						–		15	67	*worthington*
22	21	23	–	–	22	26	71	53	665	3,717	TOTAL
5	13	6	–	–	3	1	10	2	112	931	ALL OTHER*
27	**34**	**29**	**–**	**–**	**25**	**27**	**81**	**55**	**777**	**4,648**	TOTAL

TABLE IV. OTHER SALMONELLAE REPORTED FROM NONHUMAN SOURCES, JUNE 1968

SEROTYPE	DOMESTIC ANIMALS AND THEIR ENVIRONMENT							ANIMAL FEEDS			
	CHICKENS	TURKEYS	SWINE	CATTLE	HORSES	OTHER	SUBTOTAL	TANKAGE	VEGETABLE PROTEIN	OTHER	SUBTOTAL
alachua							–	1			1
berlin							–				–
binza							–	2			2
california	6		1				7			1	1
cerro							–			1	1
chameleon							–				–
cholerae-suis			2				2				–
drypool							–	4		2	6
dublin				2			2				–
eimsbuettel	2						2	10		3	13
hvittingfoss							–				–
illinois							–	1		2	3
johannesburg							–				–
kentucky		1	1				2	2			2
kottbus	1						1				–
madelia							–				–
marina							–				–
minneapolis							–			7	7
minnesota	1						1	2			2
norwich							–				–
ohio							–			1	1
orion							–	1			1
pomona							–				–
poona							–				–
pullorum	5	1					6			1	1
rubislaw							–				–
siegburg							–	2		1	3
simsbury	1						1			1	1
singapore							–	1			1
taksony							–	2		1	3
thomasville							–	1			1
uganda							–				–
urbana							–			1	1
TOTAL	16	2	4	2	–	–	24	29	–	22	51
NOT TYPED*	–	–	–	–	–	–	–	1	–	6	7
TOTAL	**16**	**2**	**4**	**2**	**–**	**–**	**24**	**30**	**–**	**28**	**58**

*See Table V-B

TABLE IV – Continued

WILD ANIMALS AND BIRDS	REPTILES AND ENVIRONMENT	HUMAN DIETARY ITEMS						MISCELLANEOUS	TOTAL	CUMULATIVE TOTAL	SEROTYPE
		EGGS AND PRODUCTS	POULTRY	RED MEAT	DAIRY PRODUCTS	OTHER	SUBTOTAL				
							–		1	24	*alachua*
	1						–		1	1	*berlin*
							–		2	42	*binza*
							–		8	47	*california*
							–		1	91	*cerro*
2							–		2	5	*chameleon*
							–		2	4	*cholerae-suis*
							–		6	15	*drypool*
							–		2	19	*dublin*
		5					5		20	137	*eimsbuettel*
						1	1		1	1	*hvittingfoss*
							–		3	5	*illinois*
1							–		1	11	*johannesburg*
							–		4	68	*kentucky*
1							–		2	7	*kottbus*
	4						–		4	6	*madelia*
	1						–		1	3	*marina*
					2		2		9	11	*minneapolis*
							–	1	4	64	*minnesota*
	1						–		1	1	*norwich*
					1		1		2	3	*ohio*
							–		1	11	*orion*
1							–		1	5	*pomona*
	1						–		1	6	*poona*
							–		7	39	*pullorum*
	1						–		1	18	*rubislaw*
							–		3	29	*siegburg*
							–		2	7	*simsbury*
							–		1	1	*singapore*
							–		3	8	*taksony*
							–		1	40	*thomasville*
	1						–		1	1	*uganda*
	1						–		2	9	*urbana*
5	11	5	–	–	3	1	9	1	101	883	TOTAL
–	2	1	–	–	–	–	1	1	11	48	NOT TYPED*
5	**13**	**6**	**–**	**–**	**3**	**1**	**10**	**2**	**112**	**931**	**TOTAL**

TABLE V. SALMONELLAE REPORTED BY GROUP IDENTIFICATION ONLY, JUNE 1968

A. HUMAN SOURCES

REPORTING CENTER	GROUP															TOTAL
	B	C	C_1			C_2	D	G			M	O	UNK			
ARKANSAS	7						1						1			9
D.C.	7	1	1			1	5						1			16
IDAHO													1			1
INDIANA	2															2
IOWA													1			1
MICHIGAN	2						1									3
MISSISSIPPI	1					1										2
MONTANA	1															1
NEW HAMPSHIRE	8						7									15
NEW MEXICO	11		2			2		1					1			17
NEW YORK - A													29			29
NEW YORK - C	1															1
OREGON	2															2
TEXAS	1		1			1	2	1					11			17
TOTAL	43	1	4			5	16	2			–	–	45			116

B. NONHUMAN SOURCES

SOURCES	GROUP															TOTAL
	B	C	C_1			C_2	D	G			M	O	UNK			
DOMESTIC ANIMALS AND THEIR ENVIRONMENT																–
ANIMAL FEEDS											3	3	1			7
WILD ANIMALS AND BIRDS																–
REPTILES AND ENVIRONMENT	2															2
HUMAN DIETARY ITEMS	1															1
MISCELLANEOUS	1															1
TOTAL	4	–	–			–	–	–			3	3	1			11