FOOD-BORNE ILLNESS IN THE NAVY—ANALYSIS OF 243 OUTBREAKS

John S. Cook, Jr.

Lieutenant (MC) U. S. Navy, U. S. Naval Medical School
National Naval Medical Center, Bethesda, Maryland

A total of 243 outbreaks of possible food-borne illness reported in the Navy during the three-year period 1950-52 is analyzed. Although the number of outbreaks of streptococcal sore throat is small, the importance of these outbreaks and their sequelae is great.

Outbreaks of diarrheal disease reported to the Navy may be roughly separated into two groups, namely, those which are over within 24 hours and those which last longer, usually much longer.

The second group, afflicting predominantly individuals of ships in tropical areas or war zones, is not usually related to a particular meal but assumes a form statistically resembling a propagated epidemic. This group of illnesses—including shigellosis, salmonellosis, and "intestinal flu"—is being intensively studied by the Navy.

INTRODUCTION

Food-borne illness is a serious matter in the Navy. From the military or operational standpoint, outbreaks of food poisoning or dysentery may be crippling to a ship or fleet. There have been reports of ships unable to proceed to sea from a harbor; there was at least one ship which ran aground because of food-borne illness. When an outbreak of possible food-borne illness has occurred, it must be the subject of an investigation. The findings of the investigation are given in a "special epidemiological report," which is required after any outbreak, or unusual incidence, of disease. To give you a better understanding of this Navy problem, I will review the characteristics of these outbreaks of food-borne disease as shown by the reports.

Statistics compiled from reports of outbreaks do not lend themselves to exactly the same sort of treatment as do those from reports of individual cases. An analysis of case reports of diarrheal diseases in the Navy was made by Smiley and Raskin in 1945.1 They noted trends in case incidence and were able to show such things as the drop in admission rate for typhoid fever following compulsory vaccination in 1911-12. In a speech to this Association at Glenwood Springs, Colorado, 1951, Lieutenant Commander Fred E. Stewart compared the reporting of food-borne illness in epidemiological, or "outbreak," reports with that of individual case reports.2 This comparison showed that from 1946 to 1950 there was increasingly inclusive coverage by "outbreak" reporting.

Only outbreak reports are considered in the present study; no attempt is made to include trends which might be shown using case incidence data. An analysis of 243 outbreaks of food-borne illness reported within the Navy for the three-year period 1950-52 is made here somewhat similar to analyses of civilian outbreaks by the U. S. Public Health Service3,4 and others.

The reports of outbreaks received in the Bureau of Medicine and Surgery of the Navy vary in their completeness. Most of them contain a simple narrative of what happened, the investigation, the findings, and control measures taken. In 1953,6 directions for these "special epidemiological reports" were revised so that future reports may be suitable for very detailed analysis, including specific attack rates for various sectors of the population at risk. The reports sent in for the three-year period 1950-52 are not so specific but are quite satisfactory for certain kinds of analysis.

Miscellaneous Outbreaks of Food-Borne Disease

The number of outbreaks in the Navy, 1950-52, in four categories of food-borne illness is given below:

- Diarrheal disease: 236
- Food-borne sore throat: 7
- Poisoning by chemicals in food: 0
- Poisoning by food substance: 0
- Total: 243

Lieutenant Cook, A. B. (Univ. of N. C.), M. D. (Duke Univ.), plans a career in naval preventive medicine. He served six years in the hospital corps of the Navy during World War II, a clinical laboratory technician and malarologist. He concluded his enlistment by a year as warrant officer with Epidemiology Unit No. 47 at the Philadelphia Naval Hospital. He was elected to membership in Alpha Omega Alpha, honorary medical fraternity, in 1950. After medical school he completed a rotating internship at the U. S. Naval Hospital, Portsmouth, Virginia, and a 10-month course in epidemiology at the U. S. Naval Medical School. He has remained at the Naval Medical School on the epidemiology and tropical medicine staff since May 1952.

The striking thing about this number of outbreaks is not how many, but how few, outbreaks were reported. During the three-year period being considered, there were an average of over 1500 activities who make this type of report. The fact that we have 243 outbreaks from a total of 4,850 "ship-or-station years" may be stated: The chances are that any particular ship or station in the Navy will report one outbreak of possible food-borne illness every 20 years.

It is evident that diarrheal disease is the main category of food-borne illness. Sore throat is occasionally traced by epidemiological methods back to a particular food eaten at a particular meal, and in these cases it is certainly a food-borne illness. Diarrheal disease is thought of as food-borne.
unless proved otherwise; streptococcal sore throat is assumed to be spread in other ways than by food unless proved to be food-borne.

In order that absence of outbreaks of chemical food poisoning during 1950-52 might be better evaluated, a search of naval medical literature for the past ten years was made. Of 100 food-poisoning outbreaks analyzed in 1945,7 one was caused by a chemical, cadmium. Three outbreaks caused by cadmium were the subject of a report in 1941.8 Cadmium poisoning was reviewed in the Naval Medical Bulletin in 1944.9

No reports of mushroom or mussel poisoning was found for the past ten years; fish poisoning, as shown in table 1, is not so rare. In 1942 an outbreak occurred on Culebra Island in the Caribbean area.10 In 1944 there was an outbreak in the Marianas Islands.11 In 1945 two outbreaks occurred simultaneously on the island of Saipan.12 All these outbreaks were caused by barracuda or barracuda-like fish. In 1949 a very severe outbreak involving 57 people who had eaten an eel occurred on Saipan.13 Although no outbreaks were reported in the Navy for 1950-52, an outbreak involving 6 people who had eaten an eel occurred at Kwajalein in March 1953.14

**Food-borne streptococcal sore throat**

As shown in table 2, seven outbreaks of streptococcal sore throat were reported as food-borne for this three-year period, 1 in 1951 and 6 in 1952. A total of 708 were admitted to the sick list; the median outbreak had 52 admissions. The incubation period for three outbreaks was 2 or 3 days. Offending food was listed in only three outbreaks: turkey salad, shrimp salad, and reconstituted powdered milk. Previously (1944) a salad was reported as the vehicle for transmission of streptococcal sore throat.15 In 1945, reconstituted powdered milk was involved, and the same type Group A streptococcus was isolated from the throat and from an infected cut on the wrist of a man who regularly mixed powdered milk as was isolated from the throats of scarlet fever and sore throat patients.16 In the turkey salad outbreak, Group A Type 14 streptococcus was isolated from the patients and from the cook. In the shrimp salad outbreak, Group A Type 5 streptococcus was isolated from the patients and from a burn lesion on the cook's arm.

The remaining four outbreaks reported gave incomplete data. Since the vehicle, incubation period, and bacterial evidence is lacking, these must be considered as of doubtful food origin. However, the evidence is clear that some streptococcal outbreaks are food-borne; in other outbreaks the connection to food may have been present but missed.
### Table 2—Outbreaks of Food-Borne Streptococcal Sore Throat
U. S. Navy, 1950-1952

<table>
<thead>
<tr>
<th>Year</th>
<th>Vehicle</th>
<th>Cases admitted</th>
<th>Streptococcal type</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>Turkey salad</td>
<td>158</td>
<td>14</td>
<td>More than 24 hrs.</td>
</tr>
<tr>
<td>1952</td>
<td>Shrimp salad</td>
<td>52</td>
<td>5</td>
<td>More than 48 hrs.</td>
</tr>
<tr>
<td>1952</td>
<td>Reconstituted powdered milk</td>
<td>135</td>
<td></td>
<td>More than 24 hrs.</td>
</tr>
</tbody>
</table>

### Diarrheal Disease Outbreaks

**Organization of study.**

The remaining 236 outbreaks were described as food poisoning or infection, gastroenteritis, diarrhea, or dysentery. It is this group of illnesses that forms the main subject matter for this paper. The analysis covers all outbreaks reported to the Bureau of Medicine and Surgery of the Navy and is not limited to outbreaks affecting Navy and Marine Corps personnel. It is not limited to U. S. Military personnel, but includes outbreaks among other United Nations troops aboard U. S. vessels, civilian employees aboard ships or stations, and military personnel exposed ashore—in addition to outbreaks of Navy and Marine Corps personnel aboard ships or stations of the Naval establishment.

A report of an outbreak might consist of (1) a dispatch that an outbreak of gastroenteritis had occurred aboard with 52 cases and 7 admitted to the sick list; (2) a letter report giving elaborate details of the clinical, epidemiological, and bacteriological aspects of the outbreak; (3) a notation in a ship's annual report that an outbreak of diarrhea occurred during August of the past year; or (4) a notation from a preventive medicine activity that during the past month the activity had been called on to investigate an outbreak aboard the USS John Doe. In most instances the report consisted of a combination of several or all of these types of reports.

The following is a list of the data abstracted from each outbreak report and entered on 5x8 McBee punch cards.

1. Name of ship or station.
2. Geographical location.
3. Date first case(s) were seen.
4. Number of cases reporting for treatment.
5. Number of admissions to sick list.
7. Diagnosis given in describing outbreak.
8. Kind of food or other vehicle involved.
10. Incubation period before onset of first case.
11. Duration of outbreak in days from the onset of the first case until the onset of the last case.

### Number of Outbreaks of Diarrheal Disease Reported in the Navy for the Years 1950-52

**Noting Duration of Outbreak**

**Legend**

- This area equals one outbreak
- Outbreaks 2 days or more
- Duration unknown
- Outbreaks 1 day or less

---

**Figure 2**
The distribution of the 236 outbreaks of diarrheal disease by year of occurrence is shown in Figure 1. Of the 236 outbreaks reported, 68 occurred in 1950, 60 in 1951, and 108 in 1952. There is a definite increase in 1952 over the previous two years in number of outbreaks reported.

In Figure 2 the same outbreaks are divided into three types of activities reporting outbreaks. The 1952 increase is made up largely of increases in reported outbreaks from shore establishments and ships of the Military Sea Transportation Service. The MSTS ships, operated by civilian crews under Navy jurisdiction, are transports carrying United Nations troops and dependents; the nature of its function makes this group of ships particularly susceptible to outbreaks of diarrheal diseases.

In Figure 3 the outbreaks are divided by duration of outbreak. Those outbreaks in which all cases became ill within 24 hours are grouped as “one-day” outbreaks. In 1952 there is an increase both in one-day outbreaks and in outbreaks lasting 2 days or more. The much greater increase in one-day outbreaks probably indicates a result of improved reporting. One-day outbreaks were arbitrarily selected as the diagnosis of the outbreak.

Table 3—Average Number of Cases Per Outbreak Reported in the Navy by Year of Occurrence

<table>
<thead>
<tr>
<th>Year</th>
<th>Average cases admitted</th>
<th>Average cases seen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>96</td>
<td>23</td>
</tr>
<tr>
<td>1951</td>
<td>120</td>
<td>23</td>
</tr>
<tr>
<td>1952</td>
<td>106</td>
<td>13</td>
</tr>
</tbody>
</table>

Although the number of cases reporting for treatment and the number of cases admitted were both studied, no use is made of the data except for general analysis of size of outbreak. The average size of outbreak in each of the three years is shown in Table 3. The number admitted is probably the more reliable figure for comparison of the three years, and this average in 1952 is 13 as compared with 23 in each of the two previous years. The decrease in average size of outbreak may be caused by an increased reporting of small outbreaks, but there is insufficient evidence to make an assertion that this is true.

In the remainder of the paper, outbreaks are considered as units and the number of cases per outbreak is ignored. The graph space occupied per outbreak is shown on each figure.
day outbreaks total 116 and those greater than one day total 88. The duration of 82 outbreaks was not given.

Figure 3 shows the distribution of these two types of outbreaks among the diagnoses used in reporting the outbreak. It is striking that 91 of 101 outbreaks called food poisoning, food intoxication, or food infection are of the one-day variety. In 21 outbreaks of dysentery, on the other hand, 19 are of more than one day duration.

It would be expected that with the outbreaks of shorter duration the vehicle would be known in a greater number of cases. That this is true is shown in figure 4 comparing the duration of outbreaks of 111 in which the vehicle is known (on the left) with the duration of 93 outbreaks in which the vehicle is not known. In 98 of 116 one-day outbreaks the vehicle is known; in 75 of 98 outbreaks lasting more than one day the vehicle is not known.

A further breakdown of 148 outbreaks in which the geographical location is known is given in figure 5. In 46 of 48 outbreaks at shore sections in the continental United States the outbreaks are of the one-day type. In 41 of 52 outbreaks on ships in tropical areas or war zones, the outbreaks are of two or more days duration.

In summary, outbreaks diagnosed food poisoning, those with the vehicle known, and those occurring at shore stations in the continental United States are typically those with a duration of 24 hours or less. Outbreaks diagnosed dysentery, those with the vehicle not known, and those occurring on ships in tropical areas or war zones are typically those with a duration of more than one day.

In the 32 outbreaks in which the duration was not given, the etiology of none of the outbreaks was definitely established and the incubation period was not known. Not much is lost by dismissing these 32 outbreaks from the remainder of the discussion. This will enable us to analyze the bulk of the outbreaks in the two categories which have become apparent—those which lasted less or more than 24 hours.

One-day outbreaks.

Of 116 one-day outbreaks, the vehicle was known in 99. These 99 outbreaks are shown by vehicle of transmission in figure 6. Water and milk were involved in only 3 outbreaks each. The bulk of transmission was by foods other than milk. First on the list is pork, with ham accounting for 24 of 27 outbreaks. Next, poultry, with turkey responsible for 12 of 18 outbreaks. Other meats (not ground) come next with beef causing 13 of 15 outbreaks. Ground meat caused 11 outbreaks; commercially treated meat such as frankfurters and vienna sausage were vehicles in 5, meat loaf or stuffed pepper were vehicles in 6. Sea-food were vehicles in 5 outbreaks, of which lobster and shrimp account for 2 each. Desserts were responsible in 6 outbreaks, potato and macaroni salad in 5, and miscellaneous foods in 6.

Etiology was definitely established in about one-third, probable in a third, and undetermined in a third. The 34 outbreaks whose eti-
mology was definitely established are shown in figure 7. The 23 outbreaks caused by staphylococcus include 10 ham outbreaks, 5 poultry, 3 beef, 2 ground meat, and 1 each of lemon cream pie, macaroni salad, and left-over baked beans. Salmonella was isolated in one roast turkey outbreak. The two water outbreaks may be considered as one. River water was pumped into a ship's fresh water system through a cross connection and back into the shore fresh water supply. As a result outbreaks of gastroenteritis were reported from both the ship and shore station. The results of rectal cultures from patients follow:

Paracolon (similar to P. Providencia 29911) 2 cultures
Paracolon intermedius 6 cultures
Coliform intermedius 4 cultures
Proteus morganii 2 cultures
Alkaligenes 2 cultures

These two outbreaks were tabulated as of paracolon etiology, since no more definite pathogen could be demonstrated. Other “doubtful” pathogens isolated from outbreaks included 2 Paracolon, 4 E. coli, 1 Proteus, and 1 aerobic Gram-positive rod.

The incubation period was known in 83 of the 116 one-day outbreaks. Figure 8 shows the distribution of outbreaks by incubation period. Of 83 outbreaks, 49 had an incubation period of less than 7 hours and 80 had an incubation period less than 18 hours.

All outbreaks whose etiology was definitely established as staphylococcus had an incubation period less than 7 hours. As the incubation period becomes longer there is less chance of recovering the food, and if the food is not recovered it becomes impossible to “establish” an etiology of staphylococcus by our standards.

Outbreaks lasting more than one day.

Outbreaks lasting more than one day require a different sort of analysis.

The duration in days of all the outbreaks is shown in figure 9. On this scale the graph for the 116 one-day outbreaks would reach about six times as high as the column shown. You will notice that there are about 6 or 8 outbreaks in each category--2-day, 3-day, 4-day, 5-day, and so on--for outbreaks up to 8 days duration. Of 88 outbreaks lasting more than one day, 49 were over within 8 days and 55 were over in 10 days. On the other hand 14 outbreaks lasted 30 days or longer.

Of the 11 outbreaks whose etiology was definitely established as shigella, 9 are outbreaks of 12 or more days duration. Ten of the 11 were on USS ships; one was on an MSTS vessel. Seven were caused by S. flexneri 3, one by S. flexneri 2, one by S. flexneri 2a, and two by Shigella species undetermined. Of the 11 reports, seven described exposure of personnel ashore or to an affected ship, one mentioned food purchased ashore, and one listed contaminated milk as contributing causes of the outbreaks.

Caution is necessary to avoid the interpretation that shigella is the cause only of outbreaks lasting more than 10 days. There is a sampling error involved. An outbreak which lasts more than 10 days is more likely to be thoroughly investigated with all the bacteriological methods in our armamentarium,
than is an epidemic which is over in a week or less. So it would not be surprising if the same pattern of definitely identified shigellosis were found, even if all the outbreaks were caused by shigella.

Figure 9 also gives the duration of the six outbreaks whose etiology was definitely established as salmonella. You will note that 5 of the 6 outbreaks have a duration of a week or less. The incubation period for three of these is known; the outbreaks lasting 1, 7, and 5 days had incubation periods of 10, 30, and 50 hours respectively, as shown in table 4. The etiology of these three outbreaks was established as S. enteritidis in one outbreak and S. typhimurium in the other two. Roast turkey was the guilty food in two cases, meat balls and spaghetti in the third.

A two-day outbreak was attributed to Endamoeba coli after 5 of 6 stool specimens showed this parasite. No outbreak of amoebic dysentery caused by Entamoeba histolytica was reported.

For the large group in which the etiology was not specifically determined, a presumptive etiology was given in 27 outbreaks lasting 2 days or more. In 17 of the 27, clinical and epidemiological features of the disease suggested a virus as the probable cause of the outbreak.

Table 5 gives a summary of the typical differences between the one-day outbreaks and those lasting more than one day.

**DISCUSSION AND CONCLUSION**

More outbreaks were reported in 1952 than in 1950 or 1951. This is probably due to improved reporting as illustrated by one or both of the following points: (1) The average outbreak was smaller in 1952 than in the two preceding years. (2) A larger portion of 1952 outbreaks were of one-day duration as compared with preceding years. Either fact would provide a satisfactory explanation, since outbreaks of either small size or short duration would be more easily concealed and less likely to be reported when reporting is poor, and an increase in these types of outbreaks was reported in 1952.
duration of one day or less

Operation with Duration of more than one day

Typical diagnosis
Food poisoning

Dysentery

Typical relation to vehicle
Vehicle known

Vehicle not known

Typical location
Shore stations in continental U. S.

Ships in tropical areas or war zones

Typical etiology
Staphylococcus

Shigella

breaks would be expected as reporting improved.

Only 7 outbreaks of food-borne streptococcal sore throat were reported, but these averaged 100 admissions per outbreak. If we estimate the number of cases of rheumatic fever which can be expected to develop from these illnesses at an approximate figure of 3 percent, these 700 cases of sore throat would be followed by 21 cases of rheumatic fever. Each case of rheumatic fever causes considerable disability to the individual, often separation from the service, a pension, and consequent expense to the taxpayer. It is difficult to demonstrate when streptococcal sore throat is food-borne, and by rigid criteria only 2 or 3 of the 7 outbreaks would unquestionably be food-borne. However, since food-borne outbreaks of streptococcal sore throat could easily be missed, figures might be still higher for the cost of this disease.

The diarrheal disease outbreaks may be separated into two groups, those of less and those of more than 24 hours' duration. This separation is one of convenience, and allows us to recognize the large size of the second group in the Navy as compared with civilian outbreak reports. The first group is made up entirely of epidemics arising from a common source, while all epidemics propagated from person to person fall into the second group.

The first group includes all the staphylococcus outbreaks and is very similar to previously reported series of such outbreaks.

The second group of outbreaks, those lasting 2 days or more, were found more commonly aboard ship than at shore activities, with a slight predominance of ships in tropical areas or war zones. One explanation could be that an outbreak of anything is more likely to be recognized aboard a ship, especially a ship at sea, because the population is a closely-knit unit and it becomes easier to make epidemiological explanations for illnesses. At best this could account for only a small part of the difference between ships and shore stations, and we must conclude that there are definitely outbreaks arising from a common source, and the food involved is identified; others of longer duration appear to be propagated epidemics, at least to the extent that several meals would have to be implicated to include all the cases.

Salmonellosis is present in both the first and second groups of outbreaks, with duration of outbreak, for only a part of the difference between ships and shore stations, and we must conclude that there are definitely outbreaks arising from a common source, and the food involved is identified; others of longer duration appear to be propagated epidemics, at least to the extent that several meals would have to be implicated to include all the cases.

Table 5—Summary of Typical Differences Between Two Types of Outbreaks, U. S. Navy, 1950-1952

<table>
<thead>
<tr>
<th>Outbreaks with duration of one day or less</th>
<th>Operation with Duration of more than one day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical diagnosis</td>
<td>Typical diagnosis</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>Food poisoning</td>
</tr>
<tr>
<td>Typical relation to vehicle</td>
<td>Typical relation to vehicle</td>
</tr>
<tr>
<td>Vehicle known</td>
<td>Vehicle known</td>
</tr>
<tr>
<td>Typical location</td>
<td>Typical location</td>
</tr>
<tr>
<td>Shore stations in continental U. S.</td>
<td>Ships in tropical areas or war zones</td>
</tr>
<tr>
<td>Typical etiology</td>
<td>Typical etiology</td>
</tr>
<tr>
<td>Staphylococcus</td>
<td>Staphylococcus</td>
</tr>
<tr>
<td>Shigella</td>
<td>Shigella</td>
</tr>
</tbody>
</table>

Figure 7

Established etiology in 34 one-day outbreaks in which the vehicle was known.

Legend

- This area equals one outbreak
- Staphylococcus
- Salmonella
- Paracolon
- E. coli
- Proteus
- Gram-positive rod

Number of outbreaks
Shigellosis accounts for many of the outbreaks in the second group. The history of epidemics of bacillary dysentery and its effect on naval vessels has been described many times.\textsuperscript{17,20} The prevention of these outbreaks of shigellosis might well be called the number one preventive medicine problem of the Navy.

The second group contains a lot of "unknown" outbreaks which are described as of the virus type. These outbreaks, as well as those attributed to paracolons, proteus, and other bacteria not well established as pathogens, deserve further study. This is exactly what is being done in the Navy at present. Although the study is centered around shigellosis and its prevention, viruses and other possible pathogens are not being overlooked. Work is in progress to try to answer the fundamental question as to whether these diseases are food-borne or water-borne, or whether they are not actually transmitted in some other way by person-to-person contact.

**ACKNOWLEDGMENTS**

The appropriate filing of the outbreak reports was performed by the staff of the Preventive Medicine Division of the Bureau of Medicine and Surgery, Navy Department. Credit for the actual investigation and reporting of individual outbreaks must go to the medical department representatives on the many Navy ships and stations. It is this group of medical department personnel, also, whose supervision of sanitation has resulted in such a small number of outbreaks, one per ship-or-station per 20 years.

**REFERENCES**


**DISTRIBUTION OF 83 ONE-DAY OUTBREAKS BY INCUBATION PERIOD**

![Figure 8](http://meridian.allenpress.com/jfp/article-pdf/17/1/4/2394903/0022-2747-17_1_4.pdf)

Legend

- This area equals one outbreak

<table>
<thead>
<tr>
<th>Incubation period (hours)</th>
<th>Number of outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>11</td>
</tr>
<tr>
<td>1-2.9</td>
<td>18</td>
</tr>
<tr>
<td>3-4.9</td>
<td>19</td>
</tr>
<tr>
<td>5-6.9</td>
<td>13</td>
</tr>
<tr>
<td>7-8.9</td>
<td>10</td>
</tr>
<tr>
<td>9-10.9</td>
<td>12</td>
</tr>
<tr>
<td>11-12.9</td>
<td>11</td>
</tr>
<tr>
<td>13-14.9</td>
<td>10</td>
</tr>
<tr>
<td>15-16.9</td>
<td>8</td>
</tr>
<tr>
<td>17-18.9</td>
<td>11</td>
</tr>
</tbody>
</table>

**NUMBER OF OUTBREAKS**

<table>
<thead>
<tr>
<th>Number of outbreaks</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-9</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2.9</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4.9</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-6.9</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-8.9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-10.9</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-12.9</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-14.9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-16.9</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-18.9</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8
**DISTRIBUTION OF 116 ONE-DAY OUTBREAKS AND 88 OUTBREAKS LASTING MORE THAN ONE DAY, BY DURATION OF OUTBREAK.**

**Legend**
- This area equals one outbreak
- Shigella
- Salmonella
- Amoeba
- Paracolon
- E. Coli
- Proteus
- Gram positive rod
- Etiology not definitely established

**Figure 9**

Duration of outbreak (days)


**NEW BRUCELLOSIS CONTROL LAW IN ILLINOIS**

On July 1, 1955, all shipments of milk to Illinois markets must come from herds that have been tested for brucellosis. Two plans are available, covering calfhood vaccination or slaughter. After July 1, 1957, new additions to a herd must be tested for brucellosis, and after that date, all milk whether graded or not, must come from herds under one of the two plans. Calfhood vaccination is free for both beef and dairy herds as long as the state funds hold out.

**NOTICE**

All members are urged to consider nominations for the $1000.00 Sanitarians Award. Please send with supporting evidence as soon as possible to:

H. L. Thomasson, Executive Secretary
P.O. Box 437
Shelbyville, Indiana

Deadline May 15, 1954

Information on the rules and procedure available from the Executive Secretary or:

Harold J. Barnum, Chairman
Committee on Recognition and Awards, Denver Department of Health and Hospitals, Denver, Colorado.