FOOD INFECTIONS IN PORTO RICO

A BACTERIOLOGICAL AND EPIDEMIOLOGICAL STUDY OF THREE OUTBREAKS.

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The old term "food poisoning" as applied to pathologic conditions following the ingestion of food is being slowly discarded. It is the general tendency among scientific workers to divide these disorders into two large groups.

1. *Food infections*, or those conditions which result directly from the action of pathogenic micro-organisms present in food.

2. *Food intoxications*, or those conditions which result from the action of bacterial toxins or other poisonous products present in foodstuffs. Botulism, mushroom poisoning, and grain intoxications fall in this category.

No reliable statistics as regards mortality or morbidity in Porto Rico from food poisoning [1] can be obtained, notwithstanding the fact that the condition is a reportable disease here. From 1923 to 1927 only five deaths attributed to food poisoning are recorded. Nevertheless reports of large outbreaks of food poisoning, especially in the city of San Juan, are frequently seen in the newspapers.

In connection with a study of dysentery and "diarrhea and enteritis" being carried on at the School of Tropical Medicine, we have studied bacteriologically and epidemiologically several outbreaks of food infections. Since there is no previous available record of investigations on the etiology of the frequent instances of food poisoning in Porto Rico, we thought it might be of value to publish the data collected.

FIRST OUTBREAK

During the month of November 1927 the first case (No. 32) in the present series came to our hands. The patient was a white man, a laborer, 28 years old, healthy and well up to November 27. That afternoon he ate supper at a friend's home. The meal consisted of lobster and coffee, the lobster being prepared the previous day and kept at room temperature until it was consumed. Twelve hours

[1] It is under this heading that morbidity and mortality records are tabulated in the Bureau of Vital Statistics of the Department of Health.

after partaking of this meal the patient was seized with violent abdominal cramps, so intense that he could not touch the abdomen or even stand a hot water bag over it. Soon diarrhea appeared, the stool being liquid, accompanied by tenesmus and pain. There was very slight fever, 37.6°C, during the attack. In two days the patient had entirely recovered.

The stool was liquid with considerable mucus and specks of blood. Large amounts of thread-like material resembling bits of intestinal mucous membrane were noticed. The stools were very foul. Microscopic examination revealed large numbers of neutrophilic polynuclears leucocytes, many intact red blood corpuscles, and enormous numbers of epithelial cells, single and in large groups, of columnar and stratified squamous types. No ova or parasites of any kind were found. Bacteriologic examination revealed *Salmonella suipestifer* (*B. cholera suis*) as proven by morphological characteristics, cultural reactions, agglutination tests, and absorption tests with immune serum produced with the isolated organisms. The blood of the patient agglutinated *Salmonella suipestifer* [2] in dilutions of 1:150 and *Salmonella enteritidis* only in dilutions as high as 1:50.

It was impossible to get a sample of the lobster for examination and all data available was obtained through the patient since the other people affected refused to be examined or to answer questions. There where three persons besides the patient present at the meal and all showed the following symptoms:

One developed abdominal pain and diarrhea twenty hours after the meal. There was no blood or mucus in the stool.

Another developed slight pain, nausea and diarrhea thirty hours later.

The third had mild pains in abdomen, slight diarrhea, and weakness. Symptoms appeared 12 hours later but lasted only a few hours

SECOND OUTBREAKS

The second group of cases came under our observation during April 1928. A dinner party was held at one of the San Juan Clubs. There were eight persons present but other people at the Club were served the same food with the exception of one or two items. Next day, that is, about 18–20 hours after the dinner four of those present at the party were taken sick. The symptoms were more or less alike though differing in severity. The patients first noticed malaise,

[2] Stock culture obtained through the courtesy of Dr. John Reichel of H. K. Mulford Co.

slight headache and weakness. Soon there was griping and diarrhea which was the most pronounced symptom. The stools were frequent, liquid, foul and contained no blood, but slight bits of mucus, large numbers of polynuclear neutrophiles and abundant epithelial cells. The stools from all four cases (Nos. 23, 24, 25 and 26) were examined bacteriologically immediately after passage. Agglutination reactions of the blood of these patients with organisms of the Salmonella group were made. The bacteriological examination for three of the stools revealed the presence of *Salmonella enteritidis* as confirmed by morphological characteristics, cultural reactions, agglutination and absorption tests. In No. 26 no organisms of the *Salmonella* group could be detected in spite of repeated trials.

A complete epidemiological study was not made. It was impossible to obtain any of the foods for examination as knowledge of the outbreak reached us four days after onset. However, the stools from all the help employed at the club were examined bacteriologically. No carrier of *S. enteritidis* or other allied organism was found in the stools of persons examined. These stools were also examined fresh, that is, within an hour after passage.

Table Showing Results of Agglutination Tests and Bacteriological Examination of Feces. (Outbreak No. 2).

Case No.	Enteritidis	Suipestifer	Paratyphoid A	Paratyphoid B	Organism isolated from feces
23	—	—	—	—	S enteritides. E. Coli-staphylococcus albus.
24	++	+	—	+ —	S. enteritidis. B. Subtilis E. Coli.
25	+ —	—	—	—	S Enteritis. E. Coli.
26	—	—	—	—	E. Coli.

Legend:

\+ positive reaction.

$+ \left\{ \begin{matrix} + \\ \\ - \end{matrix} \right\}$ — very slight agglutination.

— = negative results.

THIRD OUTBREAK

The third group of cases resulted from the eating of fish in San Juan. There were rea'ly two outbreaks, the first in March, 1928, the second in May of the same year, but since the source of infection

was the same, the two are considered together. In the earlier group (March) there were altogether 25 cases, divided among five families. Two small dogs belonging to one of the families also ate fish and died with symptoms of food poisoning. The fish eaten by all these five families was traced to one and the same source. Some of the original lot of fish was obtained for bacteriological examination. *Bacillus proteus vulgaris, escherichia coli, alcaliginis fecalis* and an organism belonging to the *Salmonella* group were isolated. Agglutination and absorption tests with the unidentified salmonella organism proved it to be *Salmonella enteritidis.*

The second group of cases was seen during the early part of May 1928 in the City of San Juan. All the cases were in people who ate regularly at the same place. A small restaurant having 45 customers, including the help, served fish, and out of the 45, 29 were taken sick, 13 remained well, and 3 could not be traced. The fish came from the same source as in the March outbreak. No sample of the fish could be obtained since all had been consumed, but a sample of a new lot was secured and examined bacteriologically. From this the following organisms were isolated:

E. Coli
Staphylococccus albus
C. Welchii
Monilia psilosis [3]

No feces could be obtained from any of the patients in this last group but blood was later obtained for agglutination tests from ten of the cases. The accompanying table shows the results of the examination.

TABLE 2

No. of cases	S Enteritidis	S. Sulpestifer	Paratyphoid A.	Paratyphoid B.
3	++	—	—	—
1	++	+ —	—	—
1	—	+ —	+	—
5	—	—	—	—

As the table shows, 50 per cent of the cases examined showed agglutinins for *B. enteritidis* or some organism of the Salmonella group.

[3] Studied and identified as such by Dr. B. K. Ashford.

The *symptoms* following the ingestion of fish were alike in both groups. About two to twenty hours after the ingestion of the fish the patient would notice a feeling of distress in the epigastrium, slight malaise and headache, chilliness, or at times a violent abdominal pain followed by griping and diarrhea. Later there was a feeling of thirst and intense weakness. There was very little fever. The weakness wou'd persist for quite a long time. It was common to observe pain in the back, knees and other joints of the body. None of the patients noticed blood in the stools. The bowel movements varied from 3 to 30 in 24 hours.

Nothing that in both groups of cases the food responsible for the attacks was fish coming from the same place a thorough study of conditions was made. This revealed several important facts.

1. The fish were handled at a single central depot but the source of supply varied. Among the sources was the mouth of a river into which drained the city wastes.

2. The fish were placed in a small house which was called 'Collecting Station'' and from here distributed. This station was proof against neither rats nor insects. About ten meters from this station stood a latrine in very bad condition.

3. Fish when not sold at once were placed in ice boxes, which were very poorly constructed and quite unsuited to the purpose.

4. Twice weekly fish from ice box were sent to San Juan, a distance of 50 kms., without refrigeration.

The feces of all persons having to do with the handling of the fish was examined bacteriologically in an attempt to discover a possible carrier and the blood was tested for agglutinins to organisms of the sa'monella group, but no positive results were obtained. Since the improvement of conditions at the central station no more cases have been reported.

Five samples of fish were obtained from the main source and subjected to bacteriological examination.

a. Live fish before they were sent to collecting station.
Negative results.

b. Fish from collecting station.
Escherichia coli
B. subtilis
Micrococcus aurantiacum.

c. Dead fish before they were sent to collecting station.
One sample revealed *B. pseudo tetanicus.*
Two samples showed negative results.

DISCUSSION

The commoner causative agents of food infections are organisms belonging to the Salmonella group. This group comprises a large number of organisms all of which are not pathogens for man. Among those that have been proven to cause food infections we have *Salmonella enteritidis*, *Salmonella paratyphi* (Aertrycke type), *Salmonella suipestifer* (B. Cholera suis), and *Salmonella pestis caviae*. The way in which the food can become infected with these organisms varies. In the case of meat, the animal itself (cow, hog, etc.) may have been infected, or the food can become infected through contact with human carriers, convalescents of the disease, or individuals suffering from the disease.

In our cases there are certain points which deserve discussion. The etiologic agent in all the cases was an organism belonging to the Salmonella group. The mode of contamination of the food is unknown. In the first outbreak, where the lobster was the causative agent there are several possibilities. It may have been infected by a carrier prior to cooking or after, it may have been contaminated by handling. There is also the possibility of an animal carrier, that is, contact with a rodent carrier of the offending organisms.

In the second group the contamination might have taken place within the eating place, or outside of it. If within the place, the only possibility, as mentioned before, is an animal carrier, rats for example since examination of the feces of all the employees handling the food revealed no carrier. As large amounts of food came from without it is possible that some articles might have been contaminated before they reached the place.

In the third outbreak we are reasonably certain that the fish was already contaminated when it left the ice box. The fish was probably contaminated on unloading it from the boats or during subsequent handling, or from contaminated water where the fish were caught. The appearance of the foodstuffs in all three instances was normal as to color, odor, or taste. These outbreaks of food infection do not exhibit any difference whatever from outbreaks described elsewhere, either in their etiology, symptomatology or epidemiology.

SUMMARY

The results of bacteriologic and epidemiologic studies of three outbreaks of food infections at San Juan are here presented.

In all instances an organism belonging to the *Salmonella* group (S. suipestifer or S. enteritidis) was isolated, either from the stools of the patient or from the offending food. The etiology, mode of

action, symptoms and epidemiology of intestinal infections caused by this group of organisms in Porto Rico follows the same general rules observed in other places, that is, the condition does not present any special noteworthy manifestations characteristic of this tropical region.

All details of technique in the various examinations have been purposely omitted in this paper.

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