The gastrointestinal outbreak at the Glenwood Springs Convention was apparently caused by the consumption of contaminated fricasse turkey served at the noonday meal on September 27, 1951.

Ninety-three persons became ill with severe abdominal cramps, frequent explosive diarrhea and gaseous distention of the abdomen. The onset of illness varied from 8 to 18 hours. Laboratory findings from the fringed meat served showed the turkey specimen harbored excessive numbers of the parasacol group.

The frequency of food poisoning cases at public or other gatherings constitutes a challenge to the sanitarian and public health official, not only to determine the cause of these unfortunate experiences, but to prevent occurrences of this character.

The convention of the International Association of Milk and Food Sanitarians at Glenwood Springs, Colorado, was no exception. Here some 350 delegates and guests were gathered to discuss and promote the welfare of the various industries represented. Those present on this occasion comprised a notable list of persons from 35 states and territories. As commented by Homer Calver: "A precise demonstration of how food poisoning works" became an uninvited part of the program.

Epidemiology

Preliminary observations made by Dr. Harry A. Sauberli indicated that the possible cause of the gastroenteritis outbreak began at the noonday meal served at the Convention Hotel on Thursday, September 27, 1951. For brief designation, this will be called the Inquiry Meal. In order to establish the likely source of infection and persons involved, the following questionnaire accompanied by a letter of explanation was submitted to about 350 guests.

Many persons attending this meal became ill during the following night.

Results From The Questionnaire

Of the 350 questionnaires submitted, approximately 80 percent were answered. An analysis of these replies showed the following:

Ate the Inquiry Meal, which included a turkey dish called "chicken" by some, noonday, at the Convention Hotel, Thursday, September 27........155
Persons made ill..................93
Persons not sick..................52
Persons who ate the noonday meal, no turkey, not ill........10
Individuals who ate elsewhere, not ill......................68
Delegates who arrived and left before September 27th, or arrived after September 27th, not ill....................28
Lady guests attending a noonday lunch at Aspen, September 27, not ill........................28
Miscellaneous persons who were ill but did not eat Inquiry Meal..............11

The people classified in the last item of miscellaneous persons ascribed their illnesses to various causes. One implicated swimming; another became ill two days later, enroute home. Two people, man and wife, suspected that the "change of water" caused slight dysentery. Another sickened on September 25th. One had cramps "one hour". Another lady became quite ill, but had not eaten the Inquiry Meal. Three other persons did not give specific details.

Illness Among The Kitchen Help

One of the delegates made the following statement in reply to a written personal inquiry: "The information came in a casual way while at breakfast when one of the persons at the table mentioned the fact that he was ill during the night. The waitress serving at this table overheard the conversation and remarked that nearly all the kitchen help were also ill during the night. She was then asked if the help had some of the buffalo meat served the previous evening and she replied that the leftover turkey or chicken from lunch (September 27th) was served to the employees for dinner.

Similar statements were obtained later through interviews with several persons who worked in the kitchen during the convention. One of the male cooks employed in the kitchen definitely ascribed their illnesses to various causes. One implicated swimming; another became ill two days later, enroute home. Two people, man and wife, suspected that the "change of water" caused slight dysentery. Another sickened on September 25th. One had cramps "one hour". Another lady became quite ill, but had not eaten the Inquiry Meal. Three other persons did not give specific details.

The kitchen help were also ill during the night. She was then asked if the help had some of the buffalo meat served the previous evening and she replied that the leftover turkey or chicken from lunch (September 27th) was served to the employees for dinner.

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and his wife refused to eat it and they were not ill. However, he said that other help who ate the turkey became sick.

These observations reported by the cook would account for the apparent absence of illness among those persons who ate the Inquiry Meal early, as against those who came late to it. The evidence tends to show that the stock turkey was contaminated when diced and that the noodle sauce added without subsequent cooking permitted rapid multiplication of gas-producing organisms in the fricasseed turkey when placed on the steam tables.

**Incubation Period**

The incubation period in the persons made ill ranged from 8 to 18 hours following the Inquiry Meal. Since the meal was served from 12 to 2 P.M., a slight variation in the time could be accounted for, depending on the actual time the meal was consumed. Apparently the majority of the victims became ill shortly before or after midnight following the midday repast. In staphylococcus toxin intoxication, the onset of illness is usually from 2 to 4 hours after exposure; hence the longer incubation period would suggest some other type of infection.

**Symptoms**

Many affected persons reported severe abdominal cramps, explosive diarrhea, sharp stomach pains, and gaseous distension of the abdomen. In exceptional instances there was slight nausea, headache, and dizziness during the diarrhea bouts. One man reported he went to the toilet 13 times during the 30 hours illness. His symptoms began at 3 A.M. on the 25th of September. Another person had two helpings of the turkey fricassee. He had "extreme diarrhea, chills, fever, and was sick 8 days—onset began at 3 A.M. on the 28th." Generally speaking there was no real vomiting aside from occasional nausea, such as might be expected in staphylococcus toxin poisoning.

The duration of illness varied from 2 to 12 hours or longer. Some cases lasted 2 days or more, but the majority less than 24 hours. Those who ate of the turkey dish "sparingly" report slight attacks in contrast to those who ate "heavily" and experienced reactions.

**Boquets and Brickbats**

Those answering the questionnaires were helpful in supplying interpretative comments. Numbers expressed great interest in the methods and results of the investigation. Eight quotations indicative of the types of comments have been selected for presentation here.

"I was sorry to hear about this outbreak and sincerely hope no one thinks evil of your state. The Colorado Committee worked hard for the Convention's success and seeing each one had a fine time."

"Rather a sad commentary to a group of international food sanitarians."

"In our party of four we had one total abstainer from alcoholic beverages, one very light 'indulger' and two heavier drinkers (not to excess). The 'teetotaler' and the light drinker both had fairly violent attacks of diarrhea during the night of September 27th; of the other two, one had no reaction and the other only a slight attack nearly 24 hours later. All ate approximately the same articles of food." (Comment by the author: Persons who drink heavily may eat less, or the alcoholic content could have retarded development of the organisms, depending on the quantity and concentration.)

"I thought at the time that the water was at fault in causing the dysentery, but later concluded the turkey was perhaps the source of trouble."

"The epidemiology would seem to me to indicate a Salmonella or dysentery type of thing."

"Noticed underhand hard contamination of dishes by food service personnel at all times."

"I am sure it was the noon dinner Thursday, September 27th. My three roommates went fishing and missed the dinner Thursday, but arrived for the buffalo supper. I ate the noonday meal and was the only sick person in the room." "I am pleased that your department has taken a keen interest in following up this food illness. There is much to be done by health departments in getting a better understanding in the underlying cause of gastroenteritis resulting from eating man-contaminated foods. It appears that more emphasis needs to be placed upon sanitary methods of preparing, processing, and serving as well as storing foods."

As requests for reference copies of the questionnaire were received from various persons, a mimeographed supply has been prepared for distribution.

**Laboratory Findings**

**Glenwood Springs Water Supply**

Since several persons attending the Convention suspected an impure municipal water supply, the records in the Colorado State Department of Public Health Laboratories were checked for the bacteriological results during the year 1951. There were 33 samples of water submitted from the municipal supply of Glenwood Springs during 1951 for purity examinations. Of this number 6 were reported "unsafe," because of coliform organisms, according to standard methods of water examination. Fourteen of the 33 samples, however, showed slow lactose fermenters which did not ferment in brilliant green. These 14 samples are classified as follows:

- 7 samples showed gas in 1 of 5-10 cc portions
- 2 samples showed gas in 3 of 5-10 cc portions
- 3 samples showed gas in 4 of 5-10 cc portions
- 2 samples showed gas in 5 of 5-10 cc portions

**Glenwood Springs**

Glenwood Springs used unfiltered water from two natural streams, No Name Creek and Grizzly Creek. The installation of an adequate filtration plant has been repeatedly recommended by the Colorado State Department of Public Health. At times of freshets or the spring runoff, the supply may be turbid, carrying considerable organic matter consisting of leaves and other trash, and cause an unpleasant taste, especially during periods of high chlorination. The water is collected in a series of two storage tanks. The city has provided a system of chlorination which operates more or less continuously—possibly varying in strength, depending on the acceptance or complaints of the local citizens. The Convention Hotel uses the municipal water supply of Glenwood Springs.

According to U.S. Weather Bureau reports there were no storms of any consequence at Glenwood Springs during the convention period that would have affected the quality of the town supply. It was reported, however, that a snowstorm occurred the previous week.

As an impure city water supply could be reflected in the health of
the citizens, an inquiry was sent to Robert R. Livingston, M.D., local Health Officer of Glenwood Springs, who replied as follows.

"In checking back on my records I do not find any undue evidence of gastrointestinal upsets at the time you mentioned. Because of the possibility that I might have issued telephone prescriptions without seeing the patient I also had the drugstores check their prescription files with essentially the same results."

**Food Specimens**

On the morning of Tuesday, October 2, 1951, five samples of food remnants were delivered to the author in person by the chief food sanitarian of the State Department of Public Health. This material was collected on the previous Friday, September 28th, from the refrigerator in the Convention Hotel. The samples were kept under refrigeration until delivery to the laboratory. The first 4 samples were collected in sterile glass containers, but the turkey specimen was wrapped in waxed paper. In the selection of material from the turkey, both light and dark portions were removed aseptically from the inside.

**Laboratory Technique and Bacteriological Results**

The technique used by the author was as follows:

One gram portions of each sample were weighed into sterile mortars diluted with 9 cc sterile saline, triturated, and diluted in multiples of ten, to one to ten-millionth of a gram. From each dilution 1 cc portions were seeded into lactose broth, also planted on nutrient agar. The cultures were incubated at 37°C for 48 hours, then at room temperature 2 days before final counting. The results were:

<table>
<thead>
<tr>
<th>Specimen Number and Kind</th>
<th>Total Count Per Gram</th>
<th>Gas in Lactose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1361-Ground raw buffalo meat</td>
<td>620,000,000</td>
<td>1-10,000,000</td>
</tr>
<tr>
<td>1362-Cooked buffalo burgers and gravy</td>
<td>90 spore bearing colonies</td>
<td>No gas 1-10</td>
</tr>
<tr>
<td>1363-Potato salad, freshly prepared</td>
<td>4,300,000</td>
<td>1,000</td>
</tr>
<tr>
<td>1364-Home made salad dressing</td>
<td>No growth 1-10</td>
<td>No gas</td>
</tr>
<tr>
<td>1365-Large portions two cooked turkeys, breast and bony carcass</td>
<td>Est. 10,000,000,000</td>
<td>1-10,000,000</td>
</tr>
</tbody>
</table>

Four cultures were incubated at 37°C for 48 hours, then at room temperature 2 days before final counting. The results were:

- A highly selective medium used for the isolation of *Shigella* and *Salmonella* organisms.

No. 1361—Ground raw buffalo meat showed rather a high bacterial content including gas producers, probably greater than in miscellaneous samples of market hamburger examined in past years by the author. Due to the length of time intervening between collection and delivery, considerable multiplication of the initial organisms doubtless occurred.

The buffalo meat came from a Wyoming herd. One animal was slaughtered at a Denver packing plant under supervision of a Denver City Veterinarian on September 18, 1951, and held in the cooler 38 hours. On September 20th, the 600 pound carcass was trucked to Glenwood Springs; delivered to the Convention Hotel butcher and placed under refrigeration one week prior to serving.

No. 1362—The specimen of the cooked buffalo burgers and gravy was practically sterile except for development of a few heat-resistant spore bearing organisms.

It is estimated at least 400 persons ate one or more of the 3 kinds of barbeque buffalo dinner (stew, roast or barbeque) served by the Convention Hotel during the evening of September 27th; some were guests of the hotel, others residing elsewhere. Of the 52 persons who ate the *Inquiry Meal* at noon on the 27th, and were not ill, 44 of these guests ate the buffalo evening meal and escaped infection. In addition to these, 87 other persons reported eating the buffalo products without subsequent illness.

No. 1363—Freshly prepared potato salad on September 27th. Since food poisoning cases have been previously reported from contaminated potato salad, suspicion was directed toward this item on the menu. The comparatively low bacterial content, including that of the gas producers, tended to eliminate this item as a major factor in causing the illness. Doubtless the bacterial count was much less at the time of serving 5 days prior to examination.

Further analysis of questionnaire reports showed that 36 of the 52 persons eating the *Inquiry Meal*, who did not become ill, also ate the potato salad served during the evening buffalo barbeque without ill effects.

Likewise 19 of the 28 persons attending the Aspen luncheon on September 27th ate potato salad during the evening barbeque meal and remained well.

No. 1364—The high acidity of the homemade salad-dressing doubtless accounted for the failure of organisms to develop from this product.

No. 1365—The writer has scarcely recovered from the shock received at the time of attempting to count the number of colonies (Quebec Colony Counter) after 4 days de-
GASTROENTERITIS OUTBREAK

In June 1966, a gastrointestinal outbreak occurred in Quebec City, which was traced to the Convention Hotel. The outbreak involved more than 200 guests and was characterized by a high incidence of nausea, vomiting, and diarrhea. The illness was caused by a strain of salmonella that was identified in a frozen turkey specimen.

Detailed History of the Incriminated Fricassee

The Convention Hotel purchased eight frozen turkeys from a local supplier in Modesto, California. These turkeys were cooked in a large steam kettle and served in a portable steam table on September 25th. The cooked turkey was served cold, but it was reheated overnight before being served the following day.

Opinions and Literature

The head chef stated that the turkey was properly cooled in cold water for about one hour before being served. However, it is possible that the turkey was not properly cooled, as heat can drop rapidly in cold food or barely refrigerated foods. The chef also stated that the gravy and noodle mixture was heated and poured over the diced turkey about 10:30 A.M., which could account for the occurrence of the illness.

Further Review of the Scientific Literature

Under ordinary circumstances, the paracolon group of organisms are considered non-pathogenic; however, there is some question as to their role in certain gastrointestinal disturbances, especially when consumed in large numbers. Edwards of the Enteric Bacteriology Laboratories, in reporting the aerogenes-like paracolon V.P. from the turkey specimen (No. 1365), commented:

"It was not meant to infer in the report made on these organisms that they were not the cause of the food infection. What was meant was merely that these organisms are not well understood and have not been definitely incriminated as a cause of food poisoning. When they were present in the meat in the numbers which you indicate, they certainly would cause trouble if they have any pathogenic properties whatsoever. I am in agreement with you that the action of the organisms of the enteric group is dependent largely upon dosage. Certainly the dosage was high enough in this instance."

A more complete review of the scientific opinions and literature is presented in the following section of this paper:

A personal communication from Dunlop 4 says:

"The pathogenicity of paracolons still remains in some doubt, although certain types are becoming recognized as possible etiological agents in gastroenteritis."

In her studies on paracolon bacilli, Mushin 9 comments as follows:

"A review of literature shows that when cases of gastroenteritis could not be traced to known pathogens of Salmonella and Shigella groups, various other types of bacteria came under suspicion. One of the groups of organisms to attract attention were the paracolon bacilli."

"In the course of this study it became apparent that a number of paracolon strains exhibited variations in their cultural characters, biochemical reactions and antigenic structure."

"The results establish that some strains are undoubted human pathogens and others have the ability to establish themselves in the intestinal tract without manifesting clinical symptoms."

Mushin further cites:

"An investigation of gastroenteritis occurring in a Royal Australian Air Force (R.A.A.F.) Camp in Victoria showed that paracolon bacilli were isolated from stools of patients with greater frequency than other recognized pathogens."

She concludes by saying:

"The results of our studies on the role of paracolon bacilli in intestinal flora point to some strains as etiological agents."

Following a turkey dinner served to students and faculty members and their families, Hart 6, Director, Bureau of Preventable Diseases, State of Connecticut, Department of Health, reports an outbreak of gastroenteritis in a boarding school as follows:

After an incubation period of 7 to 18 hours 19 students reported to the infirmary with abdominal pain and diarrhea. The investigation made by Dr. M. E. Ridge disclosed that approximately one-half of those partaking of the dinner were acutely ill. The turkey had been cooked the day before serving, refrigerated over night, but kept at room temperature several hours after slicing. An organism of the paracolon group was isolated from the leftover turkey meat.

In their studies on paracolon organisms, Barnes and Cherry 1 observed a relatively mild outbreak of diarrhea occurring among 52 patients in certain wards of the United States Naval Hospital.

The chief symptoms were abdominal cramps, nausea and vomiting. The incubation period averaged 12 hours after eating leftover corn pudding, the suspected but not proved article of diet. Rectal swabs from a number of patients revealed a group of biochemically and serologically related organisms of the paracolon group.

Stuart et al. 4 say:

"The question of the pathogenicity of coliform organisms has received considerable comment in recent literature and several outbreaks of gastroenteritis have been attributed to normal or aberrant types. Proof of pathogenicity is difficult to obtain because of the lack of susceptible animals. Our opinion, after nearly four years work in this field, is that paracolon organisms can cause a mild or acute gastroenteritis of short duration."

Rhodes 16 reports:

"A small outbreak of diarrhea which involved five patients in a mental hospital. An organism showing the characters of the paracolon bacillus was isolated from all of these cases. Agglutinins to the organism were present to significant titres in the sera of all patients, suggesting that this race of the paracolon bacillus was the etiological agent in this outbreak."

Brandly 2 states among other things, that of 232 outbreaks of food poisoning, other than botulism and chemical food poisoning, reported as occurring in 1945 by the U. S. Public Health Service, 47 were associated with poultry meat products, or approximately 20 percent.

Organisms of the paracolon group, as well as Salmonellae, are frequently found in diseased poultry, including turkeys, by the United States Bureau of Animal Industry laboratories. In past years, while in the Bureau service, the author has recovered many strains of these types in flocks. In some cases it was believed paracolon bacilli were the causative agent in the death of the birds.

In view of the cooking process, it is believed unlikely the causative organism in the present epidemic was originally present in the turkeys.

**Gastroenteritis Outbreak**

**Summary and Conclusions**

Of the 155 persons who ate the noonday meal on September 27th, 1951, at the Convention Hotel, Glenwood Springs, Colorado, 93 became ill with gastroenteritis following eating fricassee turkey.

The incubation period ranged from 8 to 18 hours, and the duration of illness from 2 to 12 hours or longer. Persons who became ill complained chiefly of severe abdominal cramps, frequent explosive diarrhea, sharp stomach pains, and gaseous distension of the abdomen.

The water supply of Glenwood Springs shows occasional unsafe samples, and could be much improved by filtration and adequate chlorination.

Remnants of food samples, especially the turkey, collected after the noonday meal, developed excessively large numbers of gas-producing organisms belonging to the colon-paracolon group. The weight of evidence would indicate the fricassee of turkey was the guilty agent responsible for the gastrointestinal outbreak.

The contamination of the turkey dish doubtless followed the cooking process the day before serving. Immersion of the hot, whole turkey carcasses into cold water of doubtful purity was considered one source of infection with paracolon bacilli. Further contamination of the turkey meat could have occurred during the dicing and preparation with sauce the day of serving. Apparently the diced cold turkey, covered with hot sauce, was not adequately cooked before placing on the steam table. Additional rapid multiplication of bacteria in the turkey dish must have occurred on the steam tables during the 2-hour noonday serving period, as those who ate early seemed to have escaped infection, while the guests who came late to dinner became ill.

A review of available literature and medical opinion indicates the paracolon group of organisms may be responsible for the occurrence of gastrointestinal outbreaks under certain circumstances, although not normally considered pathogenic. Excessive number of paracolon bacilli in a perishable food product is a factor to be considered in such instances.
GASTROENTERITIS OUTBREAK

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>Control (Counts per ml)</th>
<th>Tyrothricin 5.0 mg/ml</th>
<th>Tyrothricin 1.0 mg/ml</th>
<th>Tyrothricin 0.1 mg/ml</th>
</tr>
</thead>
<tbody>
<tr>
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<td>48</td>
<td>1,850,000</td>
<td>53,250</td>
<td>160,000</td>
<td>640,000</td>
</tr>
</tbody>
</table>

*Averages of three trials.

REFERENCES

4. Dunlop, Stuart G., Associate Professor of Bacteriology, University of Colorado School of Medicine, Personal communication, 2-152.

ACKNOWLEDGMENTS

The authors wish to thank the following for the splendid cooperation and assistance given by Mr. Philip Shaiman, President of the Colorado Hotel Association, Inc.; Mr. E. A. Kaler, Head Chef, Colorado Hotel; O. J. Wiemann, Sanitarian of the Colorado State Department of Public Health; Harold J. Barnum, Denver Bureau of Health and Hospitals; Dr. Stuart G. Dunlop, University of Colorado School of Medicine; Dr. Philip R. Edwards, Federal Security Agency, Chamblee, Georgia; and Miss Eleanor L. Richie, Director, Research and Statistics, Colorado State Department of Public Health, for assistance in editing.

THE EFFECTS OF ANTIBIOTICS

Continued from page 159

milk when stored for 48 hours at 7°C.

4. The addition of antibiotics to raw milk would result in receiving poor quality milk as an acceptable grade of milk at the dairy plant, if judged solely by bacteriological standards.

ACKNOWLEDGMENTS

The authors wish to thank the following for supplying the antibiotics in this study: Aureomycin by Lederle Laboratories, Inc., Pearl River, N. Y.; Penicillin by Merck and Company, Rahway, N. J.; Tyrothricin by Sharp and Dohme, Inc., Glenolden, Penna.; and Streptomycin by Merck and Company, Rahway, N. J.

REFERENCES


Raines—1902-1953

Mr. Raines was born in 1902 in Montague County, Texas. He died on March 29, 1953, as the result of an automobile accident which occurred on March 28, 1953.

The period from 1920 to 1937 was spent in several industrial positions in Bowie, Texas. From 1937 to 1943, he was Milk Inspector for the Texas State Department of Health. From 1943 until August 1951, he was Chief Milk Supervisor for the Bureau of Food and Drugs, State Department of Health. From August 1951 until his death, he was the Oak Farms Dairies of Dallas, Texas, as Supervisor of Milk Quality Control.

He was held in esteem as a sincere and conscientious public servant. Much of the progress in milk quality control in Texas is due to Mr. Raines working with Mr. Pearson. Both men were highly respected by the industry and the public. Past-President (of this Association) Ehlers writes: "Through the passing of Mr. Raines the state has lost one of its outstanding milk authorities."

He is survived by his wife, one daughter, a granddaughter, a son-in-law, and other relatives not of his immediate family.