Outbreak of Salmonellosis due to contaminated food preparation surfaces

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Introduction

At a recent convention, 174 participants experienced severe diarrhea within 24 hours of a banquet. Fifty-seven had to be admitted to hospitals after blood appeared in their stools and their diarrhea continued unabated. Fifteen others were also admitted and treated for dehydration and electrolyte imbalance. Health officials questioning the caterer and patrons found that those who had skipped the salad were unaffected by the outbreak. An inspection of the kitchen found the area where the salad was prepared to be adjacent to the area where the chicken had been prepared (1). Samples were obtained from both food preparation surfaces and ***Salmonella enterica*** ssp**.** ***enterica*** was found in each.

This investigation revealed that sufficient evidence exists to pinpoint the cause of the diahrreal outbreak to be cross-contamination of fresh vegetables with bacteria from raw chicken through shared cooking surfaces or utensils. The microbe recovered, ***Salmonella enterica*** ssp. ***enterica***, is a common cause of gastroenteritis and is frequently associated with digestive systems of animals (2).

Materials and methods

Sampling Methods

Based on Health Department investigation and interviews with those attending the dinner, samples were obtained from unprepared and prepared dishes and from food preparation surfaces and brought to the microbiology lab for analysis. Foods and surfaces were sampled using methods prescribed by U.S. Public Health Service guidelines. Once returned to the microbiology laboratory, samples were cultured using standard laboratory media and incubated using standard laboratory conditions (24h, 37ºC), as outlined by the U.S. Food and Drug Administration standard methods, as described previously (3).

Identification Methods

Pure cultures were obtained via streak plating, and colonies were Gram stained (Fig. 1). Identification was initated using a battery of standard biochemical test methods listed in Table 1. Results obtained helped direct the additional tests necessary to complete the identification (Table 3). All tests were performed and interpreted following the guidelines as described in ***VirtualUnknown™ Microbiology*** Help Files (4).

Figure 1. Gram stain of bacteria isolated from food preparation surfaces. Bacteria were determined to be Gram negative bacilli.

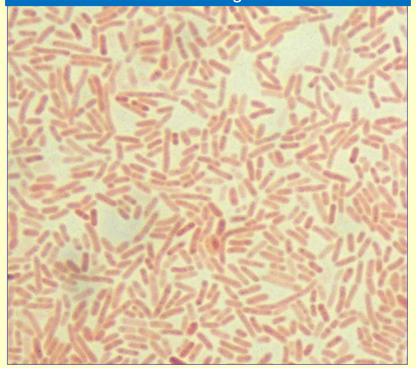


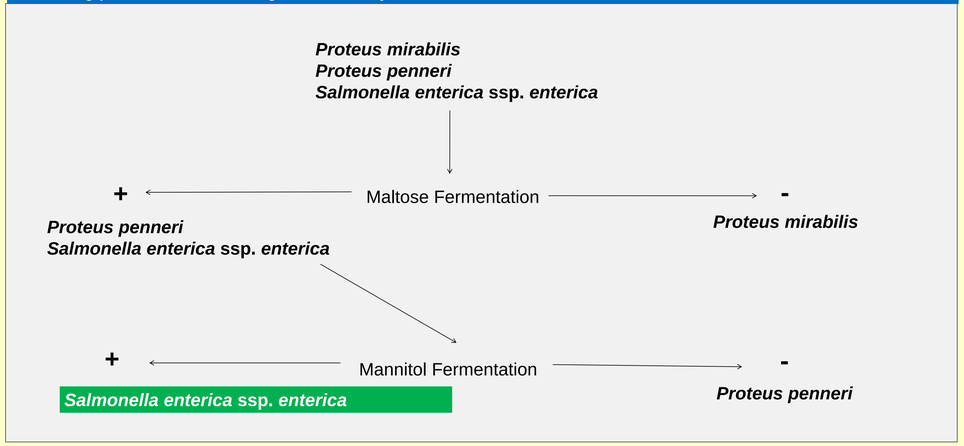
Table 1. Preliminary tests conducted for identification of isolates found to be Gram negative bacilli.

Preliminary Tests Performed	
Oxidase Test	-
O-F Glucose	+/+
Growth patterns on TSIA	Acid butt Alkaline slant Gas production H2S production
IMViC Series	Indole - MR + VP – Citrate -
Lactose Fermentation	-

Table 2. Possible identities of Health Department isolate following initial battery of standard biochemical tests.

Proteus mirabilis
Proteus penneri
Salmonella enterica ssp. enterica

Figure 2. Identification scheme for completing the identification of Health Department isolate based on remaining possibilities following initial battery of standard biochemical tests.



Results & Discussion

Initial isolation of the suspected source of the outbreak was accomplished on standard bacteriological media. Upon observation of the Gram stain, the organism was determined to be a Gram negative bacillus (Figure 1). The cells were arranged as singles with occasional pairs observed. Based on this information, a preliminary battery of tests was performed to narrow the range of possible organisms (Table 1). Growth on TSIA agar suggested the microbe was able to ferment glucose and produce gas, but was unable to ferment lactose. These results were confirmed through completion of the O-F glucose and phenol red lactose fermentation tests. Also observed in the TSIA medium following growth was the presence of hydrogen sulfide (H2S), appearing as a black precipitate. The IMViC results were negative for indole, Voges-Proskauer, and citrate utilization, but positive for methyl red. These results combined to eliminate 68 of the 71 possible bacteria found in the software.

The three remaining possible organisms were ***Proteus mirabilis***, ***Proteus penneri***, and ***Salmonella enterica*** ssp. ***enterica***. Upon review of the Identification Matrix found in ***VirtualUnknown™ Microbiology Internet Edition 2012***, it was determined that two tests would resolve the identity of the organism. Those tests were performed and the results indicated the organism was ***Salmonella enterica*** ssp. ***enterica***.

These results are completely plausible, based on the niche and typical ecology of the microbe and the symptoms of the victims. Further confirmation could be obtained by evaluating stool specimens from victims for the same microbe found in the foods.

Conclusion

Based on the results of this study, it appears the outbreak of gastroenteritis was caused by ***Salmonella enterica*** ssp**.** ***enterica*** inadvertantly transferred from the poultry preparation surface to the fresh vegetable preparation surface. Because the vegetables were served uncooked, live enteric bacteria were transmitted to patients through this lapse in standard food safety operations.

Literature Cited

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4. Biochemical Tests. 2012. In***, VirtualUnknown™ Microbiology Internet Edition 2012*** **Help Files**, Intuitive Systems, Inc., Abilene, Texas.

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For further information

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