

Epidemiology Bulletin

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Food Poisoning Outbreak in
Fuying Junior High School in
Hsinchuan, Taipei County

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On 26 May 1992, a food poisoning outbreak among the students after having taken boxed lunch occurred in the Fuying Junior High School, Hsinchuan Taipei County. Major symptoms were: vomiting (31.9%), abdominal pain (31.4%), nausea (24.8%) and diarrhea (23.2%). Lunch boxes were ordered from three companies and only these from the Chuan-chen-fu Co. seemed to have caused the outbreak. The students eating boxed lunch brought from home or ordered from the other two companies had not been affected. Of the questionnaires (490 valid) collected from 493 students in different grades who had consumed boxed lunch from the Chuan-chen-fu Co. It shows that 190 students had at least one of the four symptoms, giving an attack rate of 38.8%, a median incubation period of 3 hours and 5 minutes, an average incubation period of 3 hours and 15 minutes with a standard deviation of 75 minutes (see Figure 1). *Staphylococcus aureus* were found in the vomituses of two ill students. Statistical analysis of attack rate by food item of the six items showed that fried egg was related to the outbreak. Further analysis of the spare lunch box by the National Laboratories of Foods and Drugs also found *Staphylococcus* in the fried eggs.

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Editorial Note: 190 students of the Fuying Junior High School in Hsinchuan City two consumed the boxed lunch supplied by the Chuan-chen-fu Company and five other students of the Tanfeng Junior High School who also consumed the boxed lunch supplied by the same Company developed food poisoning. Students who did not consume boxed lunch prepared by that Company were not affected. The fried eggs contained in the lunch boxes, were considered to be the cause of the outbreak (see Table 1).

A total of 1,148 students had eaten the boxed lunch the supplied by the Chuan-chen-fu Co.: 502 students in the Fuying School, 367 in the Tanfeng School, and 279 in the Minan School. The attack rates were: 37.8% (190/502) in Fuying, 1.36% (5/367) in Tanfeng and 0.00% (0/279) in Minan. Lunch boxes were supplied first to Minan and Tanfeng, and last to Fuying, with an interval of about 20 minutes. Eight classes of Fuying had an attack rate of 100%, three class had an attack rate of 81.8%, 85.7%, and 84.6% respectively, and 27 classes had a zero attack rate. Take attack rates showed a localized aggregation. The time factor, that is, the duration the lunch boxes was left in room temperature, seemed to be the major factor in this event.

Fried eggs which contain high protein are a good medium for the growth of *S. aureus*. Another likely suspect is *Salmonella* spp. which can infect men through eggshells contaminated in the process of egg laying by poultry. However, the incubation period of *Salmonella* infection is 18-36 hours, and the incubation period of the current event was found to be only 2-4 hours.⁽¹⁾ The major symptom of *Salmonella* infection is high fever, and yet, only 5.1% of the patients of current event complained of fever. The dosage-effect analysis did not show significant relation either ($p=0.707$). It was speculated that the fever of these patients was related to the dehydration due to vomiting and diarrhea, and was not induced by the bacteria. Literatures⁽²⁾ also show that the chances of *Salmonella* transmitted by chicken eggs are smaller than duck eggs, and that it is very unlikely to intake sufficient amount in a short period of time to develop infection. The fried eggs of the current event were prepared by cooking machine in the morning. Thus, it was speculated that the pathogenic agent of the event was *Staphylococcus aureus*.

S. aureus grows under a temperature of 7-46°C, and produces enterotoxin under 10-45°C, though preferably under 35-40°C.⁽³⁾ The enterotoxin is heat-resistant (virulence is still retained even after boiling in 100°C). Bacteria may be killed under high temperature, the exoprotein can still cause sickness. 1 µg of enterotoxin in 100g of food is enough to make a person ill, 1 gm of enterotoxin will make 100,000 persons ill. In this event, 0.2 µg would be sufficient to make 195 students ill. Although enterotoxin is pure protein and can be decomposed by pepsin under pH=2.0 and less, it will not be destroyed by gastric juice and gastric proteinase when it is taken with foods.⁽⁴⁾ Enterotoxin is a low molecular weight (M.W.=30,000) substance capable of inducing neurotoxic symptoms (the molecular weight of the botulism toxins is M.W.=300,000-950,000), and joining the peripheroneural receptors of the gastroenteric walls to produce nervous impulses via automatic and vagus nerves to the vomiting center of the brain to induce vomiting. This process does not take long. These facts are in line with the incubation period of 2 to 4 hours and vomiting as the major symptom (31.9%) found in the current event.

No specimens from the food handlers could be collected for biotyping including: staphylokinase, hemolysin, bovine plasma coagulation, growth on crystal violet agar type A or C, protein A, enterotoxin [A, B, C(C, C2, C3) and D], and phage typing to decide the sources of *S. aureus*. The human strains of pathogen are more likely (61%) to as mentioned by Isigidi et al.,⁽⁵⁾ produce enterotoxin. Parker believes that the animal strains are less likely to induce poisoning, and Shiozawa shows that the true avian strains of *S. aureus* do not produce enterotoxin. Therefore, any outbreak of food poisoning is primarily due to the human strains. Specimens of food handlers should always be collected immediately

in any food poisoning outbreak to confirm the source of infection for future prevention.

References:

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Figure 1. Distribution of Incubation Periods

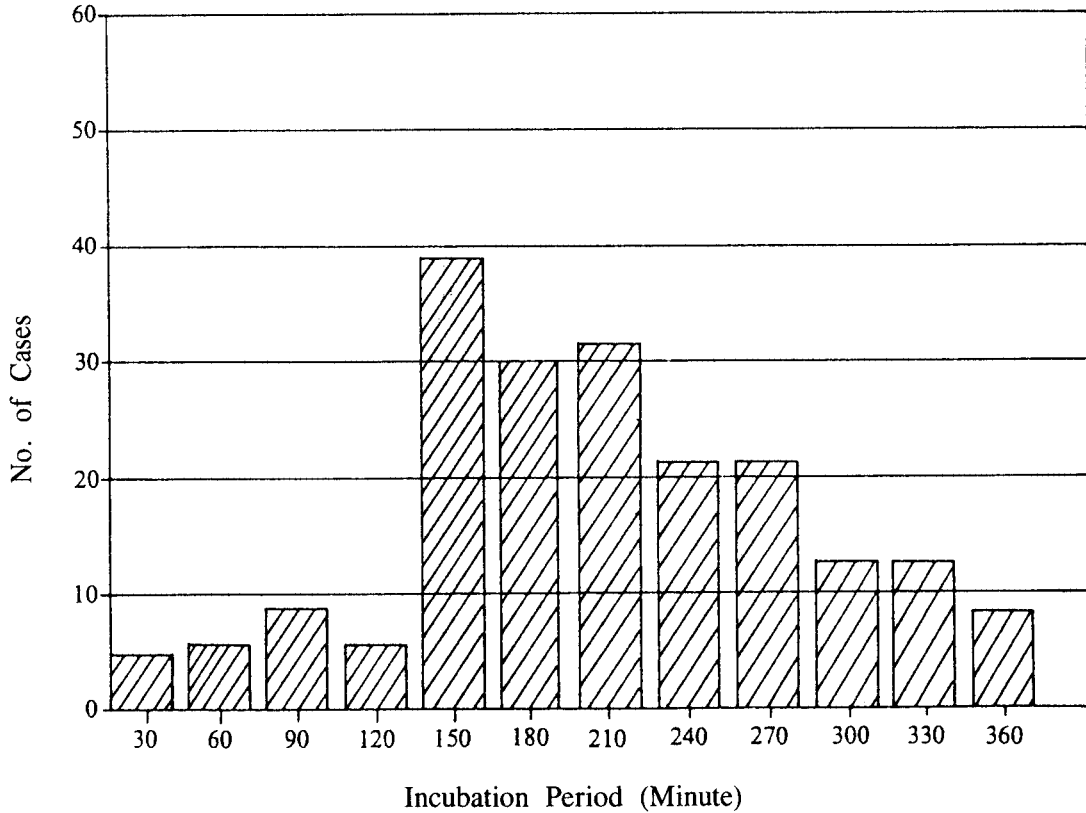


Table 1. Analysis of Relative Risk by Food Item

Food item	Eaten			Not eaten			Relative Risk	Greenland 95% CI	x ²	p-value
	Ill	Not ill	Attack rate (%)	Ill	not ill	Attack rate (%)				
Fried egg	162	221	42%	28	79	26%	1.16	1.06 < RR < 1.27	9.17	*0.002
Pork	180	289	38	10	11	4	0.98	0.94 < RR < 1.02	0.72	0.395
Sausage	166	245	40	24	35	30	1.07	0.99 < RR < 1.15	2.80	0.094
Bean sprout	160	246	39	30	54	36	1.03	0.95 < RR < 1.11	0.40	0.526
Dried turnip	146	209	41	44	91	33	1.10	0.99 < RR < 1.23	3.00	0.083
Rice	184	291	39	6	9	40	0.97	0.52 < RR < 1.82	0.02	0.896

*p < 0.05