A FOOD POISONING OUTBREAK DUE TO *STAPHYLOCOCCUS AUREUS*, KAPAR, MALAYSIA, 1983

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SUMMARY

An epidemiological investigation was carried out on a foodborne outbreak in a National Type Primary School (Chinese). The findings of the outbreak are reported. Of the 495 Chinese students (ages between 7 - 12 years) interviewed, 321 were exposed to one or more of the food items sold at the school canteen. The median incubation period was one hour for the outbreak. The main symptoms were related to the upper gastro-intestinal tract (nausea and vomiting). Fried meehoon (rice vermicelli) was suspected as being the responsible vehicle. The causative organism was Staphylococcus aureus. *48 cases were treated in the Main Health Centre, Kapar.*

INTRODUCTION

Food poisoning is an important Public Health problem in both the developing as well as in developed countries. Twenty-two out of twenty-six countries reporting routine communicable disease surveillance information to the WHO Western Pacific Region Office in 1976 included food poisoning as a cause of illness. [1]

In Japan, Benoki (1978) [2] reported that around 1,118 to 1,783 outbreaks of food poisoning had been reported in every year between 1971 - 1975, involving between 25,986 to 45,277 patients with 37 to 52 fatal cases.

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In Malaysia, an incidence of food poisoning 9.62 per 100,000 population was reported in 1981. [3] The common causes of food poisoning are due to *Staphylococcus aureus, Vibrio parahaemolyticus* and *Salmonella*. Lim *et al.*, (1982) [4] reported that 20.8% of the strains of *Staphylococcus aureus* isolated from human, food and animal sources were enterotoxigenic. We have been unable to find any previous reports of food poisoning outbreaks in the *Medical Journal of Malaysia*.

The objective of this paper is to describe an epidemiological investigation on a food poisoning outbreak due to Staphylococcus which occurred at a National Type Primary School (Chinese Medium) Kapar, Kelang District.

BACKGROUND

Kapar is a small town situated 11 miles north-west of Kelang (in the District of Kelang), Selangor. It has a population of 5,000. It is surrounded by six villages and two estates (10,000 population). The population consists of 36.7% Malays (mainly in the rural areas), 32.2% Chinese (mainly in the town area) and 31.1% Indians (mainly in the oil palm and rubber estates). The main occupations are farming, factory work, estate work and business. There is one Secondary School and 13 Primary Schools. The National Type Primary School (Chinese Medium) is situated in the heart of Kapar town and about 600 yards away from the main Health Centre. It has a student population of 807 students (99.9% Chinese). It is served by a school canteen which is situated inside the school compound. The environmental sanitation is

TABLE I
ATTACK RATES (OF THOSE WHO ATE ONE OR MORE FOOD ITEMS FROM SCHOOL CANTEEN) BY AGE AND SEX

Age	Male			Female		
	Number who ate one or more food items	Number ill	Attack Rate (%)	Number who ate one or more food items	Number ill	Attack Rate (%)
7	9	2	22.2	5	2	40.0
8	5	0	0.0	14	1	7.1
9	18	1	5.6	21	1	4.8
10	33	3	9.1	36	2	5.6
11	45	3	6.7	40	8	20.0
12	51	16	31.4	44	9	20.0
Total	161	25	15.5	160	23	14.4

satisfactory; it has a piped potable water supply and electricity.

MATERIALS AND METHOD

Of the 807 Chinese students (424 males and 383 females) studying in the school, 495 students were interviewed. Of the 495 students interviewed, 321 had eaten one or more food items from the school canteen. All the 48 cases of food poisoning identified were medically examined and interviewed. As preliminary inquiry suggested *Staphylococcus aureus* intoxication, information was obtained regarding the last meal taken. Students who did not eat from the school canteen were not sick and were excluded from tabulation. Fifteen teachers, the Principal of the school, the school canteen cook and food handlers were also interviewed to obtain information about the outbreak of food poisoning. The interviews were carried out systematically one class at a time with the objective of identifying the patients, clinical manifestations and factors related to the outbreak of food poisoning. A format was used to make certain that the investigators obtained all information required and a portion of the format was left for any other inquiry. The school canteen is managed by a 30-year-old female Chinese (from 1/1/83). She is assisted by other Chinese females aged 14, 15, 15, 15, 16 and 50 respectively. The cook and foodhandlers were medically examined. Rectal and nasal swabs were taken from them and sent to the laboratory for culture and sensitivity. The suspected, incriminated foods left unconsumed were also sent to the laboratory for bacterial isolation. Individual sterile swabs were taken from the skin lining the anterior neres and rectum beyond the sphincter from all the food handlers. The vomitus was collected from patients in plain sterile containers and cultured on Blood Agar and also 10% Robertson cooked meat with 10% salt.

RESULTS AND DISCUSSION

Attack Rates by Age and Sex

Table I shows that the highest attack rates occurred among the 7, 11 and 12 years age groups. There was no significant difference in the overall attack rates between the two sexes.

Clinical Features

Table II shows that the majority of symptoms were related to the upper gastrointestinal tract (nausea, vomiting, abdominal cramps). These symptoms were compatible with staphylococcus intoxication.

TABLE II
NUMBER AND PERCENTAGES OF SIGNS AND SYMPTOMS IN 48 CASES

Symptoms	Number with symptoms (48 ill)	Percentage with symptoms
Vomiting	39	81.3
Nausea	37	77.1
Abdominal cramps	36	75.0
Diarrhoea	14	29.2
Fever	8	16.7
Giddiness	1	2.1
Pallor	1	2.1

Incubation Period

Table III shows that there was an acute onset. The incubation period in the majority of the cases

TABLE III
FREQUENCY DISTRIBUTION OF INCUBATION PERIODS

Incubation Period (hours)	Number of cases	Cummulative frequency
0.5 –	14	14
1.0 –	11	25
1.5 –	13	38
2.0 –	5	43
2.5 –	1	44
3.0 –	1	45
3.5 –	0	45
4.0 –	2	47
4.5 –	1	48
5.0 –	0	48

was short, less than two hours after consuming the food at the school canteen. The mean incubation was 1.4 hours. The median incubation period was one hour.

Epidemic Curve

Fig. 1 shows that the epidemic curve is skewed to the right. Cases occurred rapidly reaching a peak between half-an-hour to two hours after exposure and than declined rapidly, with the range being half-hour to 4½ hours.

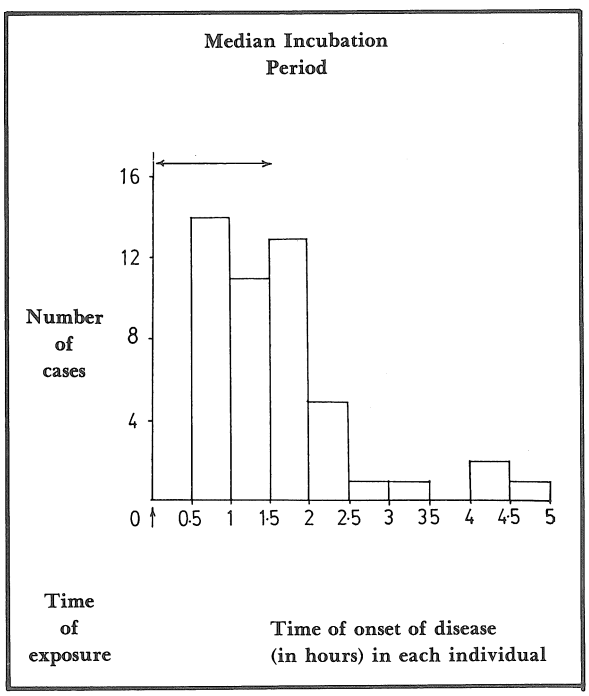

Fig. 1 Distribution of Time of onset of disease (Epidemic Curve) and median incubation period.

TABLE IV
EXPOSURE RATE BY ARTICLE OF FOOD CONSUMED

Food items sold in school canteen	Ill (48)		Not ill (273)	
	Number ate	Exposure rate %	Number ate	Exposure rate %
Fried meehoon	32	66.7	5	1.8
Laksa mee	14	29.2	89	32.6
Mee	3	6.3	25	9.2
Sotong	9	18.8	42	15.4
Black jelly water	9	18.8	36	13.2
Iced water	2	4.2	41	15.0
Sarsi water	4	8.3	3	1.1
Mamee	2	4.2	57	20.9
Banana chips	1	2.1	4	1.5
Biscuits	0	0	4	1.5
Bread	0	0	12	4.4
Prawn crackers	2	4.2	9	3.3
Sweets	0	0	16	5.9
Ice cream	0	0	3	1.1
Satay fish	1	2.1	2	0.7
Bubble gum	0	0	1	0.4
Bottle drinks	0	0	11	4.0
Fried banana	4	8.3	9	3.3
Cabe	0	0	3	1.1

Exposure Rates

Of the 42 food items sold at the school canteen, 19 were reported to have been consumed by those interviewed. Table IV shows that 46 out of the 48 ill cases consumed either meehoon or Laksa mee. Although there was no real difference in the exposure rates for Laksa mee among those ill and not ill, there was a great difference for meehoon among those ill and not ill. Meehoon also had a greater difference in percentage exposure (64.9%) between those ill and not ill than did Laksa mee (noodles) or any other food item.

Attack Rates

Mac Mahon and Pugh [5] discuss four methods of devising hypotheses; one of the methods i.e. 'Method of Difference' is utilised in this study. Table V, which compares the difference of attack rates among those who did and did not eat specific food items, shows that for meehoon there is a high percentage ill in the 'Ate' column and a low percentage in the 'Did Not Eat' column. This difference did not occur for those who did and did not eat Laksa mee or any other food items listed.

TABLE V
FOOD HISTORY ATTACK RATE

Food items sold	Number of persons who ate specified food				Number of persons who did not eat specified food				
	Ill	Not ill	Total	Percent ill (a)	Ill	Not ill	Total	Percent ill (b)	Real difference (a - b)
Fried meehoon	32	5	37	86.5	16	268	284	6.0	80.5
Laksa	14	89	103	13.6	34	184	218	15.6	2.0
Mee	3	25	28	10.7	45	248	293	15.4	4.7
Sotong	9	42	51	17.7	39	231	270	14.4	3.3
Black jelly water	9	36	45	20.0	39	237	276	14.1	5.9
Ice water	2	41	43	4.7	46	232	278	16.6	11.9
Sarsi water	4	3	7	57.1	44	270	314	14.0	43.1
Mamee	2	57	59	3.4	46	216	262	17.6	14.2
Banana chips	1	4	5	20.0	47	269	316	14.9	5.1
Biscuits	0	4	4	0.0	48	269	317	15.1	15.1
Bread	0	12	12	0.0	48	261	309	15.5	15.5
Prawn cracker	2	9	11	18.2	46	264	310	14.8	3.4
Sweets	0	16	16	0.0	48	257	305	15.7	15.7
Ice cream	0	3	3	0.0	48	270	318	15.1	15.1
Satay fish	1	2	3	33.3	47	271	318	14.8	18.5
Bubble gum	0	1	1	0.0	48	272	320	15.0	15.0
Bottled drinks	0	11	11	0.0	48	262	310	15.5	15.5
Fried banana	4	9	13	30.8	44	264	308	14.3	16.5
Cake	0	3	3	0.0	48	270	318	15.1	15.1

TABLE VI
FOURFOLD TABLE DEMONSTRATING THE RELATIONSHIP BETWEEN ILLNESS AND EXPOSURE TO MEE HOON (RICE NOODLE)

Exposure	Ill	Not ill	Total
Ate meehoon	32	5	37
Did not eat meehoon	16	268	284
Total	48	273	321

$x^2 = 162.$

Table VI shows that the calculated chi square value is 162. It indicates that the difference in attack rates for meehoon is highly significant and this difference would be expected to occur by chance alone less than one time in a million.

Laboratory Results (Culture Studies)

Vomitus from III Cases. Three of the six specimens showed the presence of *Staphylococcus aureus* (coagulase positive) on culture. **Nasal Swab - Foodhandlers.** Three of the seven individual specimens from the foodhandlers showed scanty growth of *Staphylococcus aureus* (coagulase positive). **Rectal Swab — Foodhandlers.** All the seven individual specimens from the foodhandlers were negative on culture for salmonella, shigella and cholera. **Suspected Incriminated Food left unconsumed.** Culture of the food for salmonella, staphylococcus, shigella and cholera organisms was negative.

Ingredients and method of preparation of the fried rice noodles

The ingredients used were meehoon (rice noodles), bean sprouts, fish cake, small onions garlic, salt, Aji-no-moto, black sauce, cooking oil. It was prepared as follows: cooking oil was heated in a frying pan, garlic and small onions were added and fried until brown; small pieces of fish cake were added; water, black sauce and Aji-no-moto (food seasoning) were then added; and lastly, meehoon were added, mixed and fried.

DISCUSSION

Food poisoning outbreaks occur frequently in Malaysia but they are rarely investigated by acceptable epidemiological methods to incriminate

the cause. This outbreak in Kelang presented a good opportunity to utilise the proper epidemiologic methods. All the 48 cases were identified and interviewed along with 273 persons not ill but who were exposed to the food sold at the school canteen. In the present study the range of the incubation period was half-an hour to four-and-a-half hours and the majority of the symptoms were related to the upper gastrointestinal tract (nausea, vomiting and abdominal cramps). This is consistent with staphylococcus intoxication. The early peak incidence in this outbreak may be due to the amount of contaminated food eaten, concentration of the enterotoxin and lastly the young age of those affected. The isolation of coagulase positive *Staphylococcus aureus* from three of the six vomitus specimens, provides strong evidence that staphylococcus enterotoxin caused the outbreak despite the fact that this organism was not isolated from the suspected incriminated food which was left unconsumed. Also three of the seven foodhandlers examined were found to be carriers of *S. aureus* coagulase positive, suggesting that they were the sources of infection.

CONCLUSION

48 Primary School children from the National Type Primary School (Chinese) suffered from food poisoning (intoxication) due to *Staphylococcus aureus* (coagulase positive). Epidemiological methods strongly identified fried meehoon as the most likely vehicle of transmission.

ACKNOWLEDGEMENT

The author is grateful to the Director General, Ministry of Health, Datuk (Dr) Hj Abd. Talib bin Latif, for permission to publish the paper. Thanks are also due to the following who rendered their services in one form or the other during the study, Dr Tee Kok Sang (Medical and Health Officer, Kapar), Dr Jeet Singh (Medical Officer of Health, Municipal Council, Kelang), Dr M. Jegathesan (Head of Bacteriology Department, IMR), Dr Sinniah (Dept. of Parasitology, University of Malaya). My special thanks to Dr David Dennis WHO Consultant Epidemiologist, IMR, for guidance and suggestions in the preparation of my manuscript and Mrs Fauziah Jaafar for typing the manuscript.

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