

A Food Poisoning Incident in Tainan City High School Students

Abstract

On November 7, 1999, the Center for Disease Control of the Department of Health was informed by the National Cheng Kung University Hospital about four suspected AFP (acute flaccid paralysis) cases. They were students from the same high school who all developed symptoms simultaneously and this thus could be considered to be a clustering of cases in terms of time and place. In order to evaluate the nature of the incident for the purpose of disease prevention, the Center for Disease Control dispatched a team on November 8 to investigate. After interviewing the individuals concerned and their physicians, it was suspected that the incident was a case of food poisoning caused by the school lunch the students ate on November 6.

An hour after eating the lunch, four students, one after the other developed symptoms of labial, glossal and facial paralysis, paresis of the neck and limbs, disorientation of movement, drifting feeling, and vomiting. One student, the most serious case among them, was semi-conscious upon arrival at the hospital, and was admitted to the intensive care unit. After hemodialysis and supportive

treatment, his condition stabilized.

In view of their symptoms, treatment, and the menu of the school lunch, the incident was believed to be a food poisoning case caused by tetrodotoxin in the fish fillet of the lunch.

Introduction

Tetrodotoxin, a notorious marine toxin, is produced by fish of the Tetraodon family. The toxin, though not as potent as the botulism toxin or toxins produced by some coelenterates, is potent enough to cause symptoms of human poisoning and even death⁽¹⁾. In Japan, globefish, also called blowfish or puffer fish (fugu) cuisine is popular because of its tender meat. Although the fish should only be handled fastidiously by cooks with a special license, more than ten people are poisoned each year; about 80% of the total number die. Literature in Japan shows that the lowest lethal dosage of tetrodotoxin in man is 10,000 MU^(2,3).

Major raw materials for fish fillets in Taiwan are meat of non-poisonous globefish. The other two kinds of globefish are relatively poisonous⁽⁴⁾. As fishermen and food industry workers in Taiwan are not trained to handle and differentiate fish poisons, poisoning incidents often occur. Dried fish fillets exported to Italy in 1977, for instance, caused the death of three tourists. A resident of Taipei City died in 1981 after having eaten some dried fish fillet. In February 1998, a resident of Taichung City reported to the local health authorities that the dried fish fillet he bought and ate caused glossal numbness, and the dog and cat fed with the fish fillet developed vomiting and died. The dried fish fillet was later found to contain 525 MU/g of tetrodotoxin after laboratory testing by the health authorities. Since the incident under discussion, there have been two more incidents of fish fillet poisoning involving three

deaths.

The fish fillet of the school lunch was prepared from fresh fish meat imported from mainland China. As there were no skin and tail, it was not possible to identify the fish species. As no food leftovers from that day were saved by the school, the incident could not be verified further.

The Investigation

On November 7, 1999, the National Cheng Kung University Hospital reported four suspected cases of acute flaccid paralysis. As all four students came from the same private high school in Tainan City and developed symptoms at the same time, it was an indication of clustering in terms of time, persons, and place. Fearing an outbreak of any paralytic communicable disease, the Center for Disease Control on November 8 immediately dispatched a team from its Epidemiology Division and experts of the Toxicology Department of the Taipei Veterans General Hospital for investigation. After several discussions with the physicians in charge, it was discovered that the four students had developed, an hour after having eaten the school lunch on November 6, symptoms of paralysis corresponding to poisoning by tetrodotoxin. The lunch was found to contain fish fillet made from globefish. It was decided that the incident was a food poisoning and not an outbreak of communicable disease. A questionnaire interview was conducted on November 9 to ascertain the seriousness of the incident.

Method and Materials

1. Subjects for Investigation

2,200 students in 40 classes of the school ate the lunch. 205 students in the four classes with cases were selected for interviewing.

2. Investigation Tools and Statistical Methods

205 students in four classes were asked to fill out a structured questionnaire. Questions in the questionnaire included personal background information, whether they had ingested the school lunch, time of food intake, food items eaten, any symptoms of paralysis or other symptoms, time of onset, time of recovery, whether medically treated or hospitalized. Information collected was processed and analyzed with Epi-Info for frequency ratios of symptoms, and χ^2 -tested for correlation between food items and cases meeting definitions.

3. Definition of Case

A case was defined as a person who ate the school lunch on November 6, and thereafter developed labial, glossal and facial paralysis, or numbness of the neck and limbs, and one or more of the following symptoms such as dizziness, vomiting, disorientation of movement, or drifting feeling.

4. Laboratory Testing

As no food leftovers were saved by the school, a case of 237 pieces of fish meat kept in freezer by the dealer was collected and sent to the National Laboratories of Foods and Drugs of the Department of Health for laboratory testing. Testing was conducted by force-feeding (PO) of mice.

Results

1. Findings from Questionnaire Interview

Eight of the 205 students interviewed met the definition of case, giving an attack rate of 3.9%. The average incubation period ranged from 0.5 to 3 hours. The distribution of symptoms is shown in Table 1. Of the four hospitalized, one was in critical condition with dyspnea and was admitted to the intensive care unit. He soon recovered after hemodialysis. The remaining three recovered the next day and returned to school.

2. Correlation Testing

Though the eight students who met the definition of case ate the fish fillet, the number for testing was too small. χ^2 -testing yielded a non-statistically significant $p=0.084$.

3. Findings from Laboratory Testing

As no food leftovers were saved by the school, a case of 237 pieces of fish meat kept in a freezer by the dealer was collected and sent to the National Laboratories of Foods and Drugs of the Department of Health for laboratory testing. Testing was conducted by force-feeding of mice. The result was negative for tetrodotoxin.

Discussion

Tetrodotoxin is a heat-stable neurotoxin in some marine species⁽⁵⁾. It is a sodium ion blocker in the neurons, thus inhibiting the electric potential of neurotransmission resulting in symptoms such as numbness, dizziness, vomiting, disorientation of movement, and drifting feeling. In serious cases, symptoms such as respiratory paralysis, hypotension, and bradycardia may occur⁽⁶⁾. Several marine products and amphibians such as fugu, newt, octopus, Latin American frog, snail, and crab may carry the toxin. In the past, tetrodotoxin was considered to have accumulation along the food chain. The toxin is now believed to be induced by microorganisms capable of producing tetrodotoxin⁽⁷⁾. The toxicity of fugu varies widely according to species, region and season⁽⁸⁾. The toxin works rapidly in the human body, the average time of symptom onset being less than three hours. That of botulism is over one half day. This difference can be used in their differential diagnosis⁽⁹⁾. There is no antidote yet for tetrodotoxin poisoning. Treatment of acute poisoning is primarily supportive. The prognosis is satisfactory if patients survive after 18-24 hours⁽¹⁰⁾. In Japan, there are approximately 50 deaths due

to poisoning each year. Diagnosis is generally based on clinical symptoms and history including previously ingested food items.

Though the χ^2 -test was a non-statistically significant $p=0.084$, and no tetrodotoxin was isolated from the fish fillet samples, symptoms of the hospitalized patients corresponded to the clinical symptoms of tetrodotoxin poisoning. And as all cases had eaten the fish fillet before the onset of symptoms, it was decided, after discussion with toxicology experts of the Taipei Veterans General Hospital and physicians in charge of the National Cheng Kung University Hospital, that the incident was caused by tetrodotoxin in the fish fillet eaten. It was a food poisoning incident in which a small amount of poisonous fish was present in the food served, and affected only a few persons. The findings, therefore, were not statistically significant.

Fugu meat, delicious and inexpensive, is often used by food industries for dried fish fillet. There have been several cases of food poisoning from dried fugu fish fillet. This was the first food poisoning incident caused by fresh fugu fish fillet.

The Center for Disease Control, therefore, recommends that food sanitation authorities begin to train food industry workers to differentiate edible fish and their handling methods. For the future prevention of such incidents, a licensure system should be established; and the supply of fugu controlled

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Table 1. Distribution of Clinical Symptoms

Symptoms	No.	%
Paralysis of limbs	5	62.5
Dizziness	5	62.5
Labial, glossal and facial numbness	4	50
Vomiting	3	37.5
Drifting feeling	2	25

Total no. meeting definition of case: 8 students.