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Plant Poisoning Outbreak in a Primary School in the northern Thailand, October 2015

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Abstract

On 6 Oct 2015, the Thailand Bureau of Epidemiology was notified of a food poisoning outbreak among students in a primary school. An investigation was performed to verify the diagnosis and outbreak, describe epidemiological characteristics, identify the source, and provide proper recommendations in order to prevent further outbreaks. Descriptive and retrospective cohort studies were conducted. Medical records at the hospital were reviewed, and teachers, students, cooks and janitors from the school were interviewed. A suspected case was a person in the school with at least two of the followings: nausea, vomiting, abdominal pain or diarrhea during 5-9 Oct 2015. The water samples were sent to the National Institute of Health for bacterial culture. The suspected plant was examined at the Plant Varieties Protection Division for species identification. Bivariate analysis was used to determine the food items associated with illness. The attack rate was 28.8% with 19 suspected cases out of total 66. Most common symptoms included nausea (85.0%), vomiting (85.0%) and abdominal pain (60.0%). All of the suspected cases consumed the coral plant (*Jatropha multifida*), which was also the only significant risk for the illness (P value <0.001). Therefore, this event was a coral plant poisoning outbreak. To prevent future outbreaks, a fence around the herb garden with a warning sign should be set up in the school, along with adequate warning of herb toxicity.

Keywords: plant, poisoning, *Jatropha*, coral plant, outbreak, Thailand

Introduction

Coral plant (*Jatropha multifida* L.) is a shrub or small tree with a single trunk. All parts are toxic, particularly the seeds.[1] It belongs to genus *Jatropha* L. (nettlespurge) and species *Jatropha multifida* L. (coralbush).[2] The symptoms of coral plant poisoning include vomiting, constricted pupils, leukocytosis and lethargy, that can be treated by decontamination and supportive therapy.[3] The severity of ingesting coral plant seeds is uncertain. As few as one seed could cause toxic symptoms, while in other cases, 50 seeds resulted in relatively mild symptoms. Diagnosis can be made through case history and presenting manifestations.[1]

Poisonous plant intoxicated cases accounted for 3% of all reported poisoning cases, and coral plant was identified in 3% of plant poisoning, with no fatalities.[4] Although the magnitude and severity of coral plant poisoning was relatively low, most of affected population were children who accidentally ingested the plants. Moreover, some poisoning outbreaks in Thailand reported coral plant (*Jatropha multifida*) as the source of outbreak in two (22%) out of nine seed poisoning outbreaks during 1981-1987.[5] Therefore, plant poisoning outbreak investigation is important to understand the nature and circumstances of coral plant toxicity.

In October 2015, the Bureau of Epidemiology (BOE) received a notification from the Office of Disease Prevention and Control 10 of a food poisoning outbreak in a primary school from the northern Thailand. The BOE and the local teams jointly conducted a field investigation to verify the outbreak, confirm diagnosis, describe epidemiological characteristics, determine the etiology, and make

appropriate recommendations to prevent further outbreaks.

Methods

Descriptive Study

On 7-9 Oct 2015, the investigation team visited the outbreak site and conducted a descriptive study in the primary school, including active case finding among students, teachers, cooks and janitors, face-to-face interviewing, and reviewing medical records in the school. A structured questionnaire was developed for collecting information on demographic (age, gender and grade), signs and symptoms, hospitalization, onset time and foods consumed prior to onset of illness.

A suspected case was a person in the school who had at least two of the following symptoms: nausea, vomiting, abdominal pain and diarrhea from 5-9 Oct 2015.

Environmental Study

An environmental survey was conducted in the school to investigate food production and processing. In addition, a walk-through examination was performed in kitchen, cafeteria, classrooms and garden. Students were also observed to assess health behaviors, especially hand washing before eating and sharing utensils when eating.

Laboratory Study

Samples of tap and ground water were collected on 5 Oct 2017 and sent for enteropathogenic bacteria culture at the National Institute of Health, Thailand. Samples of the suspected poisonous plant that students reported of eating before onset of symptoms were also collected and sent to the Plant Varieties Protection Division under the Department of Agriculture for identification. Nonetheless, clinical samples and leftover foods were not available for testing.

Analytical Study

A retrospective cohort study was undertaken to identify the source of outbreak. The cohort included students, teachers, cooks and janitors who were in the primary school during 5-9 October 2015.

Data were collected by interviewing and reviewing medical records. The focused variables were demographic data (age, gender and school grade), onset time, clinical symptoms and history of food consumption. The exposure such as foods and items that people in the primary school ate or put in mouth on 5 Oct 2015 were collected and analyzed by using Epi Info version 3.5.4.[6] Bivariate analysis was conducted and presented in risk ratio with 95% confidence interval. If risk ratio could not be identified, the result was shown as p-value instead.

Results

Descriptive Study

The school is a public primary school (kindergarten to primary grade 6) and located in the rural area of the northern Thailand. There were 66 people (36 males and 30 females) identified in the school, including 59 students, five teachers, one cook and one janitor.

Total 19 suspected cases were identified, with the overall attack rate of 28.8% (19/66). While all the cases were found in primary grades 1-4, the highest attack rate was observed in grade 1 (87.5%) (Table 1). There were two grades in each classroom for the primary level. Specific attack rates by classroom showed 72.7% (8/11) in room 2 (primary 1-2) and 64.7% (11/17) in room 3 (primary 3-4) (Table 2).

Table 1. Attack rate of food poisoning cases among staff and students from a primary school in the northern Thailand, 5 Oct 2015 (n=66)

Educational level	Number of case	Total number	Attack rate (percent)
Kindergarten	0	14	0
Primary grade			
1	7	8	87.5
2	1	3	33.3
3	7	10	70.0
4	4	7	57.1
5	0	2	0
6	0	15	0
Teacher, cook, janitor	0	7	0
Total	19	66	28.8

Table 2. Attack rates of food poisoning cases by classrooms from a primary school in the northern Thailand, 5 Oct 2015 (n=59)

Classroom	Number of case	Total number	Attack rate (percent)
1 (Kindergarten)	0	14	0
2 (Primary grades 1-2)	8	11	72.7
3 (Primary grades 3-4)	11	17	64.7
4 (Primary grades 5-6)	0	17	0

Cases were evenly distributed by gender with male to female ratio of 1:1. The median age was nine years (inter-quartile range 7-9 years, range 6-10 years). Among all cases, 89.5% (17/19) received treatment and 52.6% (10/19) were admitted to the hospital for observation and rehydration. Two cases were diagnosed with anaphylaxis and no one died. Clinical symptoms included nausea (85.0%), vomiting (85.0%) and abdominal pain (60.0%) (Figure 1).

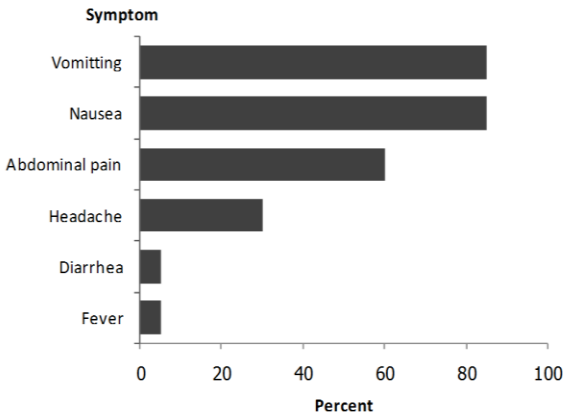

Figure 1. Clinical manifestations of food poisoning cases from a primary school in the northern Thailand, 5 Oct 2015 (n=19)

On 5 Oct 2015, the school lunch served at 10:45 to 11:30 while all cases developed symptoms around 15:00. Interview of the cases indicated that two students brought *Jatropha* to their classrooms: one in classroom 2 (grades 1-2) and one in classroom 3 (grades 3-4), and distributed the fruits to their classmates while the teachers were not around as they assumed that the plants were herbs. The students from grades 1-4 ingested around 13:00 and all of them developed symptoms within one hour after ingesting the poisonous plant. The epidemic curve was compatible with a common source outbreak (Figure 2).

Environmental Study

A *Jatropha* tree was growing in the herb garden of the school, with no fence around or a warning sign. It was located near toilets and playground, where students usually passed by. Many other coral plants were also observed outside the school compound.

No rodent or other animals were observed in the kitchen and cafeteria. The lunch items were cooked in the kitchen at 09:00 and completed around 10:30 every day as well as on the day that food poisoning occurred. The cooked foods were covered and kept warm until the serving time. The foods were served to kindergarten students at 10:45, and then served to primary students at 11:30 on that day as usual.

The team identified two water sources: groundwater and tap water. The groundwater was used for gardening and in restrooms. The tap water was used for daily cooking, washing as well as drinking in the cafeteria and playground after filtered in the tank.

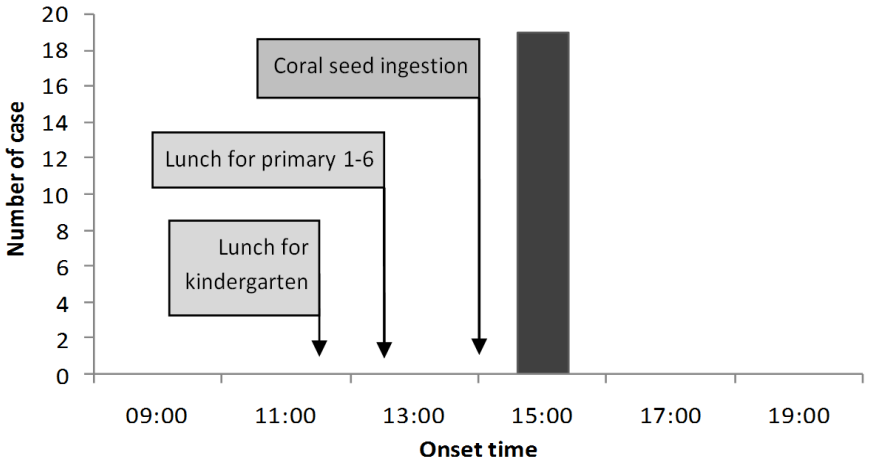

Figure 2. Number of plant poisoning (*Jatropha multicida*) cases by time of onset from a primary school in the northern Thailand, 5 Oct 2015 (n=59)

Figure 3. A *Jatropha* tree (left) (source: Wikipedia) and its seeds (right) from the herb garden of a primary school in the northern Thailand, October 2015

Laboratory Study

Water sample from the cafeteria showed growth of *Aeromanas hydrophila* and *Bacillus cereus* while only *Bacillus cereus* was found in the groundwater. There was no evidence of enteropathogenic bacteria in the water from the kitchen and restrooms. The photo and sample of the ingested herb were identified as *Jatropha multifida* L. by botanical specialists (Figure 3).

Retrospective Cohort Study

Retrospective cohort study was conducted among 59 subjects in the school. Of these, 19 cases met the case definition. The univariate results suggested that the coral plant fruit or *Jatropha multifida* was the risk factor (P-value <0.001) (Table 3).

Discussion

This outbreak was caused by the ingestion of coral plant (ฝิ่นต้น), *Jatropha multifida* L, since the cases were identified only in classrooms 2 and 3, and the implicated plant was also confirmed to be coral plant (*Jatropha multifida* L.). The clinico-epidemiological characteristics were also compatible with its etiology[1]. The majority of cases (85%) developed nausea and vomiting shortly after ingestion. The characteristics of this outbreak was consistent with the previous outbreaks that most cases had upper gastrointestinal symptoms within an hour or more after consumption of the plant.[5] Moreover, the coral plant was also identified as the risk factor (P-value <0.001) by the analytical study.

Even though laboratory results found *Bacillus* spp. and *Aeromonas* spp. in the groundwater and a water tank in the cafeteria, this could not be the source of outbreak as these enteropathogenic bacteria are often detected in drinking water[7] and clinical symptoms were not consistent with these bacteria either. Moreover, the cases were not distributed evenly among the primary students even though they shared the same water source. Statistical analysis also presented the insignificant results.

Food poisoning outbreaks are frequently occurred in children and schools.[8,9] As in the previous outbreaks of poisoning caused by coral plants, most of the cases involved children. The risk behaviors were lack of knowledge about the plant and easy access to it.[10,11] Accidental food poisoning by another species of *Jatropha curcas* L. (Physic nut) is also common in children from Thailand[12], as well as in other countries such as India[13,14] and French[15]. *Jatropha* species can contain toxalbumin ricin, which could be fatally toxic and can cause severe vomiting and diarrhea, leading to dehydration, shock as well as renal and hepatic impairments.[9]

In this event, the students believed that the coral plant was an edible herb as it was planted in the herb garden. Moreover, no warning sign was placed near the plant and supervision by teachers was not feasible around the clock. Although the investigators recommended cutting the coral plant tree, the school principal did not agree on it as it remarked the anniversary of school inauguration.

Table 3. Univariate analysis of a retrospective cohort study for food items associated with a food poisoning outbreak in a primary school of the northern Thailand, 5 Oct 2015 (n=64)

Exposure	Eating			Not Eating			Risk ratio	P-value
	Ill	Total	Percent	Ill	Total	Percent		
Stir-fried basil with minced pork	19	61	28.8	0	3	0	UD	0.34
Coral plant seed	19	19	100.0	0	45	0	UD	<0.001
Drinking tank water	19	63	30.2	0	1	0	UD	0.70
Milk	19	58	32.8	0	6	0	UD	0.11

Hence, we advised them to post a warning sign near the tree in the herb garden. Additional supervision of all students by teachers should be strengthened. Information about the coral plant (*Jatropha multifida*) and consequences of ingestion should be given to all students occasionally.

Limitations

Although residual foods, vomitus and stool samples were planned to collect for testing, the samples were not available on the day of investigation.

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Suggested Citation

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