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THE CONTROL OF DETERIORATED SUGARCANE FOOD POISONING IN CHINA

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ABSTRACT

A fatal food poisoning caused by deteriorated sugarcane was discovered in the 1970s in northern part of China. Because the etiology was unknown and the case fatality very high, especially in children, it was one of the major food safety concern in China. The Ministry of Health worked together with academic scientists and conducted a series of field survey, laboratory analysis and clinical studies and finally elucidated the etiology of this specific food poisoning. Based on the findings, specific control measures (i.e. to control the duration and condition of sugarcane storage) were promulgated at the central level and implemented by local health institutions, which resulted in a quick and efficient control of this food poisoning.

Our experience in this case demonstrated that: 1) When a food poisoning of unknown causes occurred, it is crucial to take proper action quickly and find out its etiology; and followed by the development of specific control measures to be implemented by local health workers. This will result in a quick and efficient control of the food poisoning. 2) The close collaboration between government food safety officials (risk managers) and academic food safety experts (risk assessors), as well as between central government agencies and local government agencies is critical in solving food safety emergencies.

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1. BACKGROUND

Deteriorated sugarcane poisoning is a kind of acute food poisoning, which occurred mainly in the north part of China. Fresh sugarcane grown in southern China, such as Guangdong, Guangxi and Fujian provinces, is usually shipped to northern China, and stored and sold throughout the winter season. Some deteriorated sugarcane was contaminated by *Arthrimum spp.* and their toxins, 3-nitropropionic acid and caused fatal food poisoning when sold in the next spring. The first outbreak of sugarcane food poisoning of unknown causes occurred in Henan Province in 1972. Up to 1989, there were 217 reported outbreaks caused by deteriorated sugarcane, and 884 cases were affected. Eighty-eight out of the 884 cases died, and the case fatality was 10% (Table 1).

Table 1 The geographic distribution of deteriorated sugarcane food poisoning in China

Area	Year	No. of outbreaks	No. of Cases	No. of death	Fatality (%)
Hebei	1974-89	79	430	43	10.0
Henan	1972-89	66	195	24	12.3
Shandong	1985-87	22	155	6	3.9
Liaoning	1982-88	27	67	8	11.9
Sahnxi	1985-87	5	6	1	16.7
Shan Xi	1987	6	10	2	20.0
Ningxia	1987	4	6	1	16.7
Qinghai	1985	3	5	0	-
Xinjiang	1987	1	4	0	-
Neimeng	1985	1	1	1	-
Jinasu	1985	1	2	1	-
Guizhou	1985	1	2	1	-
Hubei	1985	1	1	0	-
Total	1972-89	217	884	88	10.0

2. CLINICAL MANIFESTATIONS AND ETIOLOGY

The central nerve system is the target organ of deteriorated sugarcane food poisoning. The incubation period is from 10 minutes to more than 10 hours. Patients could have dizziness, vomiting, sight obstacle, dystonia, stare to one side, convulsion, carpopedal spasm and coma. The EEG showed scattered and spread foci in the brain. However, body temperature, heart, lung, stomach, eye, blood, urine and cerebrospinal fluid are in normal condition. The CT scans of brain in 5 dystonic patients collected from different areas showed the same bilateral hypodensities in lenticular nuclei. Most advanced cases children and death usually occurred within 1 to 3 days. Most survivors are disabled throughout the remaining life (Table 2).

Table 2 . Clinical manifestations of deteriorated sugarcane food poisoning in China

Area	Year	No. of cases	Age (yr.)	Incubation period	Vomiting	Stare to one side	Muscular spasms	Coma	?
Zhengzhou	1972	2	3-27	2-7h	+	+	+	+	/
Leting	1974	12	4-9	15'-2h	+	+	+	+	+
Anyang	1975	3	<10	3-4h	+	+	+	+	/
Hejian	1982	3	4-16	10'-8h	+	+	+	+	+
Heishan	1982	4	4-9	15'-8h	+	+	+	+	+
Xinxiang	1982	3	5-7	2-4h	+	+	+	+	/
Qinhuangdao	1983	1	9	5h	-	+	+	+	/
Hengshui	1983	5	3-10	15'-2h	+	+	+	+	/
Fengrun	1984	1	5	7h	+	+	+	+	/
Total		34	3~27	10'~8h					

One specific case maintained coma for over a week, and still had muscle spasm after 26 poisoned days. Each time of spasm lasted for about 15 seconds, and 6 to 8 times of spasm occurred in 10 minutes. Typical brain lesions (hypodensity foci) were found by CT scan. The patient died after 6 months, because of complicated infection. The autopsy showed that the cerebral fissura became shallow, but there was no brain hernia. The pathological diagnosis was brain edema.

Scientists at the Chinese Academy of Preventive Medicine studied the etiology of this specific food poisoning since 1984. The fungus species *Arthrimum* isolated from the left-over deteriorated sugarcane was identified as the pathogen and its metabolite 3-nitropropionic acid was proved to be the causative compound of deteriorated sugarcane poisoning. This was the first time that the strains of *Arthrimum* spp. was found to produce 3-nitropropionic acid and cause human food poisoning.

3. LABORATORY DIAGNOSIS, PREVENTION AND CONTROL

The main basis for laboratory diagnosis is the isolation of *Arthrimum* strains and the detection of 3-nitropropionic acid from the left-over suspected sugarcane samples. Based on the discovery of the etiology, diagnostic criteria and principles for the management of deteriorated sugarcane poisoning (WS/ T10- 1996), as well as the methods for the isolation and identification of *Arthrimum* strains and analyzing 3-nitropropionic acid (GB47689.16) were promulgated by the Ministry of Health, China, in 1996. The diagnosis of deteriorated sugarcane food poisoning shall based on epidemiological characteristics, clinical manifestations, and laboratory examination.

At the same time, the Ministry of Health issued a notification on the prevention and control of deteriorated sugarcane poisoning, which was disseminated to every provinces throughout China. A health campaign for preventing this food poisoning was launched in all provinces in northern China. And the local health institutions strengthened the inspection of sugarcane storage and sugarcane market.

The main measures adopted by the local food inspectors included:

1. Fresh sugarcane shipped to northern China should not be stored (especially piled-up) for more than 3 weeks.
2. The deteriorated sugarcane with unpleasant smell and mold growing should not be sold on the market.
3. Once the deteriorated sugarcane food poisoning outbreak occurred, the suspected left-over sugarcane should be immediately sealed and destroyed, in order to prevent further food poisoning.
4. During the outbreak, the food inspectors and clinic doctors should work closely to treat patients, especially pay attention to the brain edema and try to improve blood circulation in the brain.

Because of the promulgation of government notifications, diagnostic criteria and therapeutic guidelines for patients, as well as the efforts of local inspectors, laboratory technicians and scientists, the sugar cane food poisoning has been satisfactorily controlled. No typical case suffering from deteriorated sugarcane food poisoning was reported in the last 10 years.

4. SUMMARY

A fatal food poisoning caused by deteriorated sugarcane was discovered in the 1970s in northern part of China. Because the etiology was unknown and the case fatality very high, especially in children, it was one of the major food safety concerns in China. The Ministry of Health worked together with academic scientists and conducted a series of field surveys, laboratory analysis and clinical studies and finally elucidated the etiology of this specific food poisoning. Based on the findings, specific control measures (i.e. to control the duration and condition of sugarcane storage) were promulgated at the central level and implemented by local health institutions, which resulted in a quick and efficient control of this food poisoning. Our experience in this case demonstrated that: 1) When a food poisoning of unknown causes occurred, it is crucial to take proper action quickly and find out its etiology; and followed by the development of specific control measures to be implemented by local health workers. This will result in a quick and efficient control of the food poisoning. 2) The close collaboration between government food safety officials (risk managers) and academic food safety experts (risk assessors), as well as between central government agencies and local government agencies is critical in solving food safety emergencies.