

## Outbreak Reports

## Two Photosensitive Dermatitis Outbreaks Caused by *Cordierites frondosus* — Chuxiong Yi Autonomous Prefecture, Yunnan Province, China, 2023

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### Summary

#### What is already known about this topic?

*Cordierites frondosus* (*C. frondosus*) is a species of toxic mushroom known to induce symptoms of photosensitive dermatitis.

#### What is added by this report?

In the months of May and June 2023, a total of four patients in Chuxiong Yi Autonomous Prefecture, Yunnan Province, were affected by *C. frondosus* poisoning, occurring over two distinct incidents. The condition of two patients deteriorated after they were re-exposed to sunlight on the seventh day following the initial poisoning. Separately, an additional two patients reported experiencing a mild, needle-like sensation on areas of their skin exposed to the sun, recorded on the twelfth day subsequent to the poisoning.

#### What are the implications for public health practice?

Given that symptoms of photosensitive dermatitis, a potential severe consequence of *C. frondosus* poisoning, can manifest up to a week post-sun exposure, it is advisable to avoid sunlight for a minimum of two weeks following poisoning.

Between May 17 and June 9, 2023, four cases of suspected mushroom poisoning were treated at the People's Hospital of Chuxiong Yi Autonomous Prefecture. The patients presented with photosensitive dermatitis 21 to 45 hours after ingesting wild "wood ear" mushrooms. The China CDC partnered with the local hospital to investigate the incidents. A comprehensive examination — involving epidemiological investigations, assessing clinical symptoms, and performing morphological and molecular identifications of the toxic mushrooms — suggested that the poisonings were triggered by the inadvertent consumption of *Cordierites frondosus* (Kobayasi) Korf (*C. frondosus*). This is a wild

mushroom species that bears a striking resemblance to the traditionally edible *Auricularia* fungi. For two of the patients, the symptoms intensified upon re-exposure to sunlight a week following the ingestion, while the other two exhibited cutaneous photosensitivity up to 12 days post-poisoning. This underscores the alarmingly prolonged duration and the severity of *C. frondosus* poisoning. Following these incidents, extensive public education and outreach initiatives were disseminated through official platforms to mitigate risks of *C. frondosus* ingestion and to aid in distinguishing it from safe-to-eat wood ears. Pleasingly, these measures resulted in no further cases being reported until October in Chuxiong.

## INVESTIGATION AND RESULTS

On May 17, 2023, two patients suspected of mushroom poisoning were treated at the People's Hospital of Chuxiong Yi Autonomous Prefecture. Both patients exhibited definitive symptoms of photosensitive dermatitis, such as redness, swelling, itching, blister formation, and sharp pain in the facial region and the dorsal surface of their hands. These symptoms were amplified upon exposure to sunlight. On June 9, the hospital admitted two more patients, revealing similar symptoms (Figure 1A). All patients had consumed "wood ears" prior to the manifestation of these symptoms, prompting the hypothesis of photosensitive dermatitis induced by mushroom poisoning. In response to these cases, the China CDC and the hospital initiated case-finding and epidemiological investigations. The criteria for the definition of these cases were: patients with a history of "wood ears" consumption and manifested symptoms of photosensitive dermatitis during the period of May to June.

Four cases, comprised of three males and one female aged 45 to 57, were identified in Cangling District,



FIGURE 1. Photographs from the patients and morphological characteristics of *Cordierites frondosus*. (A) Images of photosensitive dermatitis on the dorsal surfaces of the hands from four patients in Chuxiong, Yunnan Province, captured in May and June 2023. (B) Ascoma; (C) Asci of *Cordierites frondosus*.

Note: Upon admission to the hospital on May 17 and June 9, all patients presented with mild erythema, edema, and vesicles on the dorsum of their hands. Case 1 showed symptom progression with the formation of ulcers and erosions following re-exposure to sunlight on May 23. These ulcers and erosions persisted in Case 1 and Case 2 as of May 30. By June 20, desquamation and scarring were evident on the dorsal surface of the hands in all patients.

Chuxiong Yi Autonomous Prefecture, Yunnan Province. The subjects, all rural dwellers who lived approximately 30 kilometers apart, met the case criteria. Two patients manifested gastrointestinal symptoms three hours after mushroom consumption. Subsequent development of photosensitive dermatitis in all patients occurred 21 to 45 hours after consuming 30–50 g of mushrooms. Laboratory results demonstrated minor myocardial damage, lymphocyte irregularities, and a significant increase in the inflammatory cytokine, interleukin 6 (Table 1). Case severity was correlated with high poisonous mushroom intake and exposure to sunlight. Preventive measures included isolating patients from sunlight while

therapeutic approach encompassed administration of dexamethasone, vitamin C, chlorpheniramine maleate, and calcium gluconate for anti-inflammatory, antioxidant, and anti-allergic effects. Sufentanil was supplied via infusion pumps for pain relief.

The epidemiological investigation shed light on the unfolding of the poisoning event. On the morning of May 15, 2023 — a day varying between rainy and cloudy weather — a farmer foraged around 80 g of “wood ear” mushrooms from deciduous trees near his home. These mushrooms were subsequently used in a rice noodle lunch dish at 11:00, that he and his wife consumed. By 14:00, both began to exhibit symptoms indicative of food poisoning, such as nausea, vomiting,

TABLE 1. Demographic and clinical data for four patients with *Cordierites frondosus* poisoning.

Patients	References	Case 1	Case 2	Case 3	Case 4
Sex		Female	Male	Male	Male
Age (years)		57	57	49	45
Medical history		–	–	–	Diabetes
Mushrooms ingested (g)		50	30	30	20
Ingestion to gastrointestinal symptoms onset (h)		3	3	–	–
Ingestion to photosensitive dermatitis onset (h)		39	45	21	21
Ingestion to hospital admission (h)		51	51	36	36
Hospitalization duration (days)		13	11	5	5
Outcome		Recovered	Recovered	Recovered	Recovered
Alanine aminotransferase (U/L)	7–40	28	28	26	44
Aspartate amino transferase (U/L)	13–35	32	48	104	64
Total bilirubin (μmol/L)	3–22	19.4	16.1	21.9	32.7
Blood urea nitrogen (mmol/L)	3.2–7.1	3.42	4.23	6.18	4.31
Serum creatinine (μmol/L)	58–110	42.1	79.2	58.9	47.8
Creatine kinase (U/L)	30–153	56	474	1284	341
Creatine kinase isoenzyme (U/L)	0–24	50.6	44.3	64.7	114.6
Interleukin 6 (pg/mL)	0–7	50.98	36.85	10.02	23.65
White blood cell count (10 <sup>9</sup> /L)	3.5–9.5	10.16	15.94	6.37	13.18
Neutrophil count (10 <sup>9</sup> /L)	1.8–6.3	8.93	15.5	5.3	12.77
Lymphocyte count (10 <sup>9</sup> /L)	1.1–3.2	0.32	0.39	0.67	0.33
Monocyte count (10 <sup>9</sup> /L)	0.1–0.6	0.03	0.04	0.4	0.05
Eosinophil count (10 <sup>9</sup> /L)	0.02–0.52	0	0	0	0
Basophil count (10 <sup>9</sup> /L)	0–0.06	0.01	0.01	0	0.03

Note: “–” indicates no past medical history.

and diarrhea. For the rest of that day and the next day, which was cloudy transitioning to sunny weather, the couple consumed standard meals excluding mushrooms and partook in outdoor activities. However, by the early morning hours of May 17, a sunny day, they developed photosensitive dermatitis. The distressing symptoms led them to seek medical intervention at 14:00 that day. Their symptoms improved considerably by May 22, another sunny day, upon which they requested discharge. Nevertheless, they had to be readmitted the following day due to deterioration of their symptoms after exposure to sunlight. The condition of their skin, particularly on the back of their hands, worsened, developing into ulcers and erosions. They underwent topical treatments involving fusidic acid cream, halometasone cream, and silver sulfadiazine cream. Discharged on May 28 and May 31, their health showed noticeable improvement. A follow-up examination on June 20 reported significant recovery, however, the backs of their hands

displayed extensive scarring (Figure 1A).

On a rainy morning of June 8, 2023, a farmer collected approximately 50 g of “wood ear” mushrooms from deciduous trees near his dwelling to include in his lunch. His younger brother and wife also partook in the noontime meal, which consisted of pan-fried pork, vegetable soup, and rice. The wife, however, refrained from eating the gathered mushrooms. Moreover, both brothers drank alcohol with their meals. That afternoon, they abstained from outdoor activity, consuming a mushroom-free dinner later. By 9:00 the next day, which transitioned from rain to overcast weather, both siblings started showing signs of photosensitive dermatitis (Figure 1A) while laboring outside and sought medical aid at 21:50 that night. It is noteworthy to mention that the farmer’s wife didn’t exhibit any symptoms indicative of poisoning. Both patients witnessed improvement and were discharged from the hospital on June 14, another rainy day. However, during a subsequent check-up conducted on

a sunny day on June 20, it was revealed that while their recovery was significant, they continued to feel a mild needle-like sensation on their faces and the backs of their hands when exposed to sunlight.

The mushroom samples were re-gathered from the exact location where the patients had previously collected their specimens. Initial identification was based on the observation of macroscopic features such as color, size, and shape, in addition to microstructural elements like asci and ascospores. For molecular identification, we sequenced the internal transcribed spacer (ITS) sequences, and conducted a phylogenetic analysis using the maximum parsimony (MP) method (ITS GenBank accession numbers OR884094, OR885350). We confirmed that both samples were *C. frondosus* specimens (Figure 1B&C). By associating the results of species identification with the patients' clinical manifestations, it was inferred that both episodes were caused by *C. frondosus*, resulting in photosensitive dermatitis.

## PUBLIC HEALTH RESPONSE

Local officials in Chuxiong have installed informational signs in every village about the poisonous mushrooms indigenous to Yunnan. These signs aim to educate the residents on identifying toxic mushrooms and comprehending the risks associated with mushroom poisoning. Since the implementation of this measure, no additional instances of similar poisoning have been reported in the region.

## DISCUSSION

Mushroom toxicity presents a pressing food safety issue in China, particularly in Yunnan Province (1–4). Statistically, 31.8% of foodborne disease outbreaks and 47.4% of corresponding mortalities nationwide are associated with mushroom poisoning (3). Disconcertingly, Yunnan Province bears the brunt of this epidemic, responsible for 40% of outbreaks, 43.6% of illnesses, and 41% of fatalities attributed to mushroom poisoning (4). A particular concern is the incidence of photosensitive dermatitis caused by *C. frondosus* in Chuxiong Yi Autonomous Prefecture, Yunnan Province, with 43 documented poisoning episodes from 2015 to 2020 (5). Additionally, *Bulgaria inquinans*, another mushroom species, similarly evokes photosensitive dermatitis (6). Given their distribution throughout various regions of China (6–7), the collection and consumption of these photosensitive

mushrooms imply a widespread risk across the country.

In concurrence with earlier research, the patient in the present study showed signs of photosensitive dermatitis, marked by erythema, swelling, a burning sensation, pruritus, blisters, and skin peeling, in tandem with elevated levels of the inflammation indicator, interleukin 6, and irregularities in inflammatory cells (8–10). Therefore, the initial treatment strategies comprise avoiding light exposure and administering therapies with antioxidant, anti-inflammatory, and antihistaminic properties (8). A recent finding suggests that patients' conditions worsened when re-exposed to sunlight a week after ingesting *C. frondosus* mushrooms. The prolonged presence of photosensitivity symptoms for as long as 12 days post-ingestion underscores the extended elimination period for photosensitizing agents in cases of *C. frondosus* poisoning. Notably, there have been fatal incidents of laryngeal edema in children and reports of patients needing up to 15 days of hospitalization due to severe poisoning (9–10). Based on these observations, it is advisable to avoid sun exposure for a minimum of two weeks following intoxication with this mushroom species.

Addressing the issue of mushroom poisoning requires multidisciplinary collaboration. It is critical that government and health authorities enforce restrictions against the collection and consumption of *C. frondosus*. Agencies responsible for disease prevention and control need to raise awareness of the characteristics and risks associated with this mushroom, in order to avert unintentional consumption by the public. Biologists have a crucial role in accurately identifying toxic mushrooms essential for clinical diagnosis. In situations of inadvertent consumption, it is paramount to seek immediate medical help and counsel patients to avoid sun exposure. Any leftover mushroom samples should be brought in for examination. Medical facilities must promptly report any cases and administer effective treatment methods to mitigate patient conditions and prevent fatalities.

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