

Poisoning by Hallucinogenic Mushroom Hikageshibiretake (*Psilocybe argentipes* K. Yokoyama) Indigenous to Japan

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MUSA, M., ISHII, A., TANAKA, F. and KUSANO, G. *Poisoning by Hallucinogenic Mushroom Hikageshibiretake (Psilocybe argentipes K. Yokoyama) Indigenous to Japan.* Tohoku J. exp. Med., 1986, **148** (1), 73-78 — Five cases of poisoning by indigenous mushroom Hikageshibiretake (*Psilocybe argentipes*) are reported. As this mushroom contains psilocybin, in general, clinical features were similar to those seen by pure psilocybin. Acute toxic stuporous state with complete amnesia in the culminating period occurred in one case, psychedelic state with dreamy consciousness in one case and psychotic adverse reactions with vivid visual hallucinations with consciousness in three cases. There were accompanied with anxiety and panic reactions to subjective experiences. Though these toxic effects were usually short-lived, for management of such patients it is important to recognize that horrible emotional reactions and other harmful behavioral problems can also occur. ——— hallucinogenic mushroom; psilocybin; toxic psychosis; *Psilocybe argentipes*; Hikageshibiretake

The Aztecs and neighbouring tribes used not only peyotl (*Lophophora williamsi*) which contains mescaline, but also “sacred mushrooms” called teonanacatl in their religious cult since antiquity. In 1955 R. Gordon Wasson and his wife (Wasson 1957, 1959) rediscovered the mushroom cult in Southern Mexico and brought the specimens of mushroom to Roger Heim, well-known mycologist in Paris. Heim classified the mushrooms as *Psilocybe mexicana* Heim. In 1958 Hofmann, a chemist at the Sandoz Lab., isolated from *Psilocybe mexicana* Heim hallucinogenic psilocybin and psilocin as active principles. Afterwards, the “sacred mushrooms” and psilocybin aroused the interest of psychiatrist and ethono-pharmacologist, (Miyoshi 1964; Beug and Bigwood 1982).

In Japan, too, there are several species of mushrooms known to be hallucinogenic. Among them Hikageshibiretake (*Psilocybe argentipes*), was reported by Yokoyama (1976) as a new species indigenous to Japan (Fig. 1). He also reported an accidental poisoning by this mushroom at a sampling party but this

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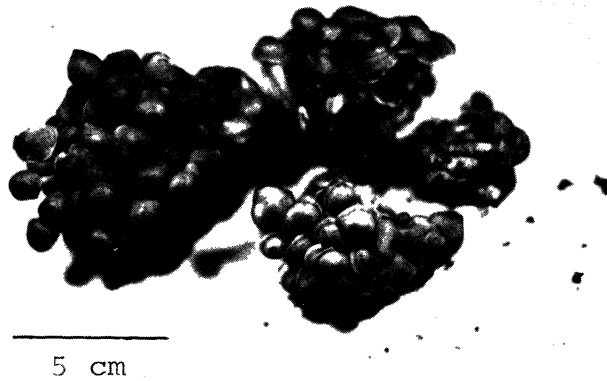


Fig. 1. *Psilocybe argentipes* K. Yokoyama
Photo: Kusano

report was not made from a psychiatric viewpoint. In 1981 Kusano, one of the present authors, and his colleagues isolated psilocybin as a hallucinogenic principle from Hikageshibiretake.

In this paper we will report five cases of intoxication by this mushroom, Hikageshibiretake, which happened in 1980 and in 1984 in Miyagi Prefecture, Japan. Therefore, this is the first report of the intoxication by psilocybin-containing mushroom from psychiatric aspects in Japan.

METHODS AND PATIENTS

We examined cases 1, 2 and 3 ten days after and cases 4 and 5 four years after the occurrence of poisoning. We tried to record as precisely as possible the subjective experiences from patients and the impressions of the patients from their family members and physicians involved in order to reconstruct the psychopathology of the mental states. Cases 1, 2 and 3 occurred in the same family in September 1984 and the other two occurred in the same locality in August 1980. All cases had no previous psychiatric history.

Case 1

The patient was a 36 year-old farmer. He took 6 or 7 mushrooms with soup at supper. Within 30 min after the meal he felt a vague sensation as if he had got drunk on whisky, and also felt dizzy and feverish. Paresthesia and numbness of his extremities followed. He had also a curious sensation of his body floating in the air and his arms seemed not to be his own. About one hour after he could not walk or stand up. Changes in visual perceptions also occurred; stationary objects appeared to move vigorously right and left and up and down. The margin of objects seemed yellow in color. Soon after the onset of the symptoms he noticed that his condition was the result of eating mushrooms. When he knew that his wife and his mother were also poisoned by them, he became very anxious and frightened of their conditions in spite of his mild euphoria. At the doctor's visit, about one and half hours after the onset, his speech was inarticulate and he could not explain his condition. The doctor said the patient's body temperature and blood pressure had been within normal limit. The doctor gave him an Obelon injection.

After he slept for 2 to 3 hr, his family and his neighbors called him again and again to wake him up, but he could not react to the environmental stimulations while he seemed to be awake. He and his wife (Case 2) were sent to an emergency hospital. The doctor who examined them said that they had been awake but had been unable to answer his calls. They could move very slowly but not spontaneously. They received a venous drip infusion (each 1,000 ml of 5% glucose solution and Ringer's solution). Though the effect of the infusion seemed to be unclear, during the infusion they became able to speak in a slow and halting way. When he got up early in the next morning, he felt absent-minded about himself and his surroundings. He presented amnesia about his experiences after the doctor's visit.

Case 2

A 35 year-old wife of case 1 took 3 mushrooms and soup. After 30 min, she felt very giddy and faint as if she had a cerebral anemia. Soon she was unable to keep standing and had to lie down on the floor of the kitchen. Things seemed to be unreal and distant from her. Stationary objects appeared to be a dark yellow. Then she felt very sleepy, however, she thought that she would never wake up again if she fell asleep. Stereotyped thought occurred; many times she repeated "I have to go farm and do my work" and "I have to go somewhere". When she saw her husband in the bedroom who could not respond to any stimulations, she thought her husband must be dying. Just then synesthesia occurred to her; when she closed her eyes, she hallucinated some curious dark red bloody patterns and heard funeral music she associated with her husband.

She was sent to the hospital with her husband. At the hospital she could scarcely explain her own condition. She claimed that she had been in a horrible dream during all her experiences, especially in the culminating period. The next morning she felt vague sensations of being in an unreal world.

Case 3

The patient was a 70 year-old widow, a mother of case 1. After supper she also felt so dizzy that she could not walk straight, and had to lie down on her bed. Objects in the room looked to be swaying vigorously, and they seemed to be shining under the sun even in the night. She was dazzled by flickering lights.

During her experiences she was completely alert. She had anxious feelings of having been dying. Visual effects subsided gradually within five hours. She got up early in the next morning and felt her body and mind were not her own ones throughout the day.

Case 4

A 62 year-old male farmer. He was under treatment for hypertension. He ate 3 mushrooms and soup with his wife at breakfast. After 20 min he felt so giddy and feverish that he thought that his blood pressure might be high. After taking a rest for about 10 min, various visual phenomena began. Surfaces of everything he saw looked yellow, red and green. The illusional motion of objects and viewed surfaces, and the kaleidoscopic color patterns were vividly hallucinated. He was paralyzed and could not walk straight. His wife was also attacked by the same clinical features. She fell into a panic reaction. At the onset of the symptoms he realized that they were poisoned by toxic mushrooms. They were sent to the town hospital and were admitted for a week. They were treated by diazepam administration and gastric lavage. Visual effects such as brighter colors and sharper margins of the objects and unsteady walk continued for a day. He said that his entire experience had been unpleasant and he was frightened of becoming insane and of death.

Case 5

The patient was a 55 year-old widow. She took two mushrooms at supper. At table she felt dizzy and giddy, and euphoric. Soon the motion of the objects and kaleidoscopic

TABLE 1. *Clinical symptoms of five cases of mushroom poisoning*

	Case 1	Case 2	Case 3	Case 4	Case 5
Feeling of fever	+	+	+	+	+
Dizziness	+	+	+	+	+
Paresthesia and numbness	+	-	-	+	-
Vague sensation	+	+	+	+	+
Euphoria	+	-	-	-	+
Anxiety and fear	+	+	+	+	+
Visual effects					
Motion of object	+	-	+	+	+
Chromopsy	+	+	+	+	+
Elementary hallucination	+	+	+	+	+
Auditory hallucination	-	+	-	-	-
Synesthesia	-	+	-	-	-
Change of body image	+	-	-	-	-
Depersonalization and derealization	+	+	+	+	-
Dreamy state	-	+	-	-	-
Stupor	+	±	-	-	-

colored patterns, especially beautiful red, yellow, and green, geometrical patterns were hallucinated impressively. As soon as she realized the mushroom poisoning, she fell into a high degree of anxiety and fear of death. She went to the doctor's office and was treated with a minor tranquilizer. Her symptoms subsided within 4 hr. She was conscious during all her experiences.

DISCUSSION

Psychiatric symptoms of our cases are summarized in Table 1.

Psilocybin, LSD-25 and related indoleamines have significant effects upon serotonergic neurons of the raphe nucleus, i.e., inhibition of the firing rate of these neurons and are more potent on the presynaptic than postsynaptic receptors. This increasing ability of indoleamines to discriminate between pre- and post-synaptic receptors parallels their increasing potency as hallucinogens (Haigler and Aghajanian 1977).

Pure psilocybin induces an abnormal mental state in man resembling that seen after taking LSD-25 and mescaline (Ishibashi and Shirahashi 1958; Isbell 1959; Leuner 1962). Psilocybin causes definite mental effects in doses of 2 to 8 mg, which are accompanied by sympathomimetic signs such as mydriasis, elevation of body temperature, pulse and respiratory rates and blood pressure. Abnormal mental states characterized by feelings of strangeness, euphoria, difficulty in thinking, anxiety and true visual hallucination, alteration of body image, time sense and a dreamy introspective state (psychedelic) were reported by the volunteer subjects. Basically, symptoms of our cases were similar to those

experienced by the above mentioned volunteer subjects.

Case 1 taking a relatively large amount of mushrooms showed a toxic stuporous state with amnesia. Cases 3, 4 and 5 who took a relatively small amount showed a mild psychedelic state with consciousness. Case 2, the person who experienced a psychedelic state with a substuporous and dreamy consciousness close to delirium, took a medium amount of mushrooms. Therefore, it can be said that the severity was parallel to the amount of ingestion. In general, toxic effects of this mushroom were induced by relatively small amounts, though Hikageshibiretake contained variable quantities of psilocybin (0.003–0.55% dry weight) (Koike et al. 1981).

From our cases it may be said that three specimens (about one g dry weight) are the suggested dosage to cause poisoning. Compared with the foreign reports on abuse (Hyde et al. 1978 ; Mills et al. 1979 ; Peden et al. 1982 ; Mack 1983), the amount of ingestion seemed to be smaller in our cases, therefore, it may be concluded that Hikageshibiretake is considerably toxic in regard to our cases.

Psychopathologically, anxiety and panic reactions were seen in all cases, in spite of mild euphoria (Cases 1 and 5). These were the secondary emotional reactions to the danger of lives of their own and family members and to getting out of control or becoming insane by ego-alien subjective experiences with acute onset. This would be an important difference between the volunteer experiments and our cases which were psychiatrically unsophisticated.

There have been no report on abuse for recreational use and few reports on accidental poisonings, but Hikageshibiretake and other psilocybin containing mushrooms such as Kawarikoshibatake (*Psilocybe medraria*), Aizomeshibafutake (*Psilocybe subcaerulipes*) and Waraitake (*Panaeolus papilionaceus*) are native mushrooms in Japan (Kusano, unpublished). Therefore, there is a possibility that these abuses might occur.

It is very important to understand that subjective experiences are divided into primary toxic effects and secondary emotional reactions. Since the toxic effects are short-lived and subside within a few hours, it appears that no active treatment is necessary. However, it is very necessary to recognize that emotional panic reactions occurred commonly as in our cases, and behavior problems such as violence, aggressive actions, homicidal and suicidal attempts (Peden et al. 1982), prolonged schizophrenia-like psychosis (Hyde et al. 1978) and convulsions (Mack 1983) occurred in some cases. In our cases (4 and 5), antianxiety drugs seemed to be effective for panic reactions and might prevent further mental deterioration.

Therefore, from a practical viewpoint we think that the patients with the hallucinogenic mushroom poisoning should be carefully observed and be treated under the psychiatric management.

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References

- 1) Beug, M.W. & Bigwood, J. (1982) Psilocybin and Psilocin levels in twenty species from seven genera of wild mushrooms in the Pacific Northwest, U.S.A. *J. Ethnopharmacol.*, **5**, 271-285.
 - 2) Haigler, H.J. & Aghajanian, G.K. (1977) Serotonin receptors in the brain. *Fed. Proc.*, **36**, 2159-2164.
 - 3) Hofmann, A., Heim, R., Brack, A. & Kobel, H. (1958) Psilocybin, ein psychotroper Wirkstoff aus dem mexicanischen Rauschpilz *Psilocybe mexicana* Heim. *Experientia*, **14**, 107-109.
 - 4) Hyde, C., Glancy, P., Omerod, P., Hall, D. & Taylor, G.S. (1978) Abuse of indigenous psilocybin mushrooms: A new fashion and some psychiatric complications. *Brit. J. Psychiat.*, **132**, 602-604.
 - 5) Isbell, H. (1959) Comparison of the reaction induced by psilocybin and LSD-25 in man. *Psychopharmacologia*, **1**, 29-38.
 - 6) Ishibashi, T. & Shirahashi, K. (1958) Mental disturbances experimentally induced by D-lysergic acid diethylamine (LSD-25). *Psychiat. neurol. jap.*, **60**, 1404-1405. (Japanese).
 - 7) Koike, Y., Wada, K., Kusano, G., Nozoe, S. & Yokoyama, K. (1981) Isolation of psilocybin from *Psilocybe argentipes* and its determination in specimens of some mushrooms. *J. natural Products*, **44**, 362-365.
 - 8) Leuner, H. (1962) Grundzüge einer konditional-genetischen Psychopathologie am Beispiel der experimentellen Psychose. *Nervenarzt*, **34**, 198-206.
 - 9) Mack, R.B. (1983) Phenomenally Phunny Phungi — Psilocybin toxicity. *New Castle med. J.*, **44**, 639-640.
 - 10) Mills, P.R., Lesinskas, D. & Watkinson, G. (1979) The danger of hallucinogenic mushrooms. *Scot. med. J.*, **24**, 316-317.
 - 11) Miyoshi, A. (1964) Psychological study of the psilocybin psychosis — comparison with the LSD-25 psychosis —. *Psychiat. neurol. jap.*, **66**, 826-836. (Japanese)
 - 12) Peden, N.R., Pringle, S.D & Crooks, J. (1982) The problem of psilocybin mushroom abuse. *Human Toxicol.*, **1**, 417-424.
 - 13) Yokoyama, K. (1976) A new hallucinogenic mushrooms, *Psilocybe argentipes* K. Yokoyama sp. nov. from Japan. *Trans. mycol. Soc. Jap.*, **17**, 349-354.
 - 14) Wasson, R.G. (1957) Seeking the magic mushroom. *Life*, **22**(12), June 10, 44-60.
 - 15) Wasson, R.G. (1959) The hallucinogenic mushrooms of Mexico: an adventure in ethnomycological exploration. *Trans. N.Y. Acad. Sci.*, **21**, 325-339.
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