

Short communication

Fly agaric (*Amanita muscaria*) poisoning, case report and review

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Abstract

Gathering and eating mushrooms and other plants containing psychoactive substances has become increasingly popular among young people experimenting with drugs. Dried fly agaric *Amanita muscaria* fruiting bodies were eaten by five young persons (18–21 years of age) at a party in order to evoke hallucinations. Visual and auditory hallucinations occurred in four of them, whereas a 18-year-old girl lost consciousness. The following morning, she went to the Clinic of Toxicology. Due to the fact that not all the active substances present in the fly agaric have been identified, and some of them have an effect after a period of latency, the patient was admitted for several days of observation during which check-up examinations were performed. After four days without any problems, she was discharged. The poisoning regressed with no organ complications. The remaining persons who had eaten the fly agaric were free from any complaints.

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1. Introduction

Man has been taking drugs for thousands of years. People have always been interested in substances that have an effect on the mood, perception and the cognition of a new reality. The psychotropic properties of *Amanita muscaria* have been known since ancient times. The use of the fly agaric is connected with mysticism. In Poland, there are plants such as *Datura stramonium* and hallucinogenic mushrooms that have become an increasingly frequent cause of poisoning, especially in young persons who experiment with psychoactive substances. In summer and autumn, mushroom poisoning is a frequent cause of hospitalisation in the Clinic of Toxicology (Satora, 2004).

In Poland, the fly agaric cannot be mistaken for any other mushroom. *A. muscaria* is commonly found in birch and coniferous tree forests throughout Poland from July to November. Its fruiting bodies reach up to 200 mm in height, whereas its caps—even up to 200 mm in diameter. Fly agaric poisoning happens accidentally, especially in children; however, it is also a cause of deliberate poisoning. Recently, toxicological centres have increasingly dealt with the practices of getting intoxicated through drinking infusions made from those mushrooms or eating the whole fruiting bodies.

2. Case study

Six large fruiting bodies of the fly agaric were gathered in a city park in Kraków one morning. The persons who gathered them used a key to mushrooms. Then the caps were

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skinned, shredded and dried in an oven. On the same evening, the mushrooms were served at a party. They were eaten with bread and salad by five persons. The participants drank a can of beer each. The first clinical manifestations appeared after about 20 min. Each person (between the ages of 18–21, four males and a female) experienced auditory and visual hallucinations (heightened colour perception). Disturbing reactions occurred in the 18-year-old girl. Initially, she had severe hallucinations, followed by loss of consciousness. Other partygoers induced her to vomit and made her drink liquids. Those who had also eaten the mushrooms exhibited no symptoms. Due to general debility, tiredness and gastric pain, next day she went to the Casualty Department of the Clinic of Toxicology, Medical College, Kraków. The patient was weak; palpation revealed tenderness in the stomach. Bilirubin level was slightly elevated, whereas amino-transferases and prothrombin index were within normal limits. No other abnormalities or metabolic disorders were found in the laboratory investigations of hepatic and renal functions. There was a regular sinus rhythm of 60/min, PQ 113 ms, QT 400 ms in the ECG; the tracing was normal. Urine samples were collected 5 h after mushroom ingestion, analysis for THC, amphetamine, opiates and amanitin was performed. The results were negative. Mycological analysis was made and the species of the poisoning-inducing mushroom was determined. Due to the fact that not all the active substances present in the fly agaric have been identified, and some of them have an effect after a period of latency, the patient was admitted for a several-day observation during which check-up examinations were performed. Since the patient complained of gastric tenderness, abdominal ultrasound examination was carried out. The examination revealed two hyperechoic foci—steatosis—in the right hepatic lobe. On the following day, a psychological evaluation was performed. The patient admitted having experimented with marijuana, hallucinogenic *Psilocybe* mushrooms and drunk beer occasionally. It was the first time she had tasted the fly agaric, but its effect made her refuse to take it any more. The patient was diagnosed with puberty-related emotional problems; she was provided with follow-up psychological care. In the treatment the patient was administered activated charcoal and nifuroxazide. She received also potassium chloride and fed light diet.

3. Discussion

Despite numerous studies of the substances present in the fly agaric, the correlation between the physicochemical properties of the active components and the mode of consumption is still unclear. Ibotenic acid (pantherine, agarine) and muscimol, which are readily soluble in cold water, are the main active substances contained in the fly agaric. The red skin of the cap and the yellow tissue beneath it contain the highest amounts of these substances. Another

substance in the fly agaric is muscazone, which is a lactame isomer of muscimol. The substances have effects on the central nervous system (tiredness, confusion), but they act with a longer latency period. Other substances found in the fly agaric are: choline, acetylcholine, betaine, muscaridine; minor amounts of tropane alkaloids: atropine, hyoscyamine, scopolamine and bufotenine. The possible occurrence in *A. muscaria* of amatoxins and phallotoxins—the typical toxins of *A. phalloides*—is taken into consideration (Michelot and Melendez-Howell, 2003). Ibotenic acid and muscimol have a structure similar to that of the two main neurotransmitters of the central nervous system: glutamic acid and GABA. Ibotenic acid and muscimol act like neurotransmitters involved in the control of neuronal activity of spinal neurones in the central nervous system (Connor et al., 1991; Michelot and Melendez-Howell, 2003). In cats, ibotenic acid is known to act on glutamic acid receptors, whereas muscimol acts on GABA receptors. Ibotenic acid and muscimol cross the blood-brain barrier, most probably by active transport, causing brain disorders by counterfeiting endogenous neurotransmitters (Michelot and Melendez-Howell, 2003). In most cases, one cap is a sufficient amount for psychotropic effects (Benjamin, 1992). Clinical manifestations typical of the poisoning with the above-mentioned *Amanita* species are those resembling alcohol intoxication. *A. muscaria* and *A. pantheria* were used by witch doctors for inducing hallucinations. In spite of the fact that tropane alkaloids are not present, the signs and symptoms of poisoning with the fly agaric are referred to as ‘mycoatropic’ and they resemble those produced by *Datura stramonium*, *Atropa belladonna* and *Hyoscyamus niger*. They are also referred to as ‘pantherine-muscarine’ poisoning syndrome. The first manifestations appear 30 min to 2 h after the mushroom consumption. First, there is dizziness, difficulty in balance and movement coordination as well as tiredness that sometimes progresses into sleep. Those are followed by psychomotor excitement with euphoria or depression and anxiety, illusions and visual and auditory hallucinations (Davis and Williams, 1999). The phases of tiredness and excitement may alternate several times. There is an increase in body temperature, the skin and mucous membranes are dry, the face is red and the pupils are dilated. Nausea, vomiting and diarrhoea are quite frequent. In severe poisoning, there is tremor or tonic-clonic seizures with loss of consciousness, followed by a coma. In such cases maximum pupillary dilation, loss of corneal, superficial (e.g. abdominal reflex) as well as deep reflexes (e.g. knee reflex) are often observed. In the most severe cases, life-threatening respiratory and circulatory disorders may occur. Sporadically, muscarine-like manifestations may appear: sweating and hypersalivation. The duration of clinical manifestations does not usually exceed several hours. Retrograde amnesia is a frequent result of the poisoning. The severity of the reaction is proportional to the amount of the mushroom ingested. Tests with rats revealed decreases in acetylcholine esterase activity, liver glycogen,

blood urea nitrogen, together with the increase in blood glucose level; serum transaminase activities were not affected. The values returned to normal within 6 h. Biochemical changes develop 30 min after peritoneal injection of aqueous extracts of *A. muscaria* (Yamahura et al., 1983).

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