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Case Report

A Prolonged Course of *Amanita muscaria* Mushroom Poisoning

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ABSTRACT

We report the case of a 56 year old male patient who presented to the Emergency Department (ED) with altered mental status and reported *Amanita muscaria* mushroom ingestion. *Amanita muscaria* or fly agaric mushrooms are known to be poisonous to humans and hallucinogenic by nature. However, the prognosis of the poisoning is generally minor and short-lived, lasting less than 24 hours.

Keywords: *Amanita muscaria*; Poisoning; Mushrooms; Toxicology

INTRODUCTION

It is generally characterized by Central Nervous System (CNS) dysfunction [1]. In this case, the patient had prolonged symptoms, alternating between excitatory muscle fasciculations with subsequent rhabdomyolysis, coma and apnea. The patient was intubated for five days while being treated for these symptoms. While one cap is potentially hallucinogenic, this patient reports taking up to 8 dried caps of fly agaric mushroom. The patient was treated with an infusion of propofol and an Intra-Venous (IV) phenobarbital load to control his excitatory symptoms and ultimately recovered with no lasting neurologic sequelae.

CASE REPORT

AA 56 year old male patient with an unknown past medical history presented to the ED with altered mental status. The patient, found covered in vomit, urine and feces was described as obtunded with intermittent periods of agitation. According to the police that accompanied the patient to the ED, the patient took 10 grams of fly agaric mushrooms approximately seven hours prior to arrival. Friends reported that he gradually started to seem "off" and "confused", lying down for several hours before becoming unresponsive. The patient was intubated in the ED. The patient's initial vital signs were blood pressure 136/112, heart rate 125 beats per minute, temperature 96 °Fahrenheit (35.6 °Celsius), respiratory rate 19 and oxygen saturation level 94%. The patient was given a Glasgow Coma Scale score of 3. Lab results revealed a leukocytosis, high anion gap metabolic acidosis, hypokalemia, acute kidney injury, hyperglycemia, and elevated lactate level (Table 1). Ethanol, salicylate, acetaminophen levels and the rapid urine drug screen were all negative. The patient was transferred to the Intensive Care Unit (ICU), where he was ventilated and sedated with propofol. The patient was noted to have alternating periods of excitability and muscle fasciculations followed by periods of apnea. An electroencephalogram was performed which did not reveal true seizures. On ventilator day three, the patient was still experiencing muscle fasciculations. The patient was loaded with Intra-Venous (IV) phenobarbital. The patient was extubated on Hospital Day (HD) five and remained in the ICU until day six for delirium until transferred to a lower level unit. The patient was discharged on HD 14 after a prolonged course for a workup of low-grade fevers and management of diabetic ketoacidosis in the setting of newly diagnosed diabetes. After the patient's delirium resolved, he reported the last thing he remembers is eating at least eight dried mushroom caps his friend ordered off of the internet, believed to be *Amanita muscaria*. This was the first time that the patient attempted to eat these mushrooms reporting he ate them with an intent to get high with no lasting effect. The patient describes the mushrooms as orange in color, tasting "like morels" (Figure 1).

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Table 1: Lab results.

Component	Value	Abnormal levels	Reference range	Units
Glucose	416	High	65–99	mg/dL
BUN	27		7–28	mg/dL
Creatinine	2.14	High	0.53–1.30	mg/dL
Sodium	144		135–145	mmol/L
Potassium	3.4	Low	3.5–5.2	mmol/L
Chloride	103		100–109	mmol/L
Carbon Dioxide	21	Low	23–31	mmol/L
Calcium	10.1		8.5–10.1	mg/dL
Alkaline Phosphate	75		35–120	U/L
Albumin	4.8		3.5–4.8	g/dL
Bilirubin, Total	0.4		0.2–1.0	mg/dL
Protein, Total	9.3	High	6.3–8.3	g/dL
AST	44	High	<41	U/L
ALT	62	High	<56	U/L
Anion Gap	20	High	3–11	
GFR, Calculated	33	Low	>60	mL/min/1.73 m2
Hemoglobin	16.9		12.5–17.0	g/dL
Hematocrit	51.6	High	37.0–48.0	%
WBC	22.3	High	4.0–10.5	thou/cmm
RBC	5.62	High	4.00–5.40	mill/cmm
Platelet count	299		140–350	thou/cmm
Lactate	10.8	High	0.5–2.1	Mmol/L Fin

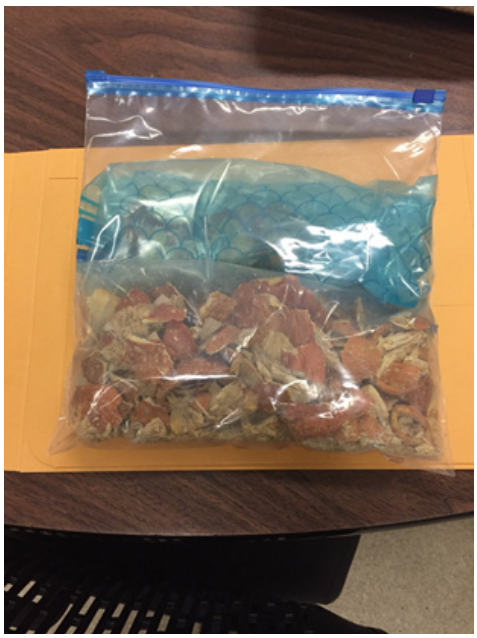

Figure 1: Patient describes the mushrooms as orange in color, tasting "like morels".

RESULTS AND DISCUSSION

The fly agaric *Amanita muscaria* mushroom cap can be 20-50 cm in diameter and bright red or orange with white plaques. It is uncommonly mistaken for other mushrooms and is typically used for recreational purposes [1]. Typically, people take *Amanita muscaria* mushrooms in order to hallucinate. Ibotenic acid and muscimol are the main active substances in the fly agaric. The red skin of the cap and the yellow tissue beneath it contain the highest amounts of these substances. Ibotenic acid and muscimol behave like neurotransmitters in the CNS: glutamic acid and GABA, respectively. In most cases, one cap is a sufficient amount for psychotropic effects [2,3]. The signs and symptoms occur within 30 minutes to two hours after ingestion. The symptoms may be excitatory as a result of the ibotenic acid and described as psychomotor agitation, muscle fasciculation or seizures. The symptoms that result from the inhibitory muscimol present as dizziness, lethargy and coma [3]. These phases may alternate several

times. However, these symptoms do not typically last more than several hours [3]. Although muscimol and ibotenic acid are the primary toxins, *Amanita muscaria* may also contain small amounts of muscarine that can stimulate muscarinic acetylcholine receptors resulting in cholinergic signs and symptoms [4]. *Amanita muscaria* poisoning is typically short-lived and rarely causes death. Typically, the patient recovers fully with supportive care and time. There are few case reports, if any, describing a prolonged course as a result of *Amanita muscaria* ingestion [5]. report the case of prolonged paranoid psychosis with visual and auditory hallucinations lasting up to five days [5].

The patient was initially treated with an infusion of propofol, fentanyl and midazolam while mechanically ventilated. On HD three, the patient had persistent muscle fasciculations and convulsive activity with persistently elevated CK and lactate levels. Medical toxicology recommended giving the patient a 15 mg/kg load of phenobarbital to assist with the persistent excitatory symptoms. Phenobarbital is a GABA agonist that acts on the chloride channels, prolonging their duration of opening and thus increasing the threshold for an action potential [6]. The half-life of phenobarbital is approximately 79 hours (range 53-118 hours) and therefore stays in a patient's system for many days controlling any adrenergic symptoms. Phenobarbital loading is not a common recommendation for fly agaric poisoning. One report recommends using up to 30 mg of IV phenobarbital to treat the adrenergic symptoms of poisoning [7]. After the phenobarbital load, the patient was extubated on HD five and continued to improve until his discharge. We propose that a loading dose of IV phenobarbital is reasonable in the uncommon presentation of prolonged *Amanita muscaria* toxicity.

CONCLUSION

Amanita muscaria are known to be poisonous to humans and hallucinogenic by nature, though they rarely cause death, they do have prolonged affects. *Amanita muscaria* or fly agaric mushrooms can cause vomiting, diarrhea, salivation, bronchoconstriction and bradycardia. Giving a loading dose of IV phenobarbital in addition to traditional supportive care with sedation and ventilation could yield positive treatment outcomes in patients presenting with prolonged *Amanita muscaria* poisoning.

CONFLICT OF INTEREST

All authors have made substantial contributions to the case and endorse the paper and its conclusions. None to report.

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