

## Clinical toxicology of 'magic mushroom' ingestion

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### Summary

The clinical features are reported in 27 cases of 'magic mushroom' ingestion. Mydriasis and hyper-reflexia were common as were disorders of perception and affect. *Psilocybe semilanceata* appears to have been the species of fungus involved.

### Introduction

Hallucinogenic mushrooms have been used for magico-religious purposes by the Indians of Mexico for many centuries (Wasson, 1959) but the active constituents, psilocybin and psilocin were not identified until 1958 (Hofman *et al.*, 1958). These compounds were subsequently found in the British species *Psilocybe semilanceata* (Benedict, Tyler and Watling, 1967; Mantle and Waight, 1969) but, despite widespread use of psilocybin mushrooms for 'recreational purposes' elsewhere (Pollock, 1975), it was not until 1978 that such use was described in Britain (Hyde *et al.*, 1978) from 3 patients from Manchester. There have since been further case reports from Glasgow (Mills, Lesinkas and Watkinson, 1979) and Aberdeen (Cooles, 1980) and the subject has also received comment in a national newspaper (*The Observer*, 1980). Two handbooks for would-be users of these mushrooms have recently been published (Cooper, 1979; Release Collective, 1979).

Ingestion of these so-called 'magic mushrooms' has been popular amongst teenagers in the Tayside region in the past 2 Autumns and the authors feel that a description of the clinical features will be useful for clinicians who may see such patients for acute medical or psychiatric assessment.

### Patients

Twenty-seven patients presented to hospital

following the ingestion of magic mushrooms in the months of September and October of 1979 and 1980. The authors personally admitted or subsequently interviewed 8 of the patients and the case records of all the patients have been reviewed. The mean age was 16.3 years (range 12-24 years) and 10 were school children. Seven patients were self-referrals. Of the remainder, 12 were brought to hospital by concerned parents, 5 by friends, 2 by the police and one had telephoned the Samaritans.

### Mushrooms and mode of ingestion

The authors have identified *P. semilanceata* growing on sites described by patients and also in gastric contents aspirated from patients. Illustrated descriptions of the fungus have been published (Watling, 1973a; Cooper, 1979).

The number of mushrooms ingested varied from 'a handful' to 100, (mean 56 in those patients who quantified it). Eighteen patients ate the mushrooms raw while in 6 cases the mushrooms were brewed in boiling water and the liquor consumed. Two patients ate dried mushrooms and one a mushroom stew.

### Clinical features

Tachycardia of  $\geq 100$  beats per minute (b/min) was noted in 10 patients while only one was significantly hypertensive (BP 180/110 mmHg). Pupils were dilated (but reacting to light) in 20 of the 23 patients in whom pupil size was noted. Deep tendon reflexes were brisk in 12 of 18 patients from whom this information was recorded. Three patients exhibited facial flushing, 3 suffered transient abdominal pain and nausea, one patient was vomiting on admission and one was incontinent of urine.

Alterations in perception occurred in 23 patients

and chiefly affected vision. Colours appeared to be particularly vivid and kaleidoscopic phenomena and flashes of coloured light were described. Facial appearance received special comment with faces appearing to change shape and colour and also to stare at the patient. Fully formed visual hallucinations of people occurred in 4 patients and in one case these were interpreted as being Martians.

Two patients noted that perception of sound was heightened while 2 suffered auditory hallucinations. Body image perception was affected in 4 patients who complained of apparent swelling of bodily parts including the tongue, while 2 patients felt a generalized numbness. Two patients described *déjà vu* phenomena while sexual fantasies were experienced by one patient.

One patient (a 12-year-old boy) had been running out in front of passing cars and was confused and disorientated on admission. Seven patients were agitated and one ran away from the Admissions and Emergency Department, leaving behind his shoes and shirt. Five patients were initially euphoric and of these 4 later became drowsy. Three patients were drowsy but easily rousable when first seen and 2 were uncommunicative and staring blankly.

Two patients exhibited pressure of speech and one was talking to himself. Twelve patients described their experiences as frightening either on admission or after recovery, and 3 had felt that they were going to die.

The principal clinical features are summarized in Table 1.

TABLE 1. Summary of principal clinical features in 27 cases of magic mushroom ingestion

	No. of patients
Perceptual disorder	23
Mydriasis	20
Dysphoria	13
Hyperreflexia	12
Tachycardia ( $\geq 100$ b/min)	10
Drowsiness	7
Euphoria	5

#### Time course

Twenty patients were entirely recovered after overnight observation, a maximum of 12 hr, and indeed, in about 50% of these patients the entire experience was over within 6 hr. Of the other patients: in one the pupils remained dilated at 12 hr (normal at 18 hr) in one the BP was elevated at 12 hr (normal at 18 hr) and one was still drowsy at 18 hr (normal at 24 hr). One patient was still hallucinating 12 hr after admission but not at 24 hr.

One patient required admission to a psychiatric unit because of hallucinations in which he identified voices speaking to him as God and the Devil. He

was very frightened. The hallucinatory episodes responded rapidly to treatment with chlorpromazine but recurred on 3 successive evenings despite no further ingestion of mushrooms.

Two patients presented again, one 7 days and one 9 days after the initial episode of mushroom ingestion, both with acute panic attacks and in both cases after ingestion of considerable quantities of alcohol.

#### Management

Twenty-four patients were admitted to hospital for observation, 2 having refused admission and one having been sent home fully recovered. Gastric lavage was performed in 12 patients and 5 were given ipecacuanha. In 4 cases mushrooms were identified in the gastric contents. One patient required administration of chlorpromazine for hallucinations while one patient presenting with a late panic attack required diazepam.

#### Discussion

The practice of magic mushroom ingestion has been common in the Tayside area in the last 2 Autumns and in a sample of 59 children aged 14–15 years from 2 school classes, interviewed by A.F.B., approximately 66% had heard of the properties of these fungi. In contrast to the report from Manchester (Hyde *et al.*, 1978) where the use of magic mushrooms was centered on the 'hippy' subculture and the report (*The Observer*, 1980) on a group of 'new gypsies' from mid-Wales, the problem in Tayside is clearly different, involving teenagers and young adults throughout the social classes. Solvent abuse by teenagers has also been a problem in this area.

The important features noted on physical examination were mydriasis, hyperreflexia and tachycardia of which mydriasis was the most constant feature. Hyde *et al.*, (1978) have commented on sympathomimetic effects and in initial volunteer studies (Isbell, 1959; Malitz *et al.*, 1960; Holister *et al.*, 1960 and Rinkel *et al.*, 1960) utilizing pure psilocybin, mydriasis and facilitation of reflexes were prominent features while changes in pulse rate and BP were less constant, with one observer (Malitz *et al.*, 1960) noting that tachycardia and hypertension occurred only in association with anxiety.

A range of psychological responses has been noted in this study. Changes in mood ranged from euphoria to severe anxiety and agitation, while a variety of perceptual abnormalities occurred. Hallucinations were on occasion complex and elaborated by secondary delusions while one patient suffered an hallucinosis which persisted for 3 days. This variety of effects has been noted previously (Hyde *et al.*,

1978). A similar range of response to pure psilocybin when administered to volunteers has also been noted (Isbell, 1959; Malitz *et al.*, 1960; Holister *et al.*, 1960; Rinkel *et al.*, 1960; Parashos, 1976–7) and identical doses of psilocybin may have widely differing effects in different individuals. It has been suggested that the effect on mood in particular is dependent on the subject's pre-exposure personality traits (Parashos, 1976–7).

Treatment by gastric lavage or induced emesis was instituted in 17 patients in this study, the importance of this having previously been emphasized (Lincoff and Mitchell, 1977). The present experience suggests that in the context of the typical clinical features described above and if a good description of the mushrooms ingested is available, as was the case in 21 of the 27 patients, then these procedures are unnecessary.

*Amanita muscaria* and *A. pantherina* may cause hallucinations or delirium coming on within 2 hr of ingestion (Matthew and Lawson, 1979) and thus the clinical features may be confused with those of psilocybin mushroom ingestion, particularly if there are prominent anti-cholinergic effects. The appearance of these 2 species is very different from the small psilocybin mushrooms (Watling, 1973b), they may be considerably more toxic and if there is any suspicion that they have been ingested then gastric lavage is essential (Matthew and Lawson, 1979).

The authors feel that patients with prominent symptoms should be observed, and particularly agitated patients may benefit from the administration of a benzodiazepine (Solursch, 1976). One patient in the present study required the administration of chlorpromazine for control of hallucinations. Of the 2 patients who presented with attacks of panic some time after the initial episode of mushroom ingestion, one required diazepam and this has been widely used in the management of these so-called 'flashbacks' and attacks of panic associated with abuse of other hallucinogens (Ungeleider and Frank, 1976).

In conclusion, 27 patients presented to hospital emergency departments in Tayside following the ingestion of magic mushrooms. The effects were usually short-lived and the main risks to health appear to be from the acute effects on the patients' behaviour which may be life-threatening. The possibility of ingestion of more toxic species of fungi must also be considered.

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