



Toxicological properties of different mushrooms

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ABSTRACT

Mushrooms are popular valuable foods as they are low in calories and rich in nutrients and also have therapeutic properties beside that there are some species which are not fit for human consumption because of toxins present in them make them poisonous. These toxins cause minor to serious damage to human health. To prevent this it is important to know about mushroom species we are consuming.

Key words: Mortality; Poisoning, Symptoms, Toxins

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INTRODUCTION

Mushroom is fleshy spore bearing fruiting body of a fungus produce above ground, on soil or on its food source. It is mainly classified into 3 types edible, poisonous, medicinal mushroom. Mushroom which are used for human consumption are edible mushroom, while those which are used for medicinal mushroom are medicinal mushroom and those having powerful toxins are poisonous mushroom. The aim of present work is to review most common toxic species of mushroom [11].

MUSHROOM POISONING

Mycetism or mycetismus or mushroom poisoning refers to condition after consumption of toxic mushroom. There are 14 type of mycotoxins out of which 8 are listed:

Amanitin: It is worst toxin causing most number of deaths, they prohibits RNA synthesis in the body.

Gastrointestinal irritants: Most common type of mushroom poisoning. Symptoms seen within an hour includes diarrhea, vomiting.

Muscarine: It is found in *Inocybe* sp. and *Clitocybe* sp., after consumption symptoms like excessive secretion of tears, drop in blood pressure, perspiration is seen.

Isoxazole derivatives(muscimol, ibotenic acid and relatives): Several wild poisonous mushroom like fly agaric contain this. Its main effect is seen on central nervous system [8].

Gyromitrin: It affects vitamin B6 utilization thus inhibits amino acid metabolism.

Orellanine: It is a mycotoxin found in group of mushroom known as Orellani of family Cortinariaceae, the toxin cause nausea, vomiting, is seen.

Psilocybin: They are alkaloids that interact with brain, affecting nerve transmission.

Coprine: The mushroom containing coprine become dangerous when interacts with alcohol [8].

POISONOUS SPECIES

Genus *Amanita*

The genus is well known for the toxin amatoxin present in several species, viz., *Amanita phalloides*, *Amanita virosa*, *Amanita verna*, *Amanita ocreata*, *Amanita bisporigera*, *Amanita suballiacea*, *Amanita tenuifolia*, *Amanita hygroscoptica* etc. They consist of alpha-amanitin, beta-amanitin, gamma and delta-amanitin and also non-poisonous component amanullin and amaninamine from *A.phalloides* and *A.virosa*, respectively [13].

Other toxins present are phallotoxin that includes phalloin, phaloidin, phallisin, phallacidin, phallacin and phallisacin and virotoxin is also present [13]. Among all *Amanita phalloides* causes most number of death due to presence of amanitin and phallotoxin and mortality rate is between 10 to 20 %. Amatoxin disturbs protein syntheses and phallotoxin causes alteration of cellular membrane [3, 6]. Hallucinogenic effect is

also seen after consumption of some species like *A.muscaria* and *A.pantherina* due to presence of components like ibotenic acid and muscimol [8].

Genus *Clitocybe*

Species like *C.acromelaga* and *C.amoenolens* have presence of acromilic acid which is responsible for poisoning and it has two isomers ACRO-A most potent and the other one ACRO-B. [11] Other species also show muscarinic syndrome like *C.dealbata*, *C.rivulosa*, *C.candicans*, *C.cerussata* and *C.phyllophila* due to presence muscarine [2].

Genus *Inocybe*

It has total 40 species which are not considered to be edible. The species *I.asterospora*, *I.fastigiata*, *I.gobeyi*, *I.lilacina*, *I.nappies*, *I.pallidicremea*, *I.patowillandii*, *I.radiata*, *I.repanda*, *I.rimosae* etc. have toxic properties. They have presence of biogenic amines, muscarin, aeruginacin which produces neurotoxic and psychotropic effect [12].

Genus *Cortinarius*

Species like *C.speciosissimus* and *C.orellanus* have presence of cyclopeptide and orellanine and their metabolites are the most active ones which make it nephrotoxic and when orellanine is oxidized in renal tissue quinone compounds are produced which makes covalent bond with biological structures and at last cell is damaged [5].

Genus *Gyromitra*

There are some species which has presence of gyromitrin which makes it toxic. There are several reasons for intoxication caused by this genus one is it is difficult to distinguish because *G.esculenta* is known as false morels and is confused with *Morchella esculenta* and *Morchella elata* [4, 13]. The other reason is that toxin is water soluble and volatile thus boiling it for long time and inhalation of vapours also caused poisoning [7].

Genus *Psilocybe*

It is a little brown mushroom used for recreation purpose however there are some species like *P.semilanceta*, *P.mexicana*, *P.bohemica*, *P.cubensis* and *P.baeocistis* which contain psychedelic compound like psilocybin, psilocin, baeocystin and psilocybin is responsible for hallucinogenic properties [1].

Identification of poisonous mushroom

1. Avoid mushrooms which are bright colored.
2. Any mushroom that has open stem avoid it.
3. Avoid all mushrooms that has rings on stem.
4. Morels after first of summer it is false morel should be avoided..
5. Poisonous mushroom blackens silver.
6. Poisonous mushroom turns rice red when boiled [8].

Table 1: Toxins present in mushroom their symptoms and cure

Name of toxin	Symptoms	Cure
Amanitin	Symptoms is seen after consumption of 6-24 hours of consumption. In initial stages influenza diarrhea, abdominal cramps vomiting is seen and at later stages liver kidney begins to fail. Coma and death are common outcomes.	Detoxification of body is done penicillin, kutkin, silibinin, oral activated charcoal, electrolytes are given. In severe cases liver transplantation is done
Gastrointestinal Irritants	Symptoms are seen within 1-4 hours of consumption. It includes nausea vomiting diarrhea abdominal cramps.	No such damage is caused to the body once the food containing toxins is eliminated out of the body it is usually cured. Only one thing whose care should be taken of is the fluid balance of body.
Muscarine	Symptoms are seen within 15-30 mins of ingestion. In initial stages excessive salivation, sweating tears vomiting diarrhea are seen. In later stages decreased blood	Ingestion of an atetode called atropine is provided.

	pressure irregular pulse and breathing difficulties is observed .	
Isoxazole Derivatives (muscimol, ibotenicacid, relatives)	Symptoms are seen between 30 mins to 2 hours of ingestion . In initial stages nausea, vomiting is seen .In later stages effect on central nervous system is observed .Drowsiness ,visual distortion and rare cases coma is seen.	Measures to reduce anxiety is temporary means of cure.fluid and electrolyte supply are given.
Gyromitrin	Symptoms are seen between 7-10 hours of consumption.Initial stages comprise of nausea, diarrhea, vomiting. In later stages bloating, abdominal pain andfinally liver damage is observed	Pyridoxine or vitamin B6 is given to inhibit action of MMH. Benzodiazepines are also given to inhibit GABA receptors. MMH also inhibits change of folic acid to folinic acid so folinic acid needs to be given
Orellanine	Symptoms are seen between 36 hours -3 weeks of consumption . In initial stages nausea vomiting lethargy , frequent urination ,burning thirst , headache ,fever is seen .In later stages kidney failure is observed .	Hemodialysis is done .
Psilocybin/Psilocin	Symptoms are seen between 50-60 mins of ingestion. In initial stages hallucinations, perceived motions of stationary objects is seen. In later stages muscle weakness fatigue, uncontrolled laughter is seen .	Benzodiazepines is given.
Coprine	Symptoms are seen between 30 mins -2 hours of ingestion .In initial stages increase pulse rate flushing over upper half of body headache is seen . In later stages dizziness nausea vomiting is observed.	Treatment is given to keep body hydrated.

CONCLUSION

Many cases of intoxication are reported every year due to misidentification of species. As many life damaging toxins are present in some species and cause different syndromes. In order to prevent this proper identification of species is required and identification of symptoms as soon as possible helps to give correct treatment.

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