



Review on poisonous effects of mushrooms and its treatment

Suryabhan Dongre*¹, Vidhyashree Thorat², Sukhada Gawde³,

1. Associate Professor, Dept. of Agadtantra, Ayurved College, Sion, Mumbai
2. Assistant Professor, Dept. of Agadtantra, Ayurved College, Sion, Mumbai
3. Assistant Professor, Dept. of Agadtantra, B. S. Ayurved College, Sawantwadi.

*Corresponding author: Mob.No.9987524463 Email: sssdongre@gmail.com

ABSTRACT:

The term Mushroom actually refers to the reproductive portion of fungus which grows up from an underground mycelium. Certain species of mushrooms are non-poisonous and used as articles of food. Others are poisonous and cases of accidental poisoning occasionally occur from one of the poisonous ones being mistaken for an edible variety. The most frequent form of mushroom poisoning is caused by a wide variety of gastrointestinal irritants. The symptoms usually appear within 20 minutes to 4 hours of ingesting the mushrooms, and include nausea, vomiting, cramps, and diarrhoea, which normally pass after the irritant had been expelled. Ingestion of even a part of one mushroom of a dangerous species may be sufficient to cause death which may take place in three to six days. The general treatment of mushroom poisoning is symptomatic. We can avoid mushroom poisoning by not eating mushrooms picked

from the ground.

KEY WORDS – Mushroom species, Mode of action, Mushroom poisoning, Treatment, Prevention, Medico-legal aspect.

INTRODUCTION:

Mushroom is a reproductive portion of fungus which grows up from an underground mycelium (mass of filaments or hyphae constituting the vegetative portion of the fungus)¹. Of the numerous species of mushrooms, less than 5% are poisonous while many are edible and very popular in western and Chinese countries.² Mushroom poisoning (mushroom toxicity) occurs after the ingestion of mushrooms that contain toxins, often in the context of foraging for nontoxic, similarly appearing mushrooms. Mushrooms are the fruiting bodies of a group of higher fungi that have evolved contemporaneously with plants for millions of years. They are widely

distributed throughout the world. There are thousands of species of mushrooms, but only about 100 species of mushrooms cause symptoms when eaten by humans, and only 15-20 mushroom species are potentially lethal when ingested. No simple rule exists for distinguishing edible mushrooms from poisonous mushrooms. In more than 95% of mushroom toxicity cases, poisoning occurs as a result of misidentification of the mushroom by an amateur mushroom hunter.³ People are poisoned each year after eating mushrooms from their yard or outside locations. These mushrooms should not to be eaten. It's difficult to tell which mushrooms can be eaten and which cannot. Poisonous mushrooms can make you sick. Some are actually deadly.

Mushroom poisoning refers to harmful effects from ingestion of toxic substances present in a mushroom. These symptoms can vary from slight gastrointestinal discomfort to death in about 10 days. The toxins present are secondary metabolites produced by the fungus. Mushroom poisoning is usually the result of ingestion of wild mushrooms after misidentification of a toxic mushroom as an edible species. The most common reason for this misidentification is close resemblance in terms of colour and general morphology of the toxic mushrooms

species with edible species.

In the absence of a definitive identification of the mushroom, all toxic ingestions should be considered serious and possibly lethal. Once mushroom toxicity is diagnosed, treatment is largely supportive. Early volume resuscitation is important for liver and kidney toxic syndromes. Gut decontamination, including whole-bowel irrigation, may be necessary for *amatoxins*. Beyond the first postprandial hour, *orogastric lavage* is not recommended, because of its questionable efficacy.

AIM AND OBJECTIVE:

- To study poisonous effects of Mushrooms and its treatment.

Mushroom and its species -

Currently there are over 10,000 known types of mushrooms. That may seem like a large number, but mycologists suspect that **this is only a fraction of what's out there!** We can put these various species in one of 4 categories: saprotrophic, mycorrhizal, parasitic, and endophytic. These categories describe how the organism feeds itself.⁴

Saprotrophic -

These mushrooms are decomposers. They release acids and enzymes that break down dead tissue into

smaller molecules they can absorb. Thus decaying wood, plants, and even animals can become food for a saprotroph.

1. **Morels** (*Morchella angusticeps*, *Morchella esculenta*, etc)
2. **Reishi** (*Ganoderma lucidum*)
3. **Shiitake** (*Lentinula edodes*)
4. **White Button** (*Agaricus bisporous*)
5. **Cremini** (*Agaricus bisporous*)
6. **Oyster** (*Pleurotus ostreatus*)
7. **Maitake** (*Grifola frondosa*)
8. **Turkey tail** (*Trametes versicolor*)
9. **Giant Puffball** (*Calvatia gigantea*)
10. **Chicken of the woods** (*Laetiporus sulphureus*)
11. **Enokitake** (*Flammulina velutipes*)
12. **Shaggy Mane** (*Coprinus comatus*)
13. **Black Trumpet** (*Craterellus cornucopioides*)
14. **Yellow Houseplant Mushroom** (*Leucocoprinus birnbaumii*)

Mycorrhizal -

These mushrooms have a fascinating relationship with trees and

other plants. The mycelia of these fungi enter into a beneficial union with the roots of plants by either weaving into the root cells (endomycorrhizal) or wrapping around the roots themselves (ectomycorrhizal).

1. **Porcini** (*Boletus edulis*)
2. **Truffles** (*Tuber melanosporum*, *Tuber magnatum*, etc)
3. **Chanterelles** (*Cantharellus cibarius*, *Cantharellus formosus*, etc.)
4. **Matsutake** (*Tricholoma matsutake*)
5. **Caesar's Mushroom** (*Amanita caesarea*)

Parasitic -

Parasitic types of mushrooms also take plant hosts. Although in this case the relationship is one-sided. These fungi will infect the host and eventually kill it.

1. **Honey fungus** (*Armillaria mellea*, *Armillaria ostoyae*, etc)
2. **Caterpillar Fungus** (*Cordyceps sinensis*)
3. **Lion's Mane** (*Hericiium erinaceus*)
4. **Chaga** (*Inonotus obliquus*)

Endophytic -

Endophytic fungi deserve their

own category due to their *behavior*. *Endophytes* partner with plants by invading the host tissue. However, unlike with parasitic fungi, the host remains healthy and seem to benefit with increased nutrient absorption and resistance to pathogens. Unlike *mycorrhizal* fungi, most *endophytes* can be easily cultivated in a lab without their host present.

Classification of Mushrooms -

Depending upon the toxic principles present, mushrooms are classified as follows⁵-

1) *Cyclopeptide* containing mushrooms-

a) *Amanita phalloides* (also known as 'dead cap' or 'deadly agaric' and contains toxic principles like phalloidin which is more rapidly acting and powerful inhibitors of cellular protein synthesis, *phalloin*, *amanitin* which is more potent but shows delayed manifestations and causes substantial hepatic, renal and CNS damage). *A. virosa*, *A. ocreata* etc.

b) *Galerina autumnalis*, *G. venenata*.

c) *Lepiota helvella*, *L. chlorophyllum*.

2) *Muscarine* containing mushrooms -

a) *Clitocybe dealbata*, *C. cerusata*.

b) *Inocybe lacera*, *I. fastigata*.

3) *Monomethyl hydrazine* containing mushrooms -

a) *Gyromitra esculenta*, *G. californica*.

b) *Lycoperdon perlatum*, *L. pyriform*.

4) *Coprine* containing mushrooms -

a) *Coprinus antramentarius*.

b) *Clitocybe clavipes*.

5) *Psilocybin* containing mushrooms -

a) *Psilocybe cubensis*, *P. caerulescens*.

b) *Gymnopilus spectabilis*.

6) *Ibotenic acid* and *muscimol* containing mushrooms-

a) *Amanita muscaria* (containing mostly *muscarine*, *muscardine* – acts like acetylcholine and may also contain a little atropine like alkaloid – causes convulsion, narcosis and hallucination), *A. pantherina*.

7) *Orelline* and *orellanine* containing mushrooms -

a) *Cortinarius orellanus*, *C. rainierensis*.

8) Gastroenteritis inducing mushrooms-

a) *Agaricus augustus*, *A. campestris*.

b) *Chlorophyllum molybdies*.

Mode of Action -

Some of the toxins like *phalloidin*

act rapidly and they interrupt active polymerization and impairs cell membrane function but little absorption.⁶

Amanitin is slow acting toxin and it also acts in the similar manner by impairing the cell membrane function.

Anatoxins are more potent and cause substantial damage through hepatic renal and CNS damage.

The organs of Target are G.I. tract epithelium. Liver, hepatocytes and kidneys.

Fatal Dose – 2 to 3 Mushrooms

Fatal Period – Usually 24 hours.

Signs and symptoms of mushroom poisoning:

Differentiating toxic and non-toxic species in the wild is difficult, even for highly knowledgeable people. Folklore rules are unreliable, and the same species may have varying degrees of toxicity depending on where and when they are harvested. If patients have eaten an unidentified mushroom, identifying the species can help determine specific treatment. However, because an experienced mycologist is seldom available for immediate consultation, treatment of patients who become ill after mushroom ingestion is usually guided by symptoms. If a sample of the mushroom,

undigested or from the patient's emesis, is available, it can be sent to a mycologist for analysis.⁷

- 1) The symptoms of poisoning are irritant and neurotic in nature. Irritant symptoms are produced in some, neurotic symptoms may be produced in some and in some there may be combination of both types of symptoms.
- 2) Irritant symptoms are usually slow to start and usually start by 6 to 12 hours and there occurs severe nausea, vomiting, sense of constriction in the throat, painful retching, profuse salivation, burning pain in the stomach, severe diarrhoea, stool containing blood with mucus, *oliguria*, urine containing albumin, cast, red cells, liver enlarged, jaundice, features of dehydration by 5 to 6 days, followed by cyanosis, profuse sweating, fall of BP, slow pulse, laboured respiration, peripheral circulatory failure, convulsion, collapse and death.
- 3) Neurotic symptoms are headache, giddiness, excitement and delirium, *diplopia*, constriction of pupils, muscular cramps, twitching of the muscles, *bradycardia*, *bronchospasm*, stupor and coma.

- 4) Death is common in case of *A. phalloides* poisoning rather than *A. muscaria* poisoning⁸.

Treatment of poisoning:

- 1) Stomach wash with 0.5% potassium permanganate solution or finely powdered charcoal.
- 2) Atropine is considered to be the physiological antidote and is given 2 mg I.V. Every 15 to 30 minutes till *atropinised*.
- 3) *Antiphalloidin* serum, if available, may be given.⁹
- 4) Correction of dehydration, acidosis and low calcium, potassium and glucose.
- 5) Repeated haemodialysis.
- 6) Symptomatic treatment.
- 7) Plenty of fluid and fruit juice orally.

Autopsy Findings:

1. Inflammation of the mucous membrane of the alimentary canal, fatty degeneration of the liver, kidneys and heart may be found.¹⁰
2. In case of neurotic symptoms, congestion of the brain and *petechial* haemorrhages in serous membranes are seen.
3. Marked post-mortem *lividity*.

4. Diminished rigor mortis
5. Mushroom spores can be recovered from the intestinal contents of the victim. Each mushroom has characteristic spores.

Medico legal Aspect:

1. Poisoning is usually accidental.
2. Rarely homicidal.

DISCUSSION:

People are poisoned each year after eating mushrooms from their yard or outside locations. These mushrooms should not to be eaten. It's difficult to tell which mushrooms can be eaten and which cannot. Poisonous mushrooms can make us sick. Some are actually deadly. Symptoms can appear right after eating the poisonous mushroom. Or they could appear several hours later. Symptoms that occur within 2 hours are less dangerous than those that appear later (after 6 hours). Eating poisonous mushrooms causes mushroom poisoning. We can avoid mushroom poisoning by not eating mushrooms picked from the ground. It's difficult to tell which mushrooms are poisonous and which are not. They can be growing next to each other. There are no tests to tell a poisonous mushroom from a non-poisonous mushroom. Assume all wild mushrooms are poisonous. It's best to buy them from the store.

Mushrooms that grow in the ground are more dangerous than mushrooms that grow on living trees. Mushrooms on the ground in forests are more dangerous than mushrooms in yards. Cooking poisonous mushrooms will not remove the toxins.

In addition to clinical symptoms, the diagnosis of mushroom poisoning may be based on the identification of spores present in materials originating from mushrooms. The analysis of spores in stomach contents has been a frequently used procedure, especially in post-mortem forensic toxicology. However, immunoassay procedures and an increasing number of methods involving chromatography and mass spectrometry are also accessible today. More extensive literature is available on the toxicological analysis of two types of toxins: *amanitins*, a major factor in mushroom poisonings and psilocybin and psilocin, controlled substances found in magic mushrooms abuse.

Management of mushroom poisonings of humans and animals can demand extensive effort from clinicians and toxicologists and often involves emotion and publicity. The public expects the toxicology profession to provide guidance and a coherent approach regarding these cases. Although it is estimated that very few species are lethal,

it is not clear how many of the mushrooms worldwide contain potentially toxic compounds.

CONCLUSION:

Mushroom poisoning can occur because of forager misidentification of a poisonous species as edible, although many cases are intentional ingestions. Thorough view of species and following preventions of its use may protect us from Mushroom poisoning and its effects.

REFERENCES:

1. Forensic Medicine And Toxicology, R.N. Karmakar, Academic Publishers, Edition 2006, page no.373.
2. Illustrated Agadtantra, Dr. P.V.N.R. Prasad, Chowkhamba Prakashan, Edition 2009, page no.335.
3. <https://emedicine.medscape.com/article/167398-overview>
4. <https://www.mushroom-appreciation.com/types-of-mushrooms.html#sthash.k2abqGbK.dpbs>
5. Forensic Medicine And Toxicology, R.N. Karmakar, Academic Publishers, Edition 2006, page no.373.
6. Illustrated Agadtantra, Dr.

P.V.N.R. Prasad, Chowkhamba Prakashan, Edition 2009, page no.337.

7. <https://familydoctor.org/condition/food-poisoning-mushroom-poisoning/>
8. [https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/amanita-](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/amanita-phalloides)

[phalloides](#)

9. Parikh's Textbook of Medical Jurisprudence and Toxicology, Dr. C.K. Parikh, CBS Publishers. Edition 2006, page no.832.
10. Forensic Medicine And Toxicology, R.N. Karmakar, Academic Publishers, Edition 2006, page no.373.

Conflict of Interest: Non

Source of funding: Nil

Cite this article:

*Review on poisonous effects of mushrooms and its treatment
Suryabhan Dongre, Vidhyashree Thorat, Sukhada Gawde*

Ayurlog: National Journal of Research in Ayurved Science- 2020; (8) (1): 1 - 8