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Lethal Wild Mushrooms Deceive the Unwary

By MOIRA HODGSON

One time that pick-your-own should be avoided.

How safe is it to pick and eat wild mushrooms? The dangers were underscored last week with the death of Sam Sebastiani Jr., 32, a member of one of California's most prominent wine-making families, who ate mushrooms gathered near his home in Santa Rosa, Calif.

The recent torrential rains in the San Francisco Bay area have led to a bumper crop of mushrooms, and nine people have been hospitalized in the last month after having eaten poisonous ones they apparently picked themselves.

Experts who know an Amanita muscaria from a Boletus edulus (the first is poisonous, the second is not) are warning inexperienced mushroom enthusiasts to leave the picking to trained mycologists, who will not be fooled by poisonous varieties that closely resemble their nonpoisonous cousins.

"Sometimes even experts need to examine spores under a microscope to know what they are doing," said Roseanne Soloway, the administrator of the American Association of Poison Control Centers, a nonprofit educational corporation in Washington, which maintains that most people should not pick and eat wild mushrooms. "A level of presumed expertise is not enough to save your life."

But consumers who buy mushrooms in stores or eat them in restaurants need not be alarmed.

"Of all the millions of pounds that go into commercial production, I've never heard of a single poisoning," said John Gottfried, an experienced mycologist and a partner in Gourmet Garage, the discount market that supplies wild mushrooms to 160 restaurants in New York day in and day out.

The mushroom Mr. Sebastiani is thought to have eaten was an Amanita phalloides, also known as the death-cap mushroom. It is the cause of 95 percent of lethal mushroom poisoning worldwide and is fatal more than 35 percent of the time; toxins in its cap destroy the victim's liver by rupturing the cells.

Mr. Sebastiani was one of three victims awaiting a possible liver transplant at the University of California at San Francisco Medical Center when he died. Several of his relatives had volunteered to be donors for a partial liver transplant (in which part of the donor's liver is grafted onto the patient's liver, and the healthy liver often helps the damaged cells to regenerate). But a transplant was ruled out in his case because his body was too heavily infected.

The most common poisonous mushrooms, and some of the most deadly, are of the genus Amanita. "They are the prettiest things you ever saw," said John Trestrail, the managing director of the Blodgett Regional Poison Center in Grand Rapids, Mich. "And they should all be totally avoided."

Amanita are tall gilled mushrooms with long stems that grow around trees in pine forests. They range in appearance from vivid orange (the edible Amanita caesarea, which is highly prized in Italy) and shiny white (the deadly Amanita virosa) to the classic fairy tale mushroom, with a bright red spotted cap (Amanita muscaria), which is also poisonous).

"Eating Amanita is Russian roulette," Mr. Gottfried of Gourmet Garage said. "It gives some people the same thrill as eating fugu fish in Japan. Despite my years of collecting, I don't play with them at all. For all their culinary legend, I would just as soon be safe. The death cap is doubly dangerous because people can pick it in the infantile stage before its characteristics become clear."

To identify a mushroom they are unsure of, mycologists take a spore print by placing a cap, gill side down, on white or black paper and leaving it for a few hours. The print that is left will mirror the spaces between the gills, which aids identification. But this is not a job for amateurs.

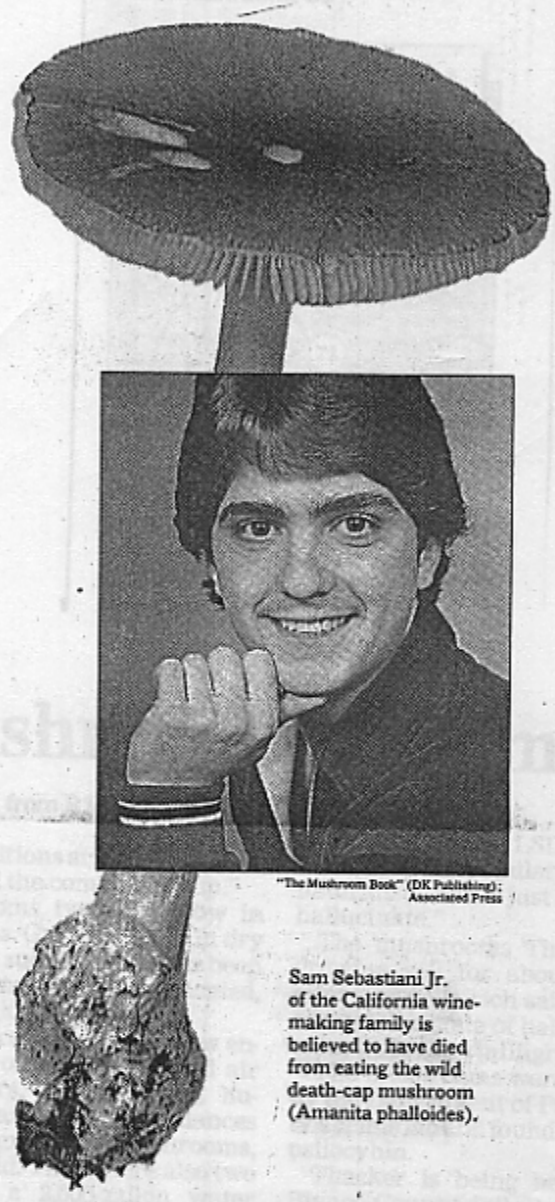
"I call the Amanita phalloides the prime seductresses of the forest," said Jack Czarnecki, author of "A Cook's Book of Mushrooms" (Artisan/Workman, 1995) and the chef and owner of Joe's Bistro 614 in Reading, Pa. "They are bright greenish-white, and because they are poisonous they haven't had to select camouflage characteristics. But when these mushrooms are wet, they could look like a wood blewit, which is pale white up to deep purple. Of course, any trained mycologist could tell the difference by looking at the bottom." Amanita have a cap at the bottom of their stems; wood blewits do not.

Although John Cage and Gertrude Stein were both enthusiastic mycologists, other Americans have never taken to mushrooming as Europeans have. On Sundays in Europe, where people eat mushrooms as readily as Americans eat bananas, it is a common sight to see families searching the woods and fields with baskets under their arms, drawn out after rain by what Vladimir Nabokov described as that "reek which makes a Russian's nostrils dilate — a dark, dank, satisfying blend of moss, rich earth, rotting leaves."

But mushroom pickers in Europe are supposed to be licensed, like hunters or fishermen. And even the most experienced can be fooled when it comes to identifying mushrooms from other continents. "Italians who emigrated to the foothills of the Sierras in the earlier part of this century would mistake a boletus for the wrong one and die," said Alice Waters, the cookbook author and owner of the legendary Chez Panisse restaurant in Berkeley, Calif. "I would only eat a mushroom I had picked if there were a certified mycologist with me."

Ten years ago, a sampling of unusual mushrooms was brought to the restaurant, but the chef would not risk serving any to the customers. "Instead, he made himself a feast, and that night he went to the hospital," Ms. Waters said. "That incident scared me enough."

Larry Forgione, the chef at An American Place restaurant in Manhattan, said that he did not want to risk his reputation on a mushroom. "I think that when you are buying mushrooms for consumption in a restaurant, the rules are a lot different than if you are a home mycologist and want to take your chances," he said. "If you don't do spore prints of a mushroom you are not 100 percent familiar with, it's a big gamble."



"The Mushroom Book" (DK Publishing); Associated Press

Sam Sebastiani Jr. of the California wine-making family is believed to have died from eating the wild death-cap mushroom (Amanita phalloides).

Some mycologists in this country are trying to spread the word to Asian immigrants who might mistake poisonous mushrooms for a safe and edible Asian variety (Amanita princeps). Five years ago, Mr. Trestrail of the Blodgett poison center said, six Laotians in Michigan collected and consumed a poisonous look-alike and had to be hospitalized. "Last year, we had two Chinese patients who required liver transplants," he added.

Now, he is involved in a project to distribute pamphlets describing the dangers in eight languages.

Mushroom poisoning occurs when a toxin in the mushroom, amantin, is absorbed from the intestine into the liver. "The first symptoms are diarrhea and cramping," said Dr. Philip Rosenthal, a professor of pediatrics and surgery at the University of California at San Francisco Medical Center and the medical director of the pediatric liver transplant program. He performed a successful auxiliary liver transplant last year on a 14-year-old girl who had eaten a death cap.

"Proteins that are normally made in your liver can't be made," he added. That prevents the liver from repairing itself and, eventually, from functioning at all.

One of the most sinister aspects of deadly mushroom poisoning is the delay between ingestion and onset of symptoms. The stronger the poison, the longer it takes to show itself, and by the time a patient is aware of the problem, it may be too late.

"I've always been afraid of the day when a naïve picker meets a gullible chef," Mr. Gottfried said. "The Amanitas are almost impossible not to recognize. But people try to fit square pegs into round holes, which in this field you must never do. Amateurs should stick to mushrooms like morels and chanterelles that have no look-alike. Otherwise, it's like putting a 9-year-old behind the wheel of a car."

Austin Amer.-Statesman 7/29/98

Mushroom drug bust a record for Texas

■ Austin man arrested after 40 pounds of psilocybin mushrooms found near Johnson City

By Rebeca Rodriguez
American-Statesman Staff

More than 40 pounds of illegally cultivated hallucinogenic mushrooms were discovered growing near Johnson City Saturday afternoon in what law enforcement officials are calling the largest mushroom seizure in Texas history.

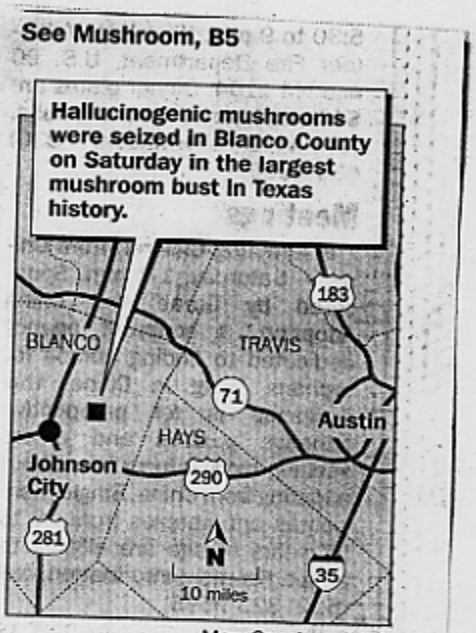
Thomas Elliot Thacker, 48, of Austin, has been charged with possession of a controlled substance with intent to deliver, said Rusty Weirich, the chief deputy for the Blanco County sheriff's office.

Weirich said the quantity of mushrooms found had a street value of $175,000.

He said the sheriff's office got an anonymous tip several months ago and began investigating Thacker, who owns the property east of Johnson City off FM 2766 in the Pedernales River Basin. The amount of mushrooms being cultivated was surprising, he said.

"It's very rare that you see anything like that," Weirich said.

See Mushroom, B5



Mary Coppinger/AA-S

Mushroom arrest made

Continued from B1

"The conditions are not favorable, but he had the complete setup."

Mushrooms typically grow in moist areas. Growing them in dry conditions such as Texas has been experiencing is complicated, Weirich said.

A large trailer seized by law enforcement officials contained air conditioners, heaters, fans, humidifiers and other appliances needed to grow the mushrooms, Weirich said. There were also two wells and a 2,000-gallon water tank.

The mushrooms are incubated and then transplanted into soil. They are later harvested and dried. In that form, they can be eaten or sprinkled on food or in beverages.

The active ingredient — psilocybin — is what causes hallucinations.

"It's kind of like LSD," Weirich said. "It's very popular among the naturalists, and it just makes you hallucinate."

The mushrooms Thacker was growing sell for about $270 an ounce, and Weirich said a person can reach a state of hallucination on as little as 10 milligrams.

The mushrooms were analyzed by the Department of Public Safety's crime lab and found to contain psilocybin.

Thacker is being held in the Blanco County Jail. Bail had not been set Saturday. Officials say have no cause to believe that any one else is involved in the cultivation.

The sheriff's office is working the case along with the 33rd Judicial Narcotics Enforcement Team, a local task force that investigates narcotics in five counties.

MUSHROOM POISONS & MOLD MYCOTOXINS - MIC 322

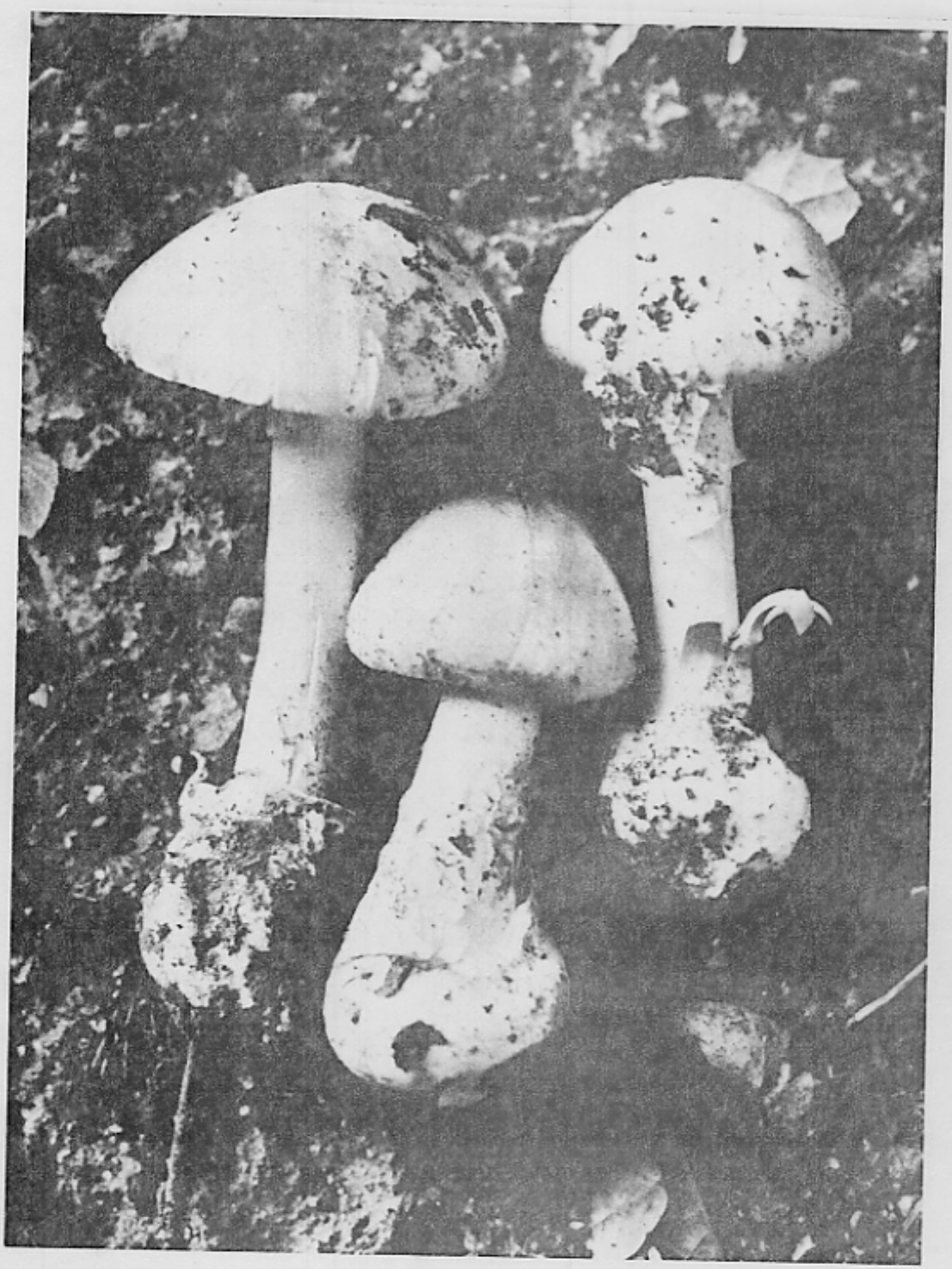


Figure 1 *Amanita phalloides.* (From Ref. 34.)

TABLE 1. Classification of the Groups Included in the Kingdom Myceteae (Fungi) Covered in This Book

Subkingdom Eumycotina

~~DIVISION AMASTIGOMYCOTA~~

Division Basidiomycota

SUBDIVISION ~~BASIDIOMYCOTINA~~: Holobasidiomycotina
spores borne on club-shaped structures called basidia

Class Hymenomycetes: Holobasidiomycetes
spores borne externally on gills or in tubes, not enclosed in a sac

Order Agaricales:
mushrooms with a cap, and basidia located on gills or in tubes on the underside of the cap; with or without a stalk

Family Amanitaceae: white spore print, with free gills, universal veil present

Family Lepiotaceae: white spore print, with free gills, without universal veil

Family Hygrophoraceae: white spore print, attached, waxy gills

Family Russulaceae: white spore print, attached gills, brittle tissue

Family Tricholomataceae: white spore print, attached gills

Family Pluteaceae: pink spore print, gills free from the stalk

Family Entolomataceae: pink spore print, gills attached to the stalk

Family Cortinariaceae: bright rust, orange-brown, or grayish brown spore print, with a veil

Family Bolbitiaceae: rusty brown to dark brown spore print

Family Agaricaceae: dark brown spore print, gills free from the stalk

Family Strophariaceae: dark brown spore print, gills attached to the stalk

Family Coprinaceae: black to blackish brown spore print

Family Boletaceae: fleshy mushrooms with a cap and stalk and basidia located in tubes on the underside of the cap; usually on the ground

Order Aphyllophorales:
fungi with basidia located on spines, pores, or wrinkled surfaces; with or without a distinct cap; stalk central, lateral, or absent

Family Cantharellaceae: chanterelles—mushrooms with cap and stalk, with basidia located on wrinkled spore-bearing ridges on the underside of the cap

Family Clavariaceae: coral and club fungi

Family Hydnaceae: tooth fungi—mushrooms with basidia located on spiny teeth; cap and stalk may be present, or fruiting body may consist of a mass of spines

Family Polyporaceae: poroid fungi typically tough to woody, usually on wood; with basidia located in tubes

Miscellaneous genera

Class Phragmobasidiomycetes

Orders Tremellales, Auriculariales, and Dacrymycetales (jelly fungi): fungi with amorphous shapes, often resembling a blob or extrusion of jelly

Class Gasteromycetes: spores enclosed by the fruiting body; spores borne on basidia within a fruiting body that is enclosed by an outer cover called a peridium

This class not always recognized as valid today

Order Lycoperdales (puffballs):
ball-shaped fungi whose spores "puff" from an opening at the top

Order Nidulariales (birds' nest fungi):
small fungi with spores in egglike packages resting in a cup-shaped structure that resembles a thimble-sized nest filled with eggs

Order Sclerodermatales (earthballs):
ball-shaped fungi with tough, thick outer covering that breaks open to release spores

Order Phallales (stinkhorns):
a group of colorful fungi, many of which are shaped like horns, with a very strong, distinctive odor

Other Gasteromycetes (stalked puffballs)

SUBDIVISION ASCOMYCOTINA:
spores enclosed in a saclike structure called an ascus

Class Pyrenomycetes (flask fungi):
fruiting bodies may have many different shapes, but all have a roughened, "pimply" surface from the flask-shaped structures that contain the spores

Class Discomycetes (cup, brain, and sponge fungi):
fruiting bodies that resemble cups, brains, or sponges, that have their spores produced in the ascus

NOTE: The classification of the Agaricales closely follows *Mushrooms of North America* by Orson K. Miller (New York: E. P. Dutton Press, 1981); the classification of the Gasteromycetes follows *Gasteromycetes: Morphological and Development Features with Keys to the Orders, Family, and Genera* by Orson K. and Hope H. Miller (Eureka, Calif.: Mad River Press, 1988); and the overall classification is as presented in *Fundamentals of the Fungi* by Elizabeth Moore-Landecker (3d ed., New York: Prentice-Hall, 1990).

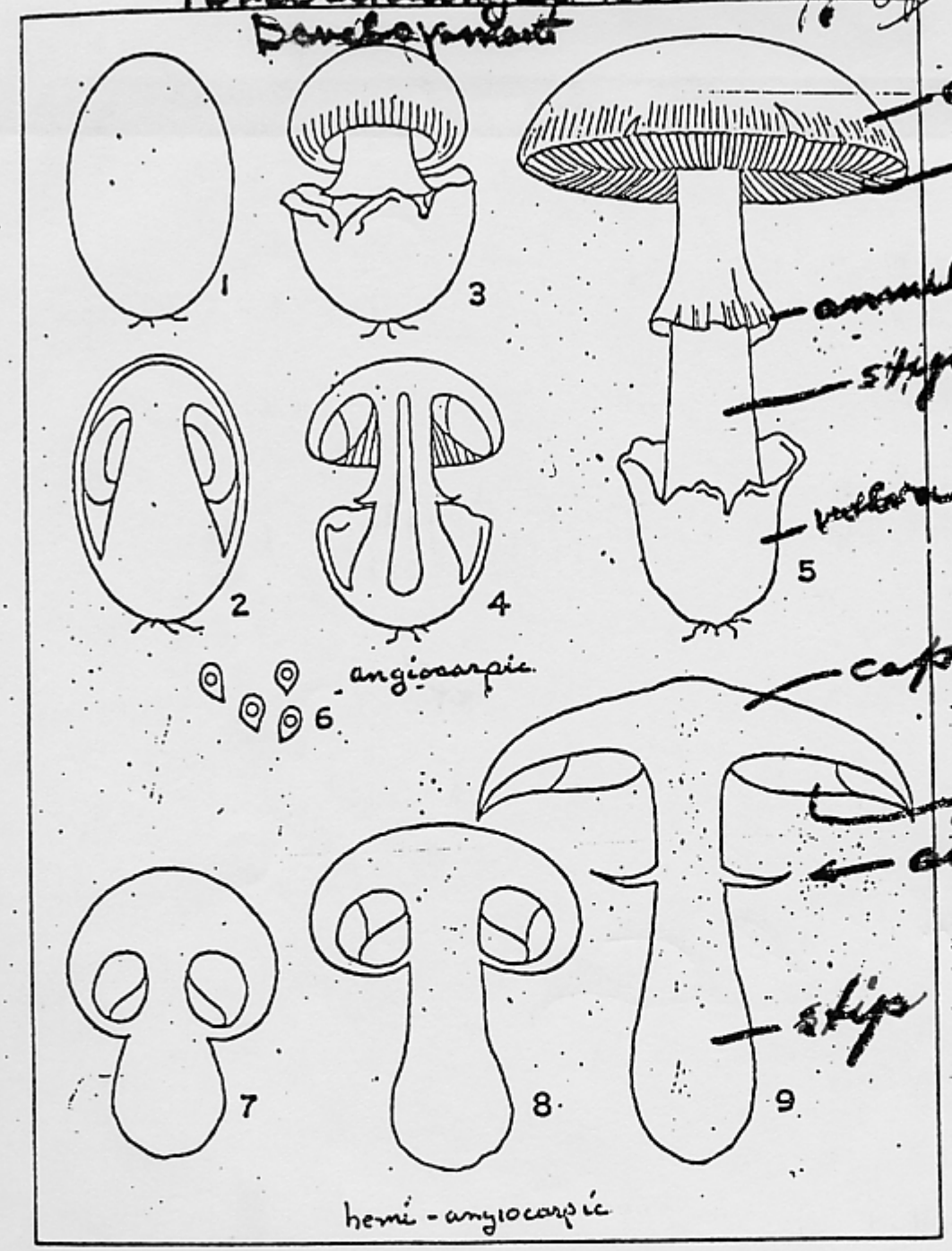
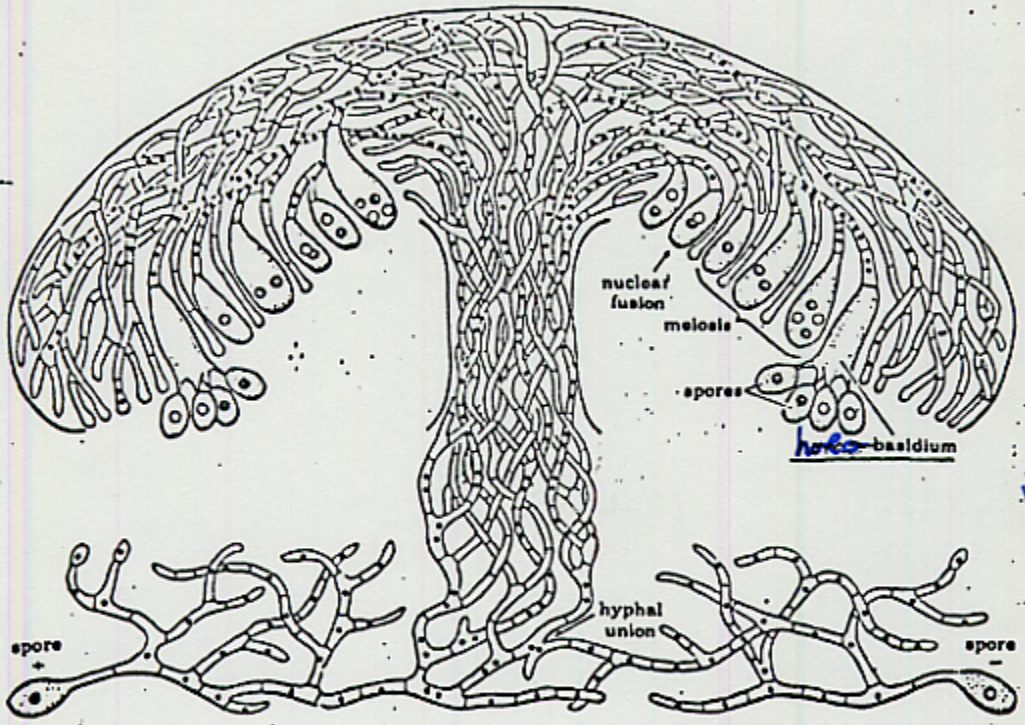
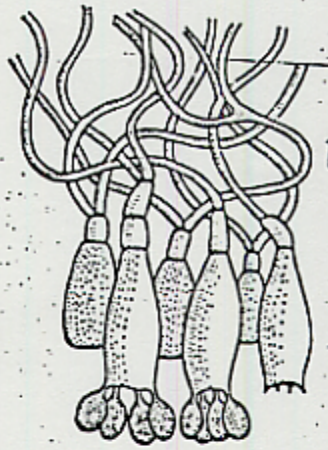


TABLE III — Development of the fruit-body: fig. 1 — Young fruit-body at the egg stage (Orange Agaric); fig. 2 — Universal veil unbroken; fig. 3 — Universal veil ruptured; fig. 4 — Cap free and broken partial veil; fig. 5 — Fruit-body fully grown with ring and volva; fig. 6 — Spores; fig. 7 — Young fruit-body without universal veil (Psalliota); fig. 8 — Fruit-body with a partial veil uniting the margin of the cap to the stem; fig. 9 — Fruit-body fully grown with the ring; remnant of the partial veil.



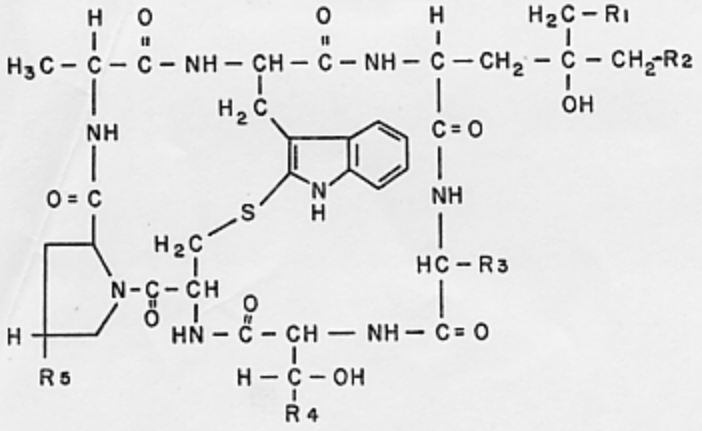
a heterothallic species

Fig. 21.29. Diagram of section through a mushroom. The entire stalk and cap are composed of hyphae tightly packed together. Spores are produced by basidia on the lower surface of the cap. [From L. W. Sharp, *Fundamentals of Cytology*, McGraw-Hill Book Co., 1943. Used by permission.]



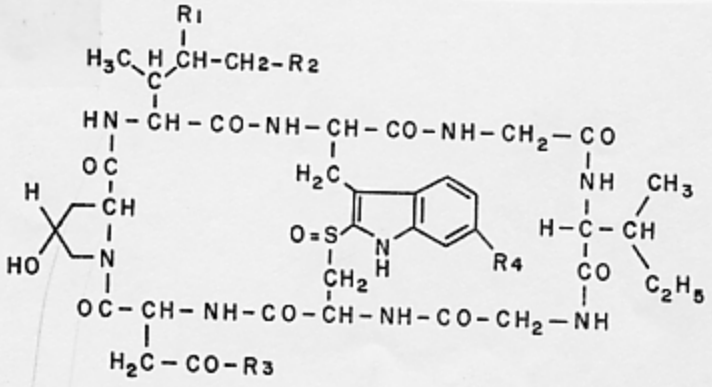
homobasidium of Homobasidiomycetes

Fig. 21.30. Reproductive structures of Basidiomycetes. The large club-shaped cells at bottom are basidia. A mature basidium bears four round spores at its end. The three shorter basidia in the figure are immature. The one on the far right is an old basidium that has shed its spores.



	R1	R2	R3	R4	R5
Phalloidin	-OH	-H	$-CH_3$	$-CH_3$	-OH
Phalloin	-H	-H	$-CH_3$	$-CH_3$	-OH
Phallisin	-OH	-OH	$-CH_3$	$-CH_3$	-OH
Phallacidin	-OH	-H	$-CH(CH_3)_2$	-COOH	-OH
Phallacin	-H	-H	$-CH(CH_3)_2$	-COOH	-OH
Phallisacin	-OH	-OH	$-CH(CH_3)_2$	-COOH	-OH
Phallin B	-H	-H	$-CH_2C_6H_5$	-CH	-H

Figure 2 Phallotoxins.



	R1	R2	R3	R4
α-Amanitin	-OH	-OH	$-NH_2$	-OH
β-Amanitin	-OH	-OH	-OH	-OH
γ-Amanitin	-OH	-H	$-NH_2$	-OH
ε-Amanitin	-OH	-H	-OH	-OH
Amanin	-OH	-OH	-OH	-H
Amanullin	-H	-H	$-NH_2$	-OH
Amaninamide	-OH	-OH	$-NH_2$	-H

Figure 3A Amatoxins.

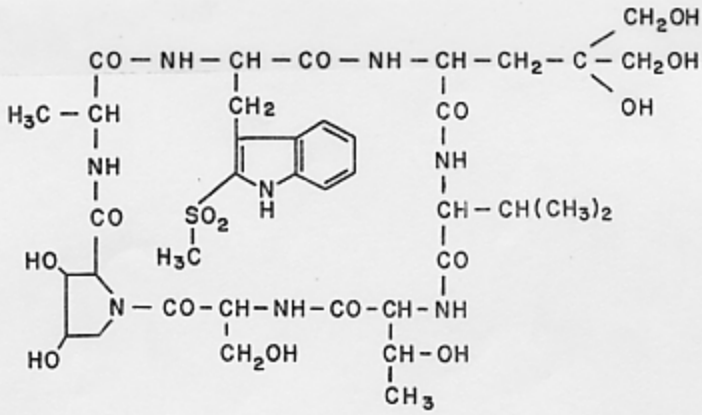


Figure 3B Viroisin.

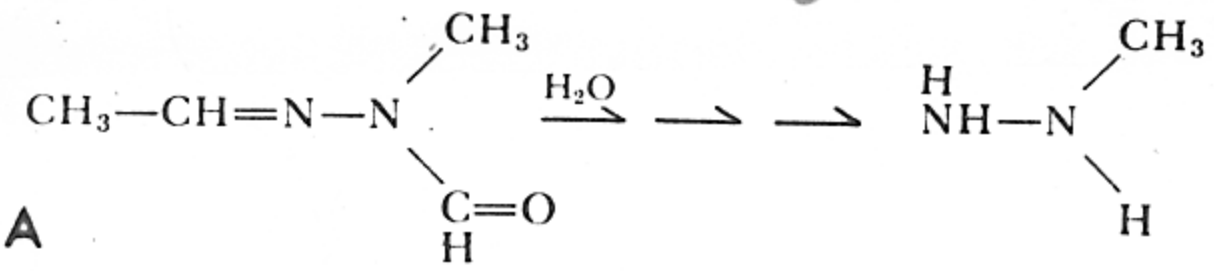
II. MUSHROOM POISONING—GENERAL MEASURES

Specific treatments are discussed under the various groups. General measures that may be taken in cases of mushroom poisoning include:

A. Reduced absorption
   1. If within 4–6 h of ingestion and patient alert, consider induction of emesis with 15 cc of ipecac syrup followed by warm water.
   2. If not alert, lavage stomach with large-bore gastric tube using 10-30 liters of isotonic saline (unless contraindicated for cardiac reasons). Most safely performed with an endotracheal tube in place.
   3. Leave activated charcoal 30-60 g in 30-60 cc of water or saline in stomach.
   4. Enemas to evacuate distal colon and possible cathartics if diarrhea not already present.

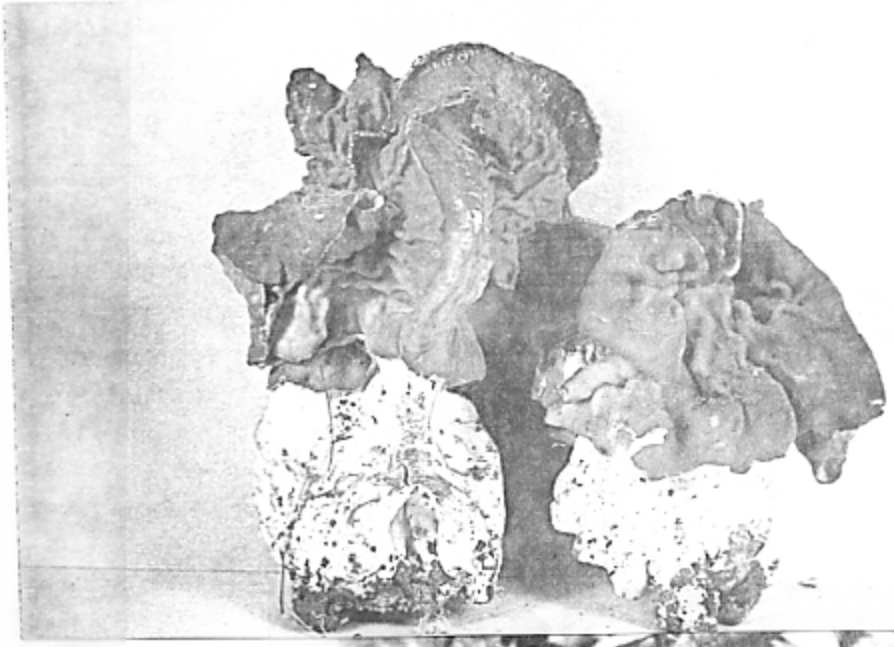
B. Increased excretion
   1. Forced diuresis with furosemide, ethacrynic acid, and/or mannitol. Careful intake and output record.
   2. Hemodialysis, peritoneal dialysis, or charcoal hemoperfusion as indicated.

C. Symptomatic measures
   1. Maintenance of the airways and arterial blood gases as indicated.
   2. Cardiovascular monitoring depending on seriousness of poisoning. May range from vital signs only to cardiac monitor, central venous pressure, or Swan-Ganz catheter.
   3. Antishock measures
      a. Plasma expansion if hypovolemic.
      b. Vasoconstrictors or vasodilators as indicated by stage of shock and current theory.
      c. Adjuvant corticosteroids in massive doses.
   4. Renal function monitoring, including indices to distinguish prerenal azotemia from renal failure (urine:plasma ratios of urea or creatinine, renal failure index, fractional excretion of sodium).
   5. Hepatic function monitoring
      a. Measures to reduce ammonia (lactulose, antibiotics, protein restriction).
      b. Adequate glucose, electrolytes, blood volume, and coagulation factors.
      c. Consider extracorporeal circulation through charcoal filter for the very ill (if available).



A

Figure 28–4. *A*, Chemical structure of gyromitrin and monomethyl hydrazine.



394a
Gyromitra
brunnea

393
Gyromitra
caroliniana

Figure 19 *Coprinus atramentarius.*

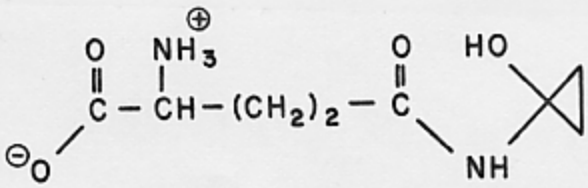


Figure 20 Coprine.

Figure 11 *Inocybe sororia.*

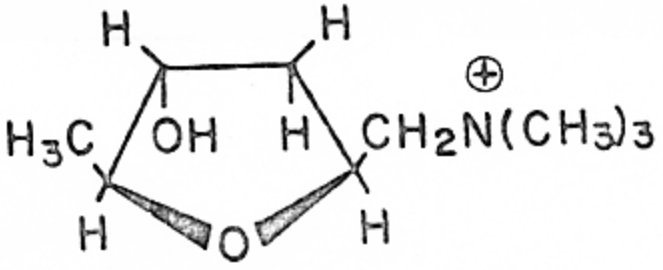


Figure 12 Muscarine.

Figure 7 *Amanita muscaria.* (From Ref. 34.)

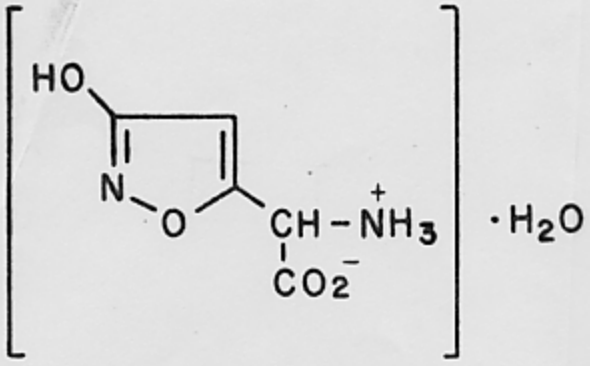


Figure 8 Ibotenic acid.

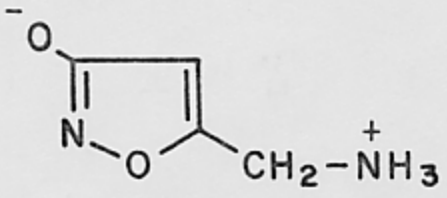


Figure 9 Muscimol.

Figure 14 *Psilocybe cubensis.*

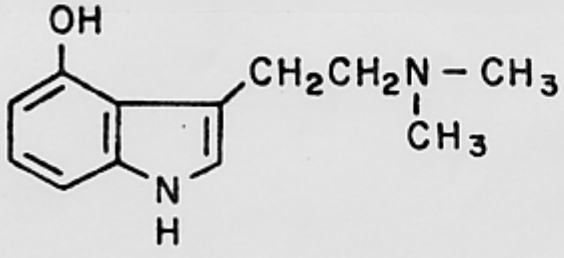


Figure 16 Psilocin.

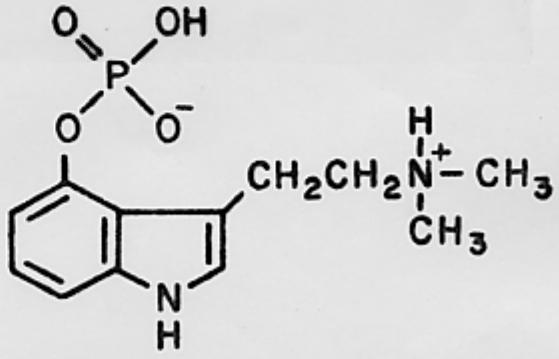


Figure 15 Psilocybin.