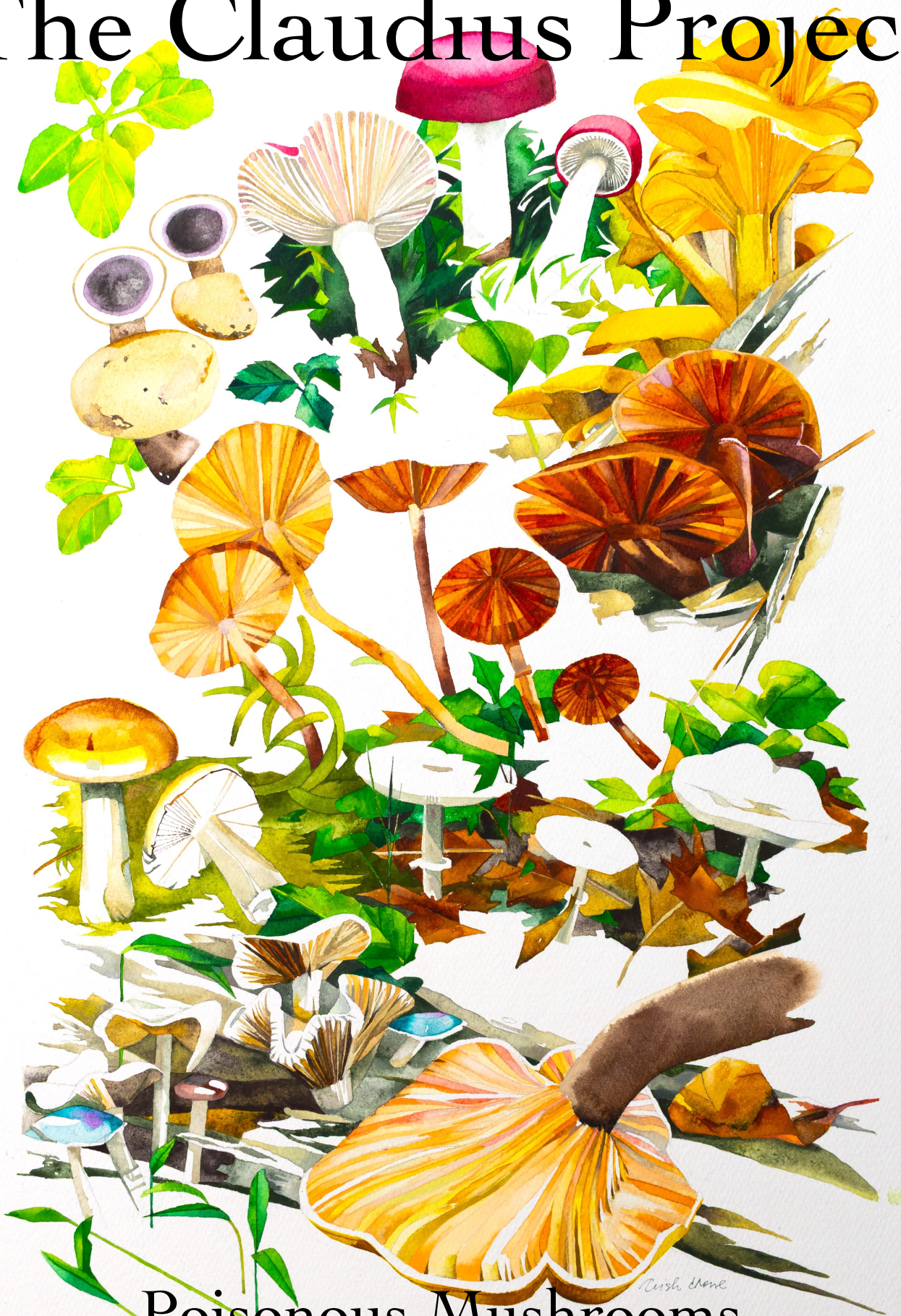
The Claudius Project



Poisonous Mushrooms in Virginia

The Claudius Project

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Published by The University of Virginia

The Claudius Project – Poisonous Mushrooms in Virginia

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Published December 2025
Published & printed by
UVAPrint

University of Virginia

Virginia Master Naturalists

The Virginia Master Naturalist (VMN) program is a volunteer program within Virginia Cooperative Extension. Virginia Cooperative Extension is a partnership of Virginia Tech, Virginia State University, the U.S. Department of Agriculture (USDA), and local governments, and is an equal opportunity employer. For the full non-discrimination statement, please visit ext.vt.edu/accessibility.

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Introduction & Acknowledgments

Mushrooms are a diverse and fascinating group of organisms that play a crucial role in ecosystems worldwide. Yes, Virginia is rich in the variety of mushrooms that grow in the wild. It is estimated that we have some 2,700 wild mushroom species in Virginia.

"In Virginia" acquired added significance during this project, as we are proud to announce that one of our authors, Patrick Mitchell, this year has observed and identified a highly poisonous mushroom at two locations in Virginia. This mushroom, *Cortinarius orellanosus*, has been known to grow in certain parts of the U.S., but had never been found in Virginia before. We owe our thanks to Stephen Russell (Founder, Mycota Lab) who, by DNA sequencing, confirmed the mushroom's identity, and to Adam Boring (Author, The Claudius Project), who confirmed these findings. There is a complete write up of this mushroom in this publication.

Mushrooms are fungi, and fungi have been of interest to people all over the world for many years. One of the oldest records of intentional use of fungi came with the discovery of the frozen body of "Otzi the Iceman" in the Alps in 1991. Using radiocarbon dating, scientists have determined that he had died in the Alps some 5,300 years ago. Astonishingly, they also found on Otzi's remains two pieces of birch fungus, *Fomitopsis betulina*.
Today we know that this fungus contains anti-inflammatory and antibacterial compounds, and amazingly, Otzi had it in his medical kit!

Mycology, the study of fungi, encompasses a vast array of species, each with unique characteristics and ecological roles. Fungi are integral to nutrient cycling, decomposition, and establishing symbiotic relationships with plants and other organisms. However, among the thousands of mushroom species, a few are capable of causing serious harm to humans. Understanding these species is crucial for public safety, especially for those who forage for wild mushrooms.

History also illustrates numerous cases where poisonous mushrooms have been used to kill a person. Perhaps the most well-known case in history of poisoning by mushrooms is of the 4th Roman Emperor Claudius, in 54 AD, allegedly by his fourth wife Agrippina, so as to put her son Nero on the throne. Hence, we have borrowed the name Claudius for this publication on poisonous mushrooms.

The Claudius Project team has selected the most significant poisonous mushrooms in our state, with symptoms that range from extremely serious to those that will cause irritation to the digestive system when consumed. By learning about them and sharing the risks associated with these fungi, the Claudius Project endeavors to promote safety and appreciation for Virginia's rich mycological heritage.

In the United States in 2022 there were 6,525 poisonous mushroom exposures reported to medical authorities, of which 733 were considered to be serious. We know, however, that the actual incidence of such exposures could be much higher, as many cases are never reported. About 40% of all cases reported in the U.S. are children 5 years of age and younger, and 28% are people 20 years of age and older.

While researching this publication we learned that for some of the mushrooms, and particularly for some of the toxins involved, there may be little or no information available. There are a few mushrooms which are not poisonous but may cause medical issues. Puffballs are one example; inhaling the spores of this mushroom can cause respiratory illness but that illness is not caused by a poison.

Photo credit: John Plischke

In addition to the write ups on individual mushrooms we have included a glossary of the more technical words commonly used in dealing with mushrooms and mycology, as well as introductory material on the toxicology of mushrooms, and comparing toxic mushrooms to nontoxic look-alikes, as well as an extensive bibliography of sources used and further reading.

This publication deals with poisonous mushrooms and the dangers involved with them. The readers should be aware that just touching a poisonous mushroom is not dangerous; only consuming a poisonous mushroom or even a part of a poisonous mushroom may be dangerous.

For appropriate medical advice call your local poison center at 1-800-222-1222.

The Claudius Project is the result of a strong partnership between the Virginia Master Naturalists program and the Division of Medical Toxicology of the University of Virginia School of Medicine. We acknowledge the support by the Division of Medical Toxicology – Department of Emergency Medicine, and the University of Virginia Health's Blue Ridge Poison Center.

Particularly we would like to acknowledge Chris Holstege, MD, Abigail Kerns, MD, and Avery Michienzi, MD, from the faculty, and the following Fellows for their guidance with

this publication – Conner McDonald, MD, Sandra Nixon, MD, Scott Schmalzreid, DO, and Anna Zmuda, MD. We also want to thank Ms. Heather Collier for her valuable administrative support.

The Claudius Project team of volunteers who have contributed as researchers and authors for this publication are from all over Virginia, and are: Lee Borg, Adam Boring, Bill Bynum, John Dent, Don Hearl, Kevin Howe, Patrick Mitchell, Harry Puffenberger, Rebecca Rader, David Saylor, and Janet Walker. The editor was Margaret Clifton. Design and layout was done by Bonnie Beers. The collector of the photographs was David Saylor. Don Hearl brought his valuable experience from the earlier Socrates and Cleopatra projects to the management team.

We owe a debt of gratitude to the Virginia artist Trish Crowe for designing and creating the cover for The Claudius Project. The beautiful original watercolor on the cover illustrates various poisonous mushrooms that grow in Virginia and which are included in this publication.

We would also like to thank the many photographers who have given us permission to use their photos in this publication. Their names are given with each photo credit.

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We are extremely grateful for their time, experience, and input to this publication.

This publication is available on the website of The University of Virginia Health's Blue Ridge Poison Center:
https://med.virginia.edu/brpc/the-learning-center/the-claudius-project/

You may also find there the two previous publications, which deal with poisons in plants and animals, on the website of The University of Virginia Health's Blue Ridge Center:

The Socrates Project – Poisonous Plants in Virginia
https://med.virginia.edu/brpc/socrates and
The Cleopatra Project – Poisonous and Venomous Animals in Virginia
https://med.virginia.edu/brpc/the-learning-center/the-cleopatra-project

Information about the Virginia Master Naturalists program can be found at:
www.virginiamasternaturalist.org.
For suggestions and comments on The Claudius Project, or if you would like to request an educational presentation on The Claudius Project, please contact:
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Introduction to Mushroom Toxins in Virginia

Mushrooms are fascinating organisms that come in thousands of different varieties. Some are delicious and highly nutritious, while others are deadly. The difference often comes down to the chemical compounds inside them, particularly their toxins. Mushroom poisoning can lead to mild discomfort, serious illness, or even death.

What Are Mushroom Toxins?
Mushroom toxins are naturally occurring substances found in some species of mushrooms which can be harmful to humans and animals if consumed. Some toxins affect the digestive system, others attack the nervous system, and some cause severe damage to the liver or kidneys.

Why Do Mushrooms Produce Toxins?
Some theories suggest that they serve as a defense mechanism against animals, insects, and microorganisms that might eat or infect them. Or that the toxins help mushrooms compete with other fungi and plants for resources. Regardless of the reason, these chemicals can be highly dangerous to humans who accidentally consume toxic mushrooms.

Common Types of Mushroom Toxins in Virginia and Their Effects
Several toxic mushroom species grow in Virginia, each containing different toxins with unique effects. The most commonly encountered and dangerous are the following (listed alphabetically):

Amatoxins
Amatoxins are among the deadliest mushroom toxins. They damage the liver and kidneys, leading to organ failure and death if untreated. Initial symptoms include nausea, vomiting, and diarrhea. After a short period of improvement, liver damage begins, leading to jaundice, seizures, and eventually death. In Virginia, many poisonous mushrooms contain amatoxins, including *Amanita phalloides* (death cap) and *Amanita bisporiger*a (destroying angel).

Coprine
Coprine itself is harmless but becomes toxic when consumed with alcohol. It causes an unpleasant reaction similar to disulfiram (Antabuse), a drug used to treat alcoholism. Symptoms include flushing, nausea, vomiting, headache, and rapid heartbeat. In Virginia, mushrooms containing coprine include *Coprinopsis atramentaria* and *Coprinopsis variegata* (known as "inky caps").

Gyromitrins
These toxins interfere with the body's ability to process certain enzymes, leading to symptoms similar to those of poisoning by industrial chemicals. Symptoms can include vomiting, diarrhea, dizziness, seizures, and damage to the liver and red blood cells. In Virginia. the *Gyromitra esculenta* species group (also known as false morels or lorchels), contain gyromitrins.

Ibotenic Acid and Muscimol
These toxins affect the nervous system, causing a mix of symptoms, including drowsiness, confusion, hallucinations, dizziness, and muscle twitches. In Virginia, mushrooms that contain these toxins include *Amanita albocreata, Amanita multisquamosa, Amanita muscaria* var. *guessowii, Amanita persicina, Amanita praecox,* and *Amanita velatipes*.

Muscarine
This toxin activates a receptor in the human brain resulting in **cholinergic syndrome**, in which the nervous system is overstimulated, leading to excessive salivation, sweating, and in severe cases, difficulty breathing and heart problems. Symptoms include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications. In Virginia, mushrooms containing muscarine include species in the *Amanita, Clitocybe, Entoloma*, *Inocybe*, and *Mycena* genera.

Orellanine
Orellanine primarily damages the kidneys, leading to kidney failure days or even weeks after ingestion. Initial symptoms may be mild, such as thirst and frequent urination, but eventually lead to kidney failure. In Virginia, *Cortinarius rubellus* contains orellanine.

Psilocybin and Psilocin
These are hallucinogenic compounds that affect the brain by altering perception, mood, and behavior. Symptoms include hallucinations, confusion, nausea, and in some cases, panic attacks or paranoia. In Virginia, mushrooms that contain psilocybin include *Psilocybe ovoideocystidiata*, *Gymnopilus* species, and *Conocybula smithii.* (See also the section on Psilocybin-containing Mushrooms.)

Other Mushroom Toxins in Virginia
Other toxins identified in Virginia mushrooms are much rarer and less likely to be encountered. They are described in the pages on the individual mushrooms in which they occur. These include illudin, involutin, phenol, molybdophyllysin, fasciculol E &

F, and polyporic acid. And finally, there are toxic mushrooms in which the actual toxin has not been identified and remains unknown.

How to Identify Toxic Mushrooms

Identifying toxic mushrooms can be challenging, as many poisonous species closely resemble edible ones. However, some general rules can help:

- Avoid mushrooms with white gills, a ring around the stem, and a bulbous base, with or without a volva, as these are common traits of deadly *Amanita* species.
- Mushrooms can change appearance with age. Young ones can look very different from mature ones.
- Look-alikes: Some poisonous mushrooms resemble popular edible species: Edible mushrooms are known to be safe to eat because they have been eaten frequently with no ill effects. Poisonous mushrooms are known because someone ate them and became ill or died. **There is no test or characteristic to distinguish edible from poisonous mushrooms.** (Refer to the section on look-alikes in this publication.)

Conclusion

Mushroom toxins are a serious concern for anyone interested in wild mushrooms. While some mushrooms are edible and delicious, others can be deadly. Understanding the different types of toxins and how they affect the body is crucial for anyone who wants to forage safely. Always be cautious, use multiple sources for identification, **and when in doubt, don't eat it!** Safety should always come first.

Introduction to Psilocybin-Containing Mushrooms

Psilocybin is a rather unique toxin in this publication. Aside from its peculiar symptoms, of which there are many, it is a toxin that is deliberately sought after and purposely eaten by people for recreational or spiritual uses. This has been the case for thousands of years in most parts of the world. These mushrooms are hallucinogenic and can cause changes in human senses. The current global count of mushrooms that contain psilocybin is about 200 species across 9 genera. This number grows daily; four new species were added to the list in 2024, including two in the U.S.: *Psilocybe caeruleorhiza,* found in Pennsylvania, and another in California that is awaiting formal publication. For this publication, we have included the most common species found in Virginia forests. In addition, we have included mushrooms that may not yet have been recorded in our state, but have been found in neighboring states with similar ecosystems. These mushrooms are small and unremarkable, and though they may not yet have been documented in Virginia, it is likely that they are here.

Mushrooms included in this publication

There are two species and one genus which contain psilocybin described in this publication: Species included are *Psilocybe ovoideocystidiata,* and *Conocybula smithii*. The genus included in the publication is *Gymnopilus*, two species of which are described.

Psilocybe ovoideocystidiata is by far the most commonly collected psilocybin-containing mushroom in Virginia. Not only is it found abundantly in our region, but there is increasing public awareness surrounding this species. The most dangerous characteristic of this mushroom is that it closely resembles the deadly *Galerina marginata* (also described in this publication). As public awareness of *Psilocybe ovoideocystidiata* increases, so do the chances of an accidental ingestion of its deadly lookalike. For this reason, it is imperative for correct and accurate information to be available regarding the identification and side effects of *Psilocybe ovoideocystidiata,* and how these differ from the *Galerina* species.

Conocybula smithii is the most rare and unique among the group, and the authors have been able to find only one reported sighting in Virginia. These mushrooms are small and usually grow in grass, sometimes in urban housing areas. Their small size might be the reason no sightings have been reported. Because of their potential for appearing in lawns, they could be grabbed and consumed by young children.

The genus *Gymnopilus* are psilocybin-containing mushrooms which are the second most common group of mushrooms in Virginia sought for their psychoactive compounds. These wood-loving fungi could be easily confused with *Omphalotus illudens*, another toxic mushroom that grows on wood (also described in this publication).

Other species worth mentioning

Psilocybe cubensis is a mushroom that prefers growing from cow dung. In Virginia it is more likely encountered after it has been cultivated and dried for recreational sale or use. Although there have been cases where individuals sought emergency medical care after

ingesting these dried black-market products, we did not feel this type of consumption needed to be addressed in this publication.

The genus *Pluteus* has about a dozen species worldwide that contain psilocybin. Of those, there are five that have been found in our region, with one confirmed in Virginia, *Pluteus americanus*. These **saprobic** mushrooms typically grow on wood and are quite difficult to find. Foragers could mistakenly consume this mushroom thinking it is another edible species of the genus, *Pluteus cervinus* being one. However, because *Pluteus* is not a highly sought after mushroom for the table, coupled with the rarity of *Pluteus americanus*, this mistake is very unlikely and thus the species is not included in this publication.

Inocybe insignis is another obscure mushroom with only a few sightings, one of which was confirmed to be in Virginia. Due to its rarity it was not chosen for this publication. It is worth mentioning, however, that extreme caution must be taken with this species, as many of the *Inocybe* species also contain **muscarine**, a known toxin (this publication also includes an *Inocybaceae* Family Introduction).

The genus *Panaeolus* has at least two species in Virginia that contain psilocybin. The uncommon *Panaeolus cinctulus* is also much less potent than other psilocybin-containing mushrooms and, coupled with its rarity, is not typically a targeted species for individuals seeking altered states. *Panaeolus cyanescens*, however, is an extremely potent member of the psilocybin-containing mushrooms group. Until recently it had not been found in Virginia, however in the last few years it has occasionally appeared in several cow pastures here. This may be a case of a species that is gradually moving north, or its appearance could be the result of the cattle industry moving livestock from states like Florida, where this mushroom is far more common.

Toxic and Nontoxic Look-alike Mushrooms

Summary

Mushroom poisoning often occurs when foragers mistake toxic mushrooms for edible look-alikes. The danger is heightened if large amounts are consumed, leading to severe illness. Virginia has several such look-alikes, making misidentification a serious risk. This article highlights how easily inexperienced collectors can accidentally poison themselves or others.

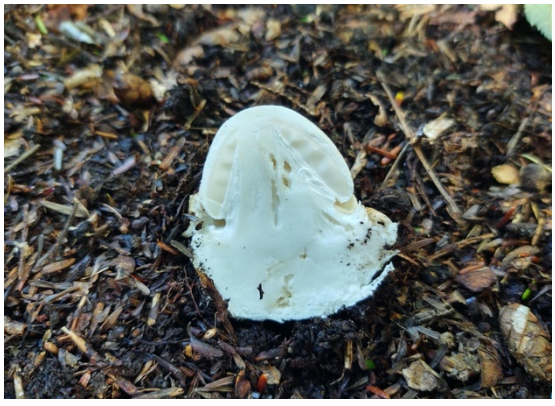
Only eat wild mushrooms if an expert confirms they are safe: Key differences can help distinguish toxic from edible species, but expert guidance is essential. Photos can aid identification, but the most reliable method is expert verification at the collection site. And **always** cook mushrooms before eating, even if identified by an expert. Many are hard to digest raw, and some, like morels, can cause serious reactions if undercooked.

Below are some important look-alikes, illustrating how closely toxic mushrooms can resemble edible ones. For more details, see the full text on each of the toxic species in this publication.

Look-alikes

The common puffball (*Lycoperdon perlatum*) is an edible mushroom found in open areas. However, young destroying angels (*Amanita bisporigera*) resemble puffballs. Cutting them in half reveals an emerging mushroom inside, distinguishing the toxic species.

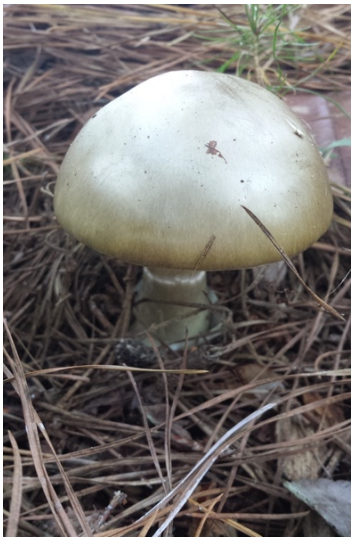
Lycoperdon perlatum **(young)**
Photo credit: Penny Firth



Amanita bisporigera **(young)**
Photo credit: Adam Boring

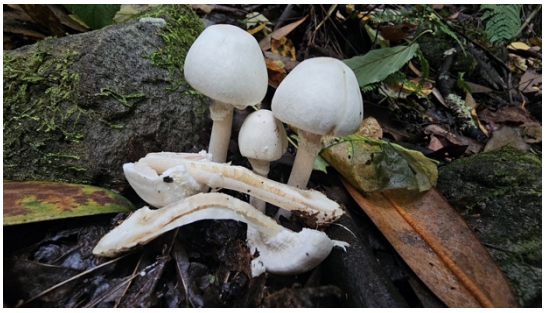
The nontoxic honey mushroom, *Armillaria mellea*, is typically found growing on trees. *Amanita phalloides*, the highly toxic death cap, grows on the ground, and never on trees. This difference highlights the importance of identifying the growth material of mushrooms in order to make a correct identification.

Armillaria mellea
Photo credit: Adam Boring



Amanita phalloides
Photo credit: Lee Borg

The nontoxic meadow mushroom, an *Agaricus* species, is commonly found in grassy areas and meadows. *Amanita bisporigera*, the toxic destroying angel, (like most species within the genus *Amanita*) grows near trees.

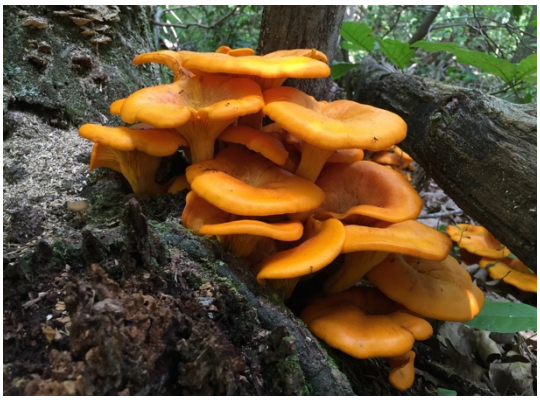


Agaricus species
Photo credit: Adam Boring

Amanita bisporigera
Photo credit: John Plischke

The edible chanterelle (*Cantharellus cibarius*) resembles the toxic Jack-o'-lantern (*Omphalotus illudens*), which grows in clusters on wood. Chanterelles grow singly or in small groups on the ground, so misidentification often occurs when habitat is ignored.

***Cantharellus cibarius* group**
Photo credit: Adam Boring

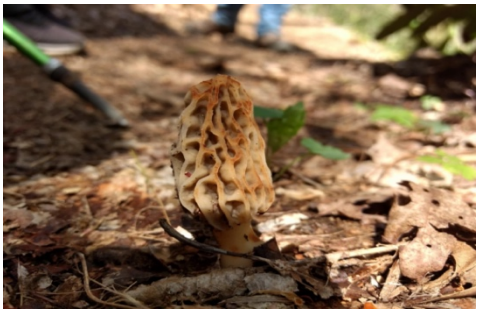


Omphalotus illudens
Photo credit: Penny Firth

The toxic *Galerina marginata* (funeral bell) is shown to the left, while the less toxic *Psilocybe ovoideocystidiata* appears to the right. Foragers seeking *Psilocybe* may accidentally collect *Galerina*, risking serious poisoning.

Galerina marginata and
Psilocybe ovoideocystidiata
Photo credit: Pat Mitchell

The edible morel (*Morchella diminutiva*) grows near trees and has a hollow stem when cut open. The toxic *Gyromitra esculenta*, found in similar habitats, looks similar but has a solid stem.



Morchella esculenta
Photo credit: Adam Boring

Gyromitra esculenta
Photo credit: Lee Borg

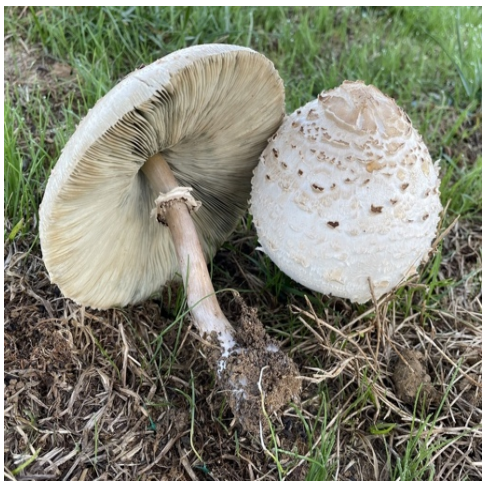
The shaggy mane (*Coprinus comatus*) is an edible mushroom that grows in soil. However, the **common inky cap** (*Coprinopsis atramentaria*), which also grows in soil, becomes toxic when consumed with alcohol.

Coprinus comatus
Photo credit: Adam Boring

Coprinopsis atramentaria
Photo credit: John Plischke

Both the nontoxic parasol mushroom *Macrolepiota macilenta* and the toxic *Chlorophyllum molybdites* (green vomiter) grow in fields and lawns. A key difference is that as *Chlorophyllum* ages, its spores turn green, giving its gills a distinctive greenish hue.

Macrolepiota macilenta
Photo credit: Amelio Little



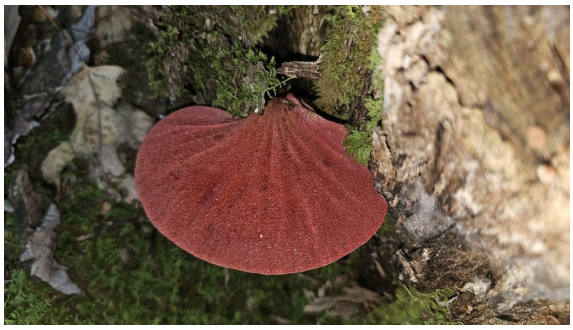
Chlorophyllum molybdites
Photo credit: Penny Firth

The nontoxic *Laetiporus sulphureus* (chicken-of-the-woods) has pores instead of gills, grows on trees or logs, and is yellow with orange highlights. The toxic *Hapalopilus rutilans* (tender nesting polypore) resembles it, but is reddish-yellow.

Laetiporus sulphureus
Photo credit: Adam Boring

Hapalopilus rutilans
Photo credit: Penny Firth

Both the *Fistulina americana* (beefsteak mushroom) and the toxic *Hapalopilus rutilans* grow on wood. *Fistulina* can be identified by its dark, soft body.



Fistulina Americana
(formerly Fistulina hepatica)
Photo credit: Adam Boring

Hapalopilus rutilans
Photo credit: Penny Firth

Agaricus Section *Xanthodermatei*

Because around 500 species are found in the U.S., the *Agaricus* genus is divided into subgroups, or sections. The section called *Xanthodermatei* contains species that stain yellow and exhibit a **phenolic** odor, which is sickeningly sweet and tarry. They are poisonous to some people, causing gastrointestinal problems. Two mushrooms in this section, the yellow stainer (*Agaricus xanthodermus)* and the inky-mushroom or flat-top agaric (*Agaricus placomyces)* are often found in Virginia. Both are described below.

Agaricus xanthodermus

Yellow Stainer

Description

The cap is 2.4 to 7 inches (6–18 cm) wide, with a stem that is 2 to 6 inches (5–15 cm) tall. The cap is somewhat round, becoming dome-shaped to almost flat as it matures. The color of the cap is white to gray, turning brown with age. The base of the stem is slightly bulbous and has a silky texture and white color. The flesh is thick and white, turning yellowish when crushed. The Latin *xanthodermus* means "yellow skin," and if bruised or cut, the mushroom turns yellow and the base of the stem turns a very bright yellow. The gills are loose, white-to-pink in color, and eventually turn black-brown. This mushroom has a strong, foul, earthy odor that has been described as similar to iodine.

Where it may be found

Agaricus xanthodermus is widely distributed throughout the U.S. and

Photo credit: Alan Rockefeller

commonly grows in scattered groups or dense patches in meadows, lawns, and pastures. It can also be found in woods (especially under oak trees) as well as alongside roads and ditches. Its growing season is from summer through fall.

What makes it poisonous

Phenol, a poisonous organic compound, is present in a sufficiently high concentration to cause toxicity. Even at low concentrations, phenol causes damage to the liver, to red blood cells and is carcinogenic. Other toxic compounds have been identified in lesser concentrations.

Potential symptoms

Some people can eat this mushroom with no ill effects, but it is not recommended. Poisonous to many people, it can cause headaches, nausea, stomach cramps, vomiting, and diarrhea. Its toxicity appears to be variable, with effects of varying severity.

Look-alikes

The edible horse mushroom (*Agaricus arvensis*) somewhat resembles *Agaricus xanthodermus*, but does not stain yellow at the base and does not smell like phenol. It has a pleasant mushroom smell, both when fresh and when cooked, while potentially toxic species may smell fine

when fresh but will smell unpleasant when cooking.

Notes
Although some people can eat this mushroom, the taste is reported to be bitter, and the foul smell gets stronger when cooked.

Agaricus placomyces
Flat Top Agaric, Inky Mushroom

Description
Agaricus placomyces has a cap that is 2 to 4 inches (5–10 cm) wide, dome-shaped to flat, and sometimes with a small raised portion or **umbo** in the center of the cap. The cap is white with a brown center. Depending on weather conditions and age, the cap may break up into soft brown scales, arranged in circles around the center of the cap. The flesh is white at first, and later turns pink and then dark brown. The cap margin will turn yellowish if rubbed. The gills are free from the stem, crowded, and with many **short gills** present. When young, the gills are covered with a rubbery **partial veil** that is white, then develops yellow-to-brown stains. The spores are brown. The stem is 3 to 6 inches (7.5–15 cm) tall and 0.3 to 1 inch (.76–2.5 cm) thick, with a slightly enlarged base.

Where it may be found
Agaricus placomyces is typically found in forests, under hardwoods or pine trees, but can also be found under trees on lawns. **Saprobic**, it gets nutrients from dead and decaying organic matter. It fruits in the summer and fall and is widely distributed in eastern North America.

Photo credit: John Plischke

What makes it poisonous
Like *Agaricus xanthodermus, Agaricus placomyces* also contains phenol, which can cause gastrointestinal distress as well as damage red blood cells and the liver. It is also carcinogenic.

Potential symptoms
Symptoms caused by eating this mushroom are similar to those of *Agaricus xanthodermus*. Consuming either of these two mushroom species is not recommended.

Look-alikes
There are several similar species that occur in eastern North America. These include *Agaricus kriegeri*, which has darker brown, more prominent scales, and a slightly larger stem. Another is *Agaricus approximans*, which has a slightly smaller cap, stains yellow, then turns brown. There are numerous edible and toxic look-alikes. The edible species will all smell pleasant, either like commercially available mushrooms or like almond extract AND will continue to smell pleasant as they are cooking. The toxic species may or may not smell of phenol when fresh but will start to stink when cooked.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Amanita Genus Introduction

The genus *Amanita* currently consists of over 1,200 species of mushrooms worldwide. Some well-known members of this genus include *Amanita bisporigera* (destroying angel), *Amanita muscaria* (fly agaric), *Amanita pantherina* (panther cap), and *Amanita phalloides* (death cap). Because there are so many different species, identifying them usually starts by determining their **section** within *Amanita*. Sections are groups that share important features, such as the presence or absence of **partial veils**, **universal veils**, **striations** on the cap, bruising, bulbous stem bases, and veil material hanging from the cap edges. Sections are further broken down into smaller groups that share similar characteristics.

Current sections for genus *Amanita* include *Amanita*, *Amarrendiae*, *Amidella*, *Arenariae*, *Caesareae*, *Lepidella*, *Phalloideae*, *Roanokenses*, *Strobiliformis*, *Vaginatae*, and *Validae*. In this publication, we cover the species that have been reported in Virginia, which are primarily in sections *Amanita*, *Phalloideae,* and *Roanokenses*.

Of the three sections covered in this publication, four different toxins are of concern. Species of section *Amanita* may contain the toxins **ibotenic acid** and/or **muscimol.** Additionally, some species of section *Amanita* are known to contain **muscarine**. The presence and concentration of muscarine in amanitas that contain ibotenic acid and muscimol is not fully understood at this time: One recent study indicates that other species were implicated with muscarinic symptoms, such as *Amanita persicina* and *Amanita pantherina*, to name a few. Because of the close genetic relationship that *Amanita muscaria*, *Amanita persicina* and *Amanita pantherina* have with many of the other ibotenic acid and muscimol-containing amanitas in our publication, it is safe to assume that muscarine may be present and be a factor in these as well.

Species of section *Phalloideae* contain **amatoxins**. At least two species of section *Roanokenses* have been found to contain the toxin **allenic norleucine** (a third in Virginia is also suspected of containing this toxin).

Even though DNA sequencing has made species groups more complicated for new mushroom hunters — new species are often assigned temporary names that appear as combinations of letters and numbers — the authors of this publication aim to simplify the identification process by highlighting observable features of toxic fungi that can be recognized using your senses.

Amanita albocreata

(Synonym: *Amanitopsis albocreata*)
Ringless Panther

Description
This dainty mushroom has a cap size of 1 to 2.5 inches (2.5–6.5 cm) and stems that are 3 to 5 inches (8–12 cm) tall. The white stem gently widens toward the abruptly bulbous and collared base. The stem is white and lacks a **partial veil**, which gives it the common name ringless panther, as it is a member of what is termed the panther group. The gills are white and crowded. The cap is **striated,** with parallel ridges around the edge, and whitish to pale yellow or tan towards the center. White-colored warts may be present on top of the cap, however these are easily washed off with rain and other environmental factors.

Where it may be found
These mushrooms are most notably associated with hemlock trees. They can also be found growing with birch, oak and basswood. They typically grow in the late spring through the fall.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. Muscimol is the product of the decarboxylation of ibotenic acid by either drying the mushroom or by metabolism in the human liver. This is a chemical reaction that removes a part of a molecule called a carboxyl group, thus releasing carbon dioxide. These toxins are found in varying amounts within the mushroom. Ibotenic acid and muscimol are chemicals that are related to the **neurotransmitters** glutamic acid and gamma-aminobutyric acid (GABA), respectively. Ibotenic acid binds to and stimulates the N-methyl-D-aspartate (NMDA) **receptor** and muscimol binds to and stimulates the GABA-A receptor. The interactions with these receptors on cells cause the psychoactive effects of intoxication from this mushroom. Additionally, some species of *Amanita* are known to contain **muscarine**. The presence and concentration of muscarine in amanitas that contain ibotenic acid and muscimol is not fully understood at this time: One recent study indicates that other species were implicated with muscarinic symptoms, such as *Amanita persicina* and *Amanita muscaria,* to name a few. Because of the close genetic relationship that these amanitas have with many of those containing ibotenic acid and muscimol in our publication, it may be assumed that muscarine is present and a factor in these as well.

Photo Credit: John Plischke

Potential symptoms
Symptoms typically start 30 minutes to two hours after ingestion. A state of confusion, dizziness, and tiredness, visual and auditory aesthesia (hypersensitivity), and time and space distortion have been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur. Hallucinations, vivid color perception, and a sense of time standing still have been documented following ingestion. A drowsiness period after two

hours follows these initial symptoms, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts eight hours. Gastrointestinal effects are inconsistently reported and are not characteristic. Seizures and coma have been reported, with patients having to be placed on life support. In most cases recovery is rapid and complete after 24 hours, without noticeable long-term adverse effects. Fatalities may occur following the ingestion of mushrooms containing ibotenic acid and muscimol. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.

Look-alikes

Given its small size, this mushroom is unlikely to be accidentally collected by foragers, however, it is important to note that some edible species within the *Amanita* section *Vaginatae* might be confused with *Amanita albocreata* by inexperienced foragers. The key differences, aside from color, are the bulbous base of *Amanita albocreata*, versus the **saccate** (**sac-like)** base of Amanitas in the *Vaginatae* section. The edible *Amanita fulva* could also cause some confusion; it is similar in color, has prominent striation and also lacks the partial veil. *Amanita albocreata* could also be confused with another poisonous mushroom, *Amanita praecox* (also described in this publication).

The absence of a visible ring is unique for the panther group in particular and could cause an inexperienced forger to confuse it with one of the other Amanitas that lack a ring. For example, species of *Amanita* section *vaginatae* are both edible and also lack a ring.

Notes

This mushroom's features place it in the Pantherina group, and because of its small size, it has been referred to as a member of the "junior panther brigade." Though missing a partial veil on its stem, it prominently displays the panther group's hallmark which is a rolled-collar on top of its bulbous base. The Latin name describes this feature: *albo* means white, and *ochrea* is a greave, or piece of armor worn between the knee and ankle.

Photo credit: Sarah Culliton

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Amanita bisporigera

(Synonyms: *Venenarius vernellus* and *Amanita vernella*; incorrectly labeled as synonymous with *Amanita virosa*)
Destroying Angel, Death Angel, Eastern Destroying Angel, North American Two-spored Destroying Angel

Photo credit: Lee Borg

Description

Amanita bisporigera is one of the deadliest mushrooms in the *Amanitaceae* family and a close relative of *Amanita phalloides*. This mushroom often contains enough toxin to kill an adult human. All parts of this mushroom are white. The cap is a nearly oval shape that is initially convex and then becomes broadly convex to somewhat bell-shaped or nearly flat with age. It sometimes has a slight yellow tinge and is bald and slimy or sticky to the touch, depending on age. The cap has a width of 2 to 5 inches (5–12.5 cm). The cap edge is smooth and the flesh white. The smell is not distinctive in younger specimens, but may become sickeningly sweet in older specimens. The taste is not distinctive.

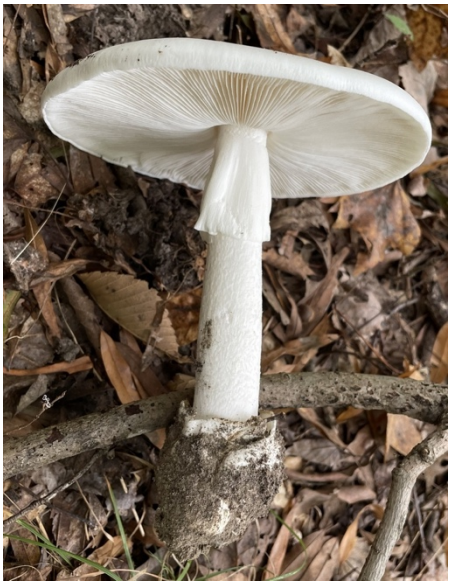


Photo credit: Penny Firth

The stem is white, thick, and solid, with a persistent skirt-like ring. The stem tapers upward from a bulbous base sheathed in a sac-like **volva**. It ranges from 2.5 to 6 inches (6.5–15 cm) tall, and is smooth to cottony-scaly. The gills are white and covered by a membranous white **partial veil** when young, and are not attached to the stalk or barely reach it. They are close or crowded with many short gills. The spore print is white.

When young, these mushrooms are completely enveloped in a **universal veil,** which is a skin-like membrane. As it grows it resembles an egg that splits open as the cap pushes through, leaving the veil

attached at the base of the stalk, forming a loose sack or cup called a volva.

Where it may be found
These are common **mycorrhizal** mushrooms – the most widely distributed and commonly encountered "destroying angel" of eastern North America. They are frequently found on the ground in hardwood and pine woods, especially with oaks. They can also be found beneath trees in lawns and parks. They appear in early summer through fall.

What makes it poisonous
Amanita bisporigera contain dangerous **amatoxins**. Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6–24 hours following ingestion. Immediately after ingestion, the victim will likely be symptom free. The second phase, the gastrointestinal phase (which may begin as early as 6 hours after ingestion, but typically within 24 hours) is defined by nausea, vomiting, abdominal cramps, and diarrhea. During the third, or latent phase of poisoning, gastrointestinal symptoms can improve briefly. The fourth, or multisystem organ failure phase is characterized by liver and kidney injury, and often peaks 3–5 days after ingestion. Recovery can occur but numerous fatalities have been reported following the ingestion of this mushroom.

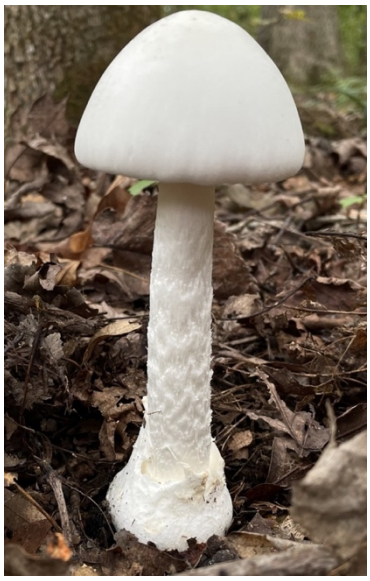


Photo credit: Penny Firth

Look-alikes
Amanita bisporigera mushrooms are most likely to be confused with the white-spored *Lepiotaceae*, which have neither a volva nor a sticky cap, but no *Lepiota* species is recommended as edible. *Amanita bisporigera* may also be confused with *Limacella*, a small genus of slimy gilled mushrooms with white spore prints and gills that are free from the stem. When in its early button stage *Amanita bisporigera* may resemble and be confused with common puffballs, genus *Lycoperdon*, which are completely white inside and edible when young. Another potential source of confusion is *Amanita citrina,* which is pale yellow with a rimmed basal bulb, but it is generally considered inedible. Finally, *Volvopluteus gloiocephalus* (also known as *Volvariella speciosa*) is a look-alike, but it lacks a ring, has a pink spore print and pink mature gills, and is usually found growing in gardens, lawns, wood chips, and other urban places.

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Amanita elliptosperma and *Amanita magnivelaris*

Atkinson's Destroyer &
Great Felt Skirt Destroying Angel

Amanita magnivelaris
Photo credit: Adam Boring

Amanita elliptosperma
Photo credit: Alan Rockefeller

Description
These two *Amanita* species are very similar in appearance and difficult for non-experts to distinguish. Both have white caps, 2 to 5 inches (1–2 cm) in diameter, which can be sticky when moist. The gills are crowded and white, sometimes with a pinkish tinge. Their stems are about 2 to 7 inches (1–3 cm) tall and feature a distinctive, bulbous base called a **volva,** that may be partially hidden underground. *Amanita magnivelaris* has a large, woolly, cream-to-yellow **annulus** (veil), while *Amanita elliptosperma* has a thinner, more membranous veil. This difference can help in identification. In Latin *magnivelaris* means "great veil," and *elliptosperma* means "elliptical spores." Experts often use microscopes to examine spores for identifying characteristics.

Where it may be found
Like many *Amanita* species, these grow in soil near trees, sharing their mineral and other resources (**ectomycorrhizal)**. Often found in groups, these mushrooms will not be found growing directly from wood. Their impressive size and bright white color makes them stand out in the woods and be attractive to foragers, which might lead to accidental ingestions. Reports and documented observations of these two mushrooms in Virginia are quite rare.

What makes it poisonous
These mushrooms contain deadly **amatoxins.** Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6–24 hours following ingestion. Immediately after ingestion, the victim will likely be symptom free. The second phase, the gastrointestinal phase (which may begin as early as 6 hours after ingestion, but typically within 24 hours) is defined by nausea, vomiting, abdominal cramps, and diarrhea. During the third, or latent phase

of poisoning, gastrointestinal symptoms can improve briefly. The fourth, or multisystem organ failure phase is characterized by liver and kidney injury, and often peaks 3–5 days after ingestion. Recovery can occur but numerous fatalities have been reported following the ingestion of this mushroom.

Look-alikes

These two *Amanita* species may be mistaken for *Agaricus campestris* (field or meadow mushroom) a large, white, edible mushroom that can be distinguished by its dark gills. It is important to note that young specimens of the "destroying angel" group can resemble small puffballs, which are edible. Confusing a young amanita for a puffball can lead to poisoning: Cut all presumed puffballs in half from top to bottom and discard any that are not uniformly pure white inside and soft like a marshmallow. An amanita button will display a developing stem and gills.

Notes

Charles Horton Peck, a highly accomplished 19th and early 20th century American mycologist, initially misidentified *Amanita magnivelaris* as *Amanita elliptosperma,* highlighting the difficulty in distinguishing between these two species.

Amanita elliptosperma.
Photo credit: Alan Rockefeller

Amanita magnivelaris
Photo credit: Adam Boring

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Amanita multisquamosa

(Synonyms: *Amanita pantherina var. multisquamosa*, *Amanita cothurnata)*
Small Funnel-Veil Amanita, White Panther

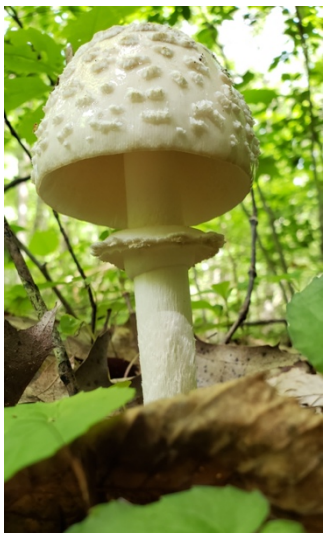

Photo credit: Lee Borg

Photo credit: John Plishke

Description
Amanita multisquamosa is a member of the *Amanita pantherina* group, and is a strikingly beautiful mushroom. As with others in this group, *Amanita multisquamosa* also has a collared base at the bottom of the stem**.** One feature unique to this mushroom is an upturned **partial veil**, giving it a funnel shape. Depending on age and environmental factors, the partial veil may appear downturned or even be non-existent. The stem is white and ranges from approximately 3 to 5 inches (8–13 cm) in height. The white gills are crowded and detached from the stem. The cap ranges from 1.4 to 4 inches (3.5–10 cm) across. Its color may vary but is most typically white at the outer edge, fading to tan or brown at the center. The cap is distinctly **striate**, with parallel ridges around the edge, and is typically covered in whitish warts. Heavy rain and other environmental conditions can wash off the warts.

Where it may be found
Amanita multisquamosa can be found growing alone, scattered, or grouped together, in small or large clusters, in mixed hardwood forests, most commonly associated with oaks. It appears from summer through fall.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. When the mushroom dries, or is processed in the body after eating, ibotenic acid turns into muscimol. These toxins are found in varying amounts within the mushroom, with the highest amounts detected in the cap. Ibotenic acid is similar in structure to **glutamic acid**, and muscimol is similar to **gamma-aminobutyric acid** (**GABA)**, both of which are brain chemicals. Both activate **receptors** in the brain, interactions which cause the psychoactive effects of intoxication. Additionally, some species of *Amanita* are known to contain **muscarine**. The presence and concentration of muscarine in amanitas that contain ibotenic acid and muscimol is not fully understood at this time:
One recent study indicates that other species are implicated with muscarinic symptoms, such as *Amanita persicina* and *Amanita muscaria*, to name a few. Because

of the close genetic relationship that this amanita has with many of those containing ibotenic acid and muscimol in our publication, it may be assumed that muscarine is present and a factor in these as well.

Potential symptoms

Symptoms typically start within 30 minutes to 2 hours. A state of confusion, dizziness, and tiredness, visual and auditory **aesthesia** (hypersensitivity), hallucinations, space distortion, and unawareness of time have all been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur. After two hours a period of drowsiness follows, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts 8 hours. Gastrointestinal effects are sometimes reported and are not characteristic. Seizures and coma have been reported, and some patients have required life support. In most cases recovery is rapid and complete after 24 hours, without noticeable long-term adverse effects. Fatalities are possible. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.

Look-alikes

The most notable look-alikes for *Amanita multisquamosa* would be some pale forms of *Amanita amerirubescens* and *Amanita brunnescens.* Key identifying differences are in the partial veil and the flesh. With *Amanita amerirubescens,* the partial veil is located near the top of the stem, but with *Amanita multisquamosa* it is located more centrally. *Amanita amerirubescens* belongs to a group called 'the blushers' because its flesh turns reddish-brown when damaged.

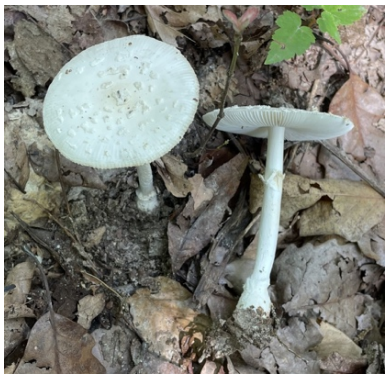

Photo credit: Penny Firth

Notes

There is a detailed case report of a 30 year old woman who cooked and ate an unknown mushroom that was later identified as *Amanita multisquamosa*. Initial symptoms began after 3 hours and were described as "altered mental state." She was regularly monitored and never found to have vital signs other than "unremarkable." She was treated and within 14 hours her mental state had improved. She was discharged after 2 days. The scientific writeup on the incident reads, "Conclusion: This was a patient case involving rare exposure to an uncommon *Amanita* species, *Amanita multisquamosa*, resulting in clinically significant central nervous system toxicity but no hepatotoxicity.

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Amanita muscaria var. *guessowii*

American Yellow Fly Agaric, Yellow Fly Agaric

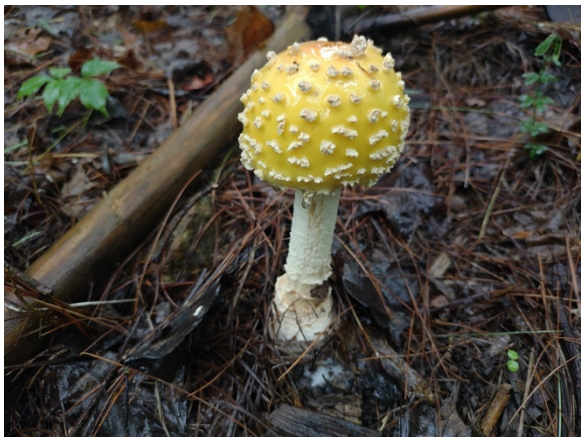

Photo credit: Adam Boring

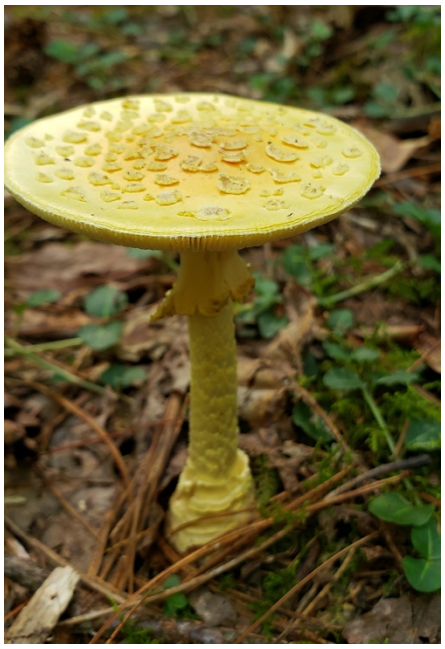

Photo credit: Lee Borg

Description

The cap of this mushroom is 2 to 7 inches (5–19 cm) wide. It begins nearly round in shape, but as it matures, it becomes convex, then broadly convex or nearly flat. Its surface can sometimes be smooth and range in color from pale yellow to bright yellow, reddish-orange, or orange-yellow, fading with age. The cap is covered with numerous whitish to yellowish cottony warts, which are remnants of the partial veil. It feels sticky when fresh, and the margin is usually slightly lined. The gills of this mushroom are narrowly attached to the stem or sometimes free from it. They are white and closely spaced, with shorter gills being infrequent and usually limited to the edges near the margin.

The stem measures 2 to 12 inches (6–30 cm) tall and up to 1.0 inch (1–3.5 cm) thick. It typically tapers toward the top and flares out at the base to an enlarged basal bulb. The surface of the stem is often somewhat shaggy and white, with a delicate, whitish, skirt-like ring that may have a yellowish edge. At the top of the bulb, concentric, rim-like bands of the universal veil are often visible. There is no odor and the spores are white. This mushroom looks similar to the *Amanita muscaria* in Europe and Asia, but the North American variety is a distinct species.

Where it may be found

This mushroom is primarily **mycorrhizal**, typically found with conifers (pines, red spruce, and eastern red cedar), sometimes with hardwoods. At higher elevations, above 3,000 feet in Virginia, it will start fruiting July through September. At lower elevations it will fruit from late summer into the fall. In wet years (such as 2023) the fruiting can be dramatic, with hundreds fruiting in young pine areas.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. When the mushroom dries or is processed in the body after eating, ibotenic acid is converted by the body to muscimol. These toxins are found in varying amounts within the mushroom, with the highest amounts detected in the cap. Ibotenic acid is similar in structure to **glutamic acid**, and muscimol is similar to **gamma-aminobutyric acid** (**GABA)**, both of which are brain chemicals. Both of these toxins activate **receptors** in the brain, interactions which cause the psychoactive effects of intoxication from this mushroom. This species of *Amanita* is also known to contain **muscarine**, a toxin that activates a receptor in the brain, resulting in **cholinergic syndrome** in which the nervous system is overstimulated, leading to excessive salivation, sweating, and in severe cases, difficulty breathing and heart problems.

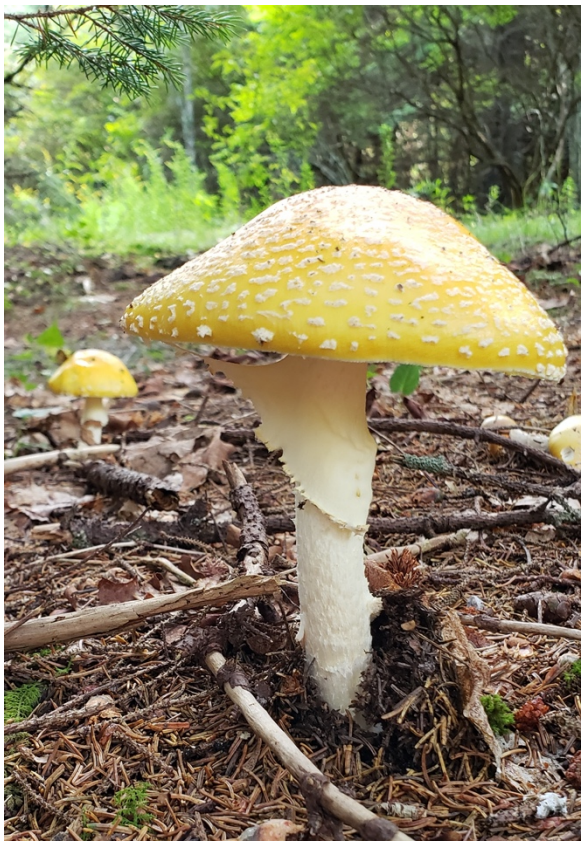

Photo credit: Lee Borg

Potential symptoms
Ibotenic acid and muscimol symptoms typically start 30 minutes to 2 hours after ingestion. A state of confusion, dizziness, and tiredness, visual and auditory **aesthesia** (hypersensitivity), hallucinations, space distortion, and unawareness of time have been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur.
A period of drowsiness after 2 hours follows these initial symptoms, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts 8 hours. Gastrointestinal effects are inconsistently reported and are not characteristic. Seizures and coma have been reported, and some patients have required life support. In most cases recovery is rapid, and complete after 24 hours, without noticeable long-term adverse effects, however, rare fatalities have been reported, though not definitively linked to these toxins in humans. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.

Look-alikes
Amanita persicina looks very similar but is more peachy in color; *Amanita praecox* is also similar (both of these species are also covered in this publication).

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Amanita persicina

(Synonym: *Amanita muscaria var. persicina*)

Peach Amanita, Peach-colored Fly Agaric

Photo credit: Penny Firth

Photo credit: Penny Firth

Description

The cap is 1.6 to 8 inches (4–20 cm) wide, almost round to convex at first, becoming flattened with age. The cap color is pale orange to dull red, fading with time to peach, melon, or yellowish, and is often darker in the center. The cap is smooth and can be a little sticky when fresh. The cap is slightly **appendiculate** (the edge of the cap has a little veil tissue on it, making it less than smooth) and covered with many yellowish, cottony warts that are remnants of a **universal veil**. These may wash off in the rain. The cap edge usually becomes slightly lined (**striate**) with age. The gills are close to crowded, and medium wide or broad; either free from the stem (appearing cut off), or narrowly attached to the stem. The gills are white, cream, or pinkish, with a cottony edge; **short gills** are frequent. The thin, fragile **annulus**, (**partial veil** remnant**,** often called a ring or skirt) hangs from the mid-to-upper portion of the white to off-white stem. This ring is mostly white but yellowish underneath. The stem, 1.6 to 10 inches (4–25 cm) tall and 0.4 to 1.2 inches (1–3 cm) thick, is more cottony/shaggy toward the base, but sometimes also at the pale-yellow top. Remnants of the **volva** (another part of the **universal veil)** above the bulbous stem-base are pale yellow to tan, with thin woolly or fibrous fragments or patches, often in broken, imperfect, concentric rings. These very flimsy remnants, along with any ring on the stem, sometimes fall off entirely. The spores are white. The flesh is also white and doesn't change if sliced or bruised except for an occasional faint yellowish tint in the stem.

Where it may be found

These mushrooms are **mycorrhizal** (sharing nutrients with), mostly with oaks and pines, and may be found growing singly, scattered, or in troops. They are found in the woods under trees, and in urban settings, in the summer and fall. They have been reported in several different regions of Virginia.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. When the mushroom dries or is processed in the body after eating, ibotenic acid turns into muscimol. These toxins are found in varying amounts within the mushroom, with the highest amounts detected in the cap. Ibotenic acid is similar in structure to **glutamic acid**, and muscimol is similar to **gamma-aminobutyric acid** (**GABA)**, both of which are brain chemicals. Both of these toxins activate **receptors** in the brain, interactions which cause the psychoactive effects of intoxication from this mushroom. This species of *Amanita* is also known to contain **muscarine**, a toxin that also activates a receptor in the brain resulting in **cholinergic syndrome**, in which the nervous system is overstimulated, leading to excessive salivation, sweating, and in severe cases, difficulty breathing and heart problems.

Potential symptoms
Symptoms typically start 30 minutes to 2 hours after ingestion. A state of confusion, dizziness, and tiredness, visual and auditory **aesthesia** (hypersensitivity), hallucinations, space distortion, and unawareness of time have been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur. A period of drowsiness after 2 hours follows these initial symptoms, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts 8 hours. Gastrointestinal effects are inconsistently reported and are not characteristic. Seizures and coma have been reported, and some patients have required life support. In most cases recovery is rapid and complete after 24 hours without noticeable long-term adverse effects. Fatalities may occur following the ingestion of mushrooms containing ibotenic acid and muscimol. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.


Photo credit: Penny Firth

Look-alikes
Amanita muscaria var. *guessowii,* which is also poisonous (and covered in this publication), has more "perfectly" concentric rings of veil remnants at the base of the stem, and a more yellow-orange cap. *Amanita persicina* may also be mistaken for the classic red *Amanita muscaria* var. *flavivolvata,* the iconic mushroom of fairy tales and psychedelic art, but which is not found in Virginia. An uninformed forager might be seeking hallucinogenic effects and instead end up with a dangerous intoxication.

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Amanita phalloides

Death Cap, Euro-Asian Death Cap

Photo credit: Alan Rockefeller

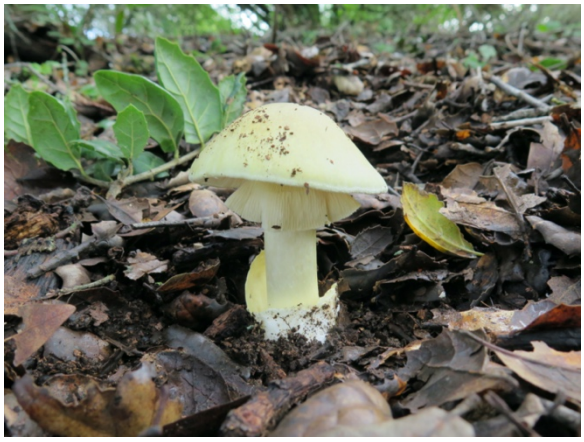

Photo credit: Alan Rockefeller

Photo credit: Alan Rockefeller

Description

Amanita phalloides, one of the deadliest mushrooms in the *Amanitaceae* family and closely related to *Amanita bisporigera*, often contains enough toxin to kill an adult. Its cap varies from pale to dark olive-green, yellow-green to yellow, gray, brown, or occasionally white. It is often darker in the center and paler at the edges, fading with age to grayish-green, light brown, olive-buff, or dull yellowish. Sometimes, thin, silky white patches of **universal veil** tissue are present on the cap, which is typically smooth-edged, initially oval, and becomes dome-shaped to flat as it matures. The cap is smooth, sticky when moist, and often shiny or metallic when dry. The cap ranges from 1.6 to 6.25 inches (4–16 cm) in width. The flesh is white, with a mild odor that becomes pungent or nauseating over time, resembling raw potatoes or chlorine. The taste is not distinctive. The stem is white or slightly colored like the cap, solid or hollow, thick, and tapers upward or is equal in width with an enlarged base. It can be smooth or have tiny scales and fibers. Stems range from 2 to 7 inches (5–18 cm) tall and 0.4 to 1.2 inches (1–3 cm) thick. The gills are detached from the stem, close together or crowded, white or tinged faintly greenish. A white or yellow-green tinged **partial veil** forms a fragile skirt-like ring, which may disappear with age. The spore print is white. When young, the mushroom body is enveloped in the universal veil. As the mushroom grows it resembles an egg that splits open. The cap pushes through this veil, which remains attached, forming a **volva**, a loose sac or cup at the base of

the stem, which is thin and fragile, often buried in the ground, and sometimes in pieces.

Where it may be found
This mushroom can form **mycorrhizal** relationships with many plants, though it is most commonly associated with oaks. It is widely distributed and found primarily in the eastern and western United States. In Virginia it has been observed under pine trees, possible evidence of its ability to associate with a variety of plants. You can find it growing singly, scattered, or in groups in woods or on lawns near trees. These mushrooms typically appear from fall through early winter.

What makes it poisonous
Amanita phalloides contains deadly **amatoxins.** Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit protein synthesis in cells, which can lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6 to 24 hours following ingestion; amatoxin poisoning occurs in four phases: Immediately after ingestion, the victim will likely be symptom free. The second phase, the gastrointestinal phase (which may begin as early as 6 hours after ingestion, but typically within 24 hours) is defined by nausea, vomiting, abdominal cramps, and diarrhea. During the third, or latent phase of poisoning, gastrointestinal symptoms can improve briefly. The fourth, or multisystem organ failure phase is characterized by liver and kidney injury, and often peaks 3 to 5 days after ingestion. Recovery can occur but numerous fatalities have been reported following the ingestion of this mushroom.

Look-alikes
Look-alike poisonous mushrooms for *Amanita phalloides* include two other amanitas. These are *Amanita citrina* (false death cap), which is pale yellow in color and has a rim around its base. Another, *Amanita bisporigera* (also covered in this publication) is all white. *Amanita phalloides* has also been misidentified as the edible straw mushroom (*Volvariella volvacea*), the field mushroom (*Agaricus campestris*), and when young, a puffball. *Amanita phalloides* can be distinguished by its smell and large cup at the base of the stem.

Notes
The North American version is the same as the European *Amanita phalloides*, first named in the early 19th century. Evidence has been found to support the idea that *Amanita phalloides* was introduced in California and the New Jersey area, and is expanding its range on the West Coast and in the Mid-Atlantic states.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Amanita praecox

(Provisional name–*Nomen provisorum*)
Early Spring Amanita

Photo credit: John Plischke

Photo credit: Penny Firth

Description

This early spring mushroom is a member of the **pantheroid** group of amanitas. The cap is yellow, sometimes with shades of orange, gray, pale tan, or a darker brownish yellow. Initially dome-shaped, the cap flattens with age and develops a slight **umbo** (nipple or knob). As it matures, the cap edges curve upward. The cap flesh is white, does not bruise when cut, and is 0.1 to 0.4 inches (2.5 to 3.5 mm) thick above the stem. The edge is **striate** (grooved) up to a quarter of the cap radius. The cap is typically sticky when dry and slimy when wet. When young, caps are covered with a weak **universal veil** that can leave cottony white patches on the surface.

The stem of *Amanita praecox* is 2.3 to 5.3 inches (6–14 cm) tall and 0.01 to 0.65 inches (0.5–2 cm) thick, white or whitish (but can bruise brown when touched), with a powdery top and fibrous lower part. The white bulb at the base is 0.6 to 1.26 inches (1.5–3.2 cm) long and 0.43 to 1.1 inches (1.1–2.8 cm) wide, sometimes with thick white **mycelium** attached. The stem flesh is white and can be filled with cottony material. Located above the middle of the stem, the white **ring** (remains of a **partial veil**) has a thickened edge, and often disappears with age or weather. Gills are **decurrent**, or detached from the stem, and may leave a bit of gill material called a **decurrent tooth** at the very top of the stem. Gills are white to cream-colored and are spaced somewhat close together, but not crowded. Randomly distributed **short gills** of various lengths are present. The spores are white or whitish.

Where it may be found

Amanita praecox is nearly always associated with Eastern hemlock (*Tsuga canadensis*) trees and is one of the first amanita mushrooms to emerge in the spring. Eastern hemlock is common in the mountains of Virginia, infrequent in the Piedmont, and rare in the Coastal Plain. Like other amanitas, *Amanita praecox* grows in the soil near trees, rather than on wood or leaf litter.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. When the mushroom dries or is processed in the body after eating, ibotenic acid turns into muscimol. These toxins are found in varying amounts within the mushroom, with the highest amounts detected in the cap. Ibotenic acid is similar in structure to **glutamic acid**, and muscimol is similar to **gamma-aminobutyric acid** (**GABA)**, both of which affect the brain. These toxins activate **receptors** in the brain, interactions which cause the psychoactive effects of intoxication from this mushroom. Additionally, some species of *Amanita* are known to contain **muscarine**. The presence and concentration of muscarine in amanitas that contain ibotenic acid and muscimol is not fully understood at this time: One recent study indicates that other species were implicated with muscarinic symptoms, such as *Amanita persicina* and *Amanita muscaria*, to name a few. Because of the close genetic relationship that these amanitas have with many of those containing ibotenic acid and muscimol in our publication, it may be assumed that muscarine is present and a factor in these as well.

Potential symptoms
Symptoms typically start 30 minutes to 2 hours after ingestion. A state of confusion, dizziness, and tiredness, visual and auditory **aesthesia** (hypersensitivity), hallucinations, space distortion, and unawareness of time have been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur.

A period of drowsiness after 2 hours follows these initial symptoms, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts 8 hours. Gastrointestinal effects are inconsistently reported and are not characteristic. Seizures and coma have been reported, and some patients have required life support. In most cases recovery is rapid and complete after 24 hours without noticeable long-term adverse effects. Fatalities may occur following the ingestion of mushrooms containing ibotenic acid and muscimol. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.

Look-alikes
Amanita praecox can look similar to several other **pantherinoid** mushrooms such as *Amanita stranella* (the little straw-colored *Amanita*) – you can tell them apart by where they grow: *Amanita praecox* is found near Eastern hemlock trees, while *Amanita stranella* is found near pines. Other similar mushrooms can be identified by their appearance and the time of year they grow. These include *Amanita albocreata*, *Amanita multisquamosa*, *Amanita velatipes* (also described in this publication), and *Amanita subvelatipes*.

Notes
Amanita praecox is a provisional, or temporary, name; this mushroom has not yet been officially described in a peer-reviewed publication and therefore information about it is limited. More details might be available under its previous provisional code name, "*Amanita* sp-32."

Consuming poisonous mushrooms can be dangerous.
*For appropriate medical advice, call your local poison center at **1-800-222-1222.***

Amanita suballiacea

Garlic-scented Destroying Angel, Destroying Angel

Photo credit: John Plischke

Photo credit: Adam Boring

Photo credit: John Plischke

Description

The largest of the North American destroying angels group, the cap of this mushroom is robust, round to oval, and 2 to 7 inches (5-18cm) wide. As the mushroom ages, the cap becomes dome shaped, smooth, white to ivory colored, and slightly sticky. The flesh is thin and white. The gills are close together, even crowded, white, and detached from the stem. The stem is 2 to 7 inches (5-18cm) tall slightly expanded at the top, solid and white, with a thin membrane on the **volva** at the top of the **bulb**. The skirt is membranous, thin and weak. The stem's bulb is egg-shaped and may be deeply buried in the **substrate**, the material the mushroom grows from. This mushroom has a strong to faint odor of garlic or sometimes bleach; the odor also may be absent entirely. Spore size and shape set this mushroom apart from the other deadly amanitas.

Where it can be found

Amanita suballiacea thrives in a range of habitats, from sandy soils near beaches to rocky soils in mixed hardwood forests. It is commonly associated with trees such as pines, oaks, and hickories. Historically, this species was primarily seen in the Gulf Coast states, but recent DNA analyses have confirmed its presence in southwest Virginia and as far north as Wisconsin. First described in Florida, *Amanita suballiacea* was initially observed with live oak and loblolly pine trees.

What makes it poisonous
These mushrooms contain deadly **amatoxins**. Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6-24 houses following ingestion. Immediately after ingestion, the victim will likely be symptom free. The second phase, gastrointestinal phase (which may begin as early as 6 hours after ingestion, but typical within 24 hours) is defined by nausea, vomiting, abdominal cramps, and diarrhea. During the third or latent phase of poisoning gastrointestinal symptoms can improve briefly. The fourth or multisystem organ failure phase is characterized by liver and kidney injury, and often peaks 3-5 days after ingestion. Recovery can occur but numerous fatalities have been reported following the ingestion of this mushroom.

Photo credit: John Plischke

Look-alikes
Common look-alikes are *Amanita phalloides* and *Amanita bisporigera* (both of which are also covered in this publication), and *Aminiata sturgeonii*, all of which have slight differences.

Leucoagaricus leucothites is an edible look-alike mushroom, but lacks the volva sac. Another edible mushroom, *Volvariella bombycina*, is also similar, but has a pink spore print and grows on stumps and other wood.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Amanita velatipes

(Synonym: *Amanita pantherina var velatipes*)
Great Funnel Veil Amanita, Yellow Panther

Photo credit: John Plischke

Photo credit: John Plischke

Description
The cap of this mushroom measures 3 to 10 inches (7–18 cm) wide. It is oval or egg-shaped at first, becomes convex, and then broadly convex or nearly flat. It is sticky when young, or when wet. The surface of the cap is smooth but covered with numerous whitish warts that are generally concentric and may disappear in wet weather. The cap is brownish when very young; sometimes reddish brown in the center, and becomes dull tan to creamy yellow along the edges. As with most *Amanita* species, the gills are generally considered to be free, or detached from the stem. Close observation may reveal a faint line of attachment. The gills are white and crowded, with numerous **short-gills** (that don't extend from the cap edge to the stem) present. The flesh of the cap is white throughout. There is no distinct odor.

The stem is 3 to 8 inches (8–20 cm) tall and 0.2 to 0.8 inches (0.5–2 cm) thick; the stem is generally equal from the cap down to the base. There is a sturdy white ring near the top of the stem, the remains of the **partial veil** which covered the mushroom in its earliest stages. The stem surface above the ring is smooth or silky and below the ring the stem is hairy to shaggy.

The stem ends in a **basal bulb**, the lower round part of which is connected to the **mycelium**. The basal bulb usually has a folded-over rim of **universal veil** remnant along its upper edge and more bands of veil material below.

Where it may be found
These mushrooms are found singly or in groups. Their preferred habitat is in mixed forests with oaks and pines. They are found throughout the state of Virginia from July through September. *Amanita velatipes* has a **mycorrhizal** relationship with oak trees and may be seen along their buried roots.

What makes it poisonous
This mushroom contains both **ibotenic acid** and **muscimol**. When the mushroom dries or is processed in the body after

eating, ibotenic acid turns into muscimol. These toxins are found in varying amounts within the mushroom, with the highest amounts detected in the cap. Ibotenic acid is similar in structure to **glutamic acid**, and muscimol is similar to **gamma-aminobutyric acid** (**GABA)**, both of which are brain chemicals. Both of these toxins activate **receptors** in the brain, interactions which cause the psychoactive effects of intoxication from this mushroom. Additionally, some species of *Amanita* are known to contain **muscarine**. The presence and concentration of muscarine in amanitas that contain ibotenic acid and muscimol is not fully understood at this time: One recent study indicates that other species were implicated with muscarinic symptoms, such as *Amanita persicina* and *Amanita muscaria*, to name a few. Because of the close genetic relationship that these amanitas have with many of those containing ibotenic acid and muscimol in our publication, it may be assumed that muscarine is present and a factor in these as well.

Potential symptoms

Symptoms typically start 30 minutes to 2 hours after ingestion. A state of confusion, dizziness, and tiredness, visual and auditory **aesthesia** (hypersensitivity), hallucinations, space distortion, and unawareness of time have been reported. Dryness of the mouth and **mydriasis** (dilation of the pupils) may occur. A period of drowsiness after 2 hours follows these initial symptoms, with vivid dreams reported. A deep sleep ends the poisoning, which generally lasts 8 hours.

Photo credit: John Plischke

Gastrointestinal effects are inconsistently reported and are not characteristic. Seizures and coma have been reported, and some patients have required life support. In most cases recovery is rapid and complete after 24 hours without noticeable long-term adverse effects. Fatalities may occur following the ingestion of mushrooms containing ibotenic acid and muscimol. Symptoms caused by muscarine may include increased saliva, sweating, nausea, vomiting, blurred vision, and in severe cases, heart complications.

Look-alikes:

Look-alikes for *Amanita velatipes* include some other Amanitas that contain the same toxins, including *Amanita muscaria var. guessowii*, *Amanita persicina*, and *Amanita praecox* (also covered in this publication) and *Amanita subvelatipes*.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Boletus sensibilis

Curry Bolete, Sensitive Bolete

Photo credit: John Plischke

Description

This mushroom features pores underneath its cap, instead of gills, resembling a bun with a spongy underside. It lacks remnants of an **annulus** (**partial veil**, also called a ring or skirt). The cap ranges from 2 to 6.25 inches (5–16 cm) wide, initially rounded and then flattening with age. Its color starts as brick red, fading to rosy or cinnamon hues, and it can be slightly velvety or completely smooth. The pore surface starts yellow and matures to dull brown. The stem measures 3 to 5 inches (8–12 cm) in length and 0.4 to 1.4 inches (1.0–3.5 cm) in thickness, sometimes thicker near the base. It is yellow, occasionally pinkish or reddish near the base, mostly smooth, but may have a faint net-like texture at the top. Its odor varies, sometimes fruity, akin to maple syrup, licorice, fenugreek, or commonly, curry. Features that distinguish this mushroom include yellowish flesh inside the cap and stem that instantly stains a deep dark blue when cut, bruised, or handled, fading to a grayish-orange over time.

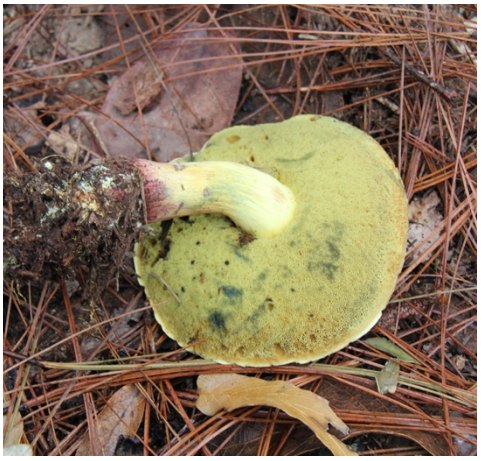

Photo credit: Alan Rockefeller

Where it may be found

Usually found growing on the ground, in the woods, under deciduous trees from July through September. It may be found singly or in a group, and has been found growing in all regions of Virginia.

Photo credit: Alan Rockefeller

What makes it poisonous
Although this mushroom is often called inedible in the media, there are very few scientific reports of it being toxic to humans. Scientists have not identified a specific poison in this mushroom yet. There are scattered reports of **muscarine** being present in small quantities, but this cannot be confirmed.

Potential symptoms
If ingested, gastrointestinal upset has been reported to occur in some people, consisting of nausea, vomiting, abdominal cramps, and diarrhea. No fatalities have been confirmed due to ingestion of this mushroom. There are reports that some people eat this mushroom with no trouble.

Photo credit: Alan Rockefeller

Look-alikes
Baorangia bicolor, the bicolor Bolete, which is edible, is a look-alike, as is *Lanmaoa pseudosensibilis* (syn. *Boletus pseudosensibilis*). Although *Lanmaoa pseudosensibilis* are not known to be poisonous, they are very difficult to differentiate from *Boletus sensibilis,* as indicated by the name.

Notes
There are three boletes that are easily confused, and the often-described curry scent is not always present or may be present in other species.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Chlorophyllum molybdites

(Synonym: *Lepiota morganii*)
False Parasol, Green Gill, Green Spored Parasol, The Vomiter

Description

The cap of this mushroom measures from 4 to 15 inches (7–40 cm) across, and is convex to round when young, becoming nearly flat with age. In the button (early) stage the cap is dry and bald but soon becomes scaly, with brown to pinkish-brown or tan scales that are uplifted or flat. The scales concentrate near the center and the cap surface under the scales is hairy and white to pale tan in color. The scales will peel off, unlike look-alike edibles, where the scales do not peel. There is a thick white **partial veil** which may slide down the stem, leaving a persistent white ring with a green to brownish lower edge. The gills are detached or slightly attached to the stem and close together. **Short gills** (that do not reach the stem) are frequent. The gills are white when young, becoming grayish green to brownish green as the spores mature. The stem is 2 to 10 inches (5–25 cm) tall and 0.5 to 1 inch (1.5–3 cm) thick, tapering slightly towards the top, and slightly enlarged towards the base. The stem is dry, hairless or very finely hairy, firm, and white to brownish in color. When handled the stem bruises slightly brown. The flesh of the cap is white or can change color to slightly red with age. The spores are a dull, grayish green.

Where it may be found

It is usually found in grassy areas, often in groups, or "**fairy rings**." The species can be found coast-to-coast in warm humid regions and has extended its range northward in recent decades.

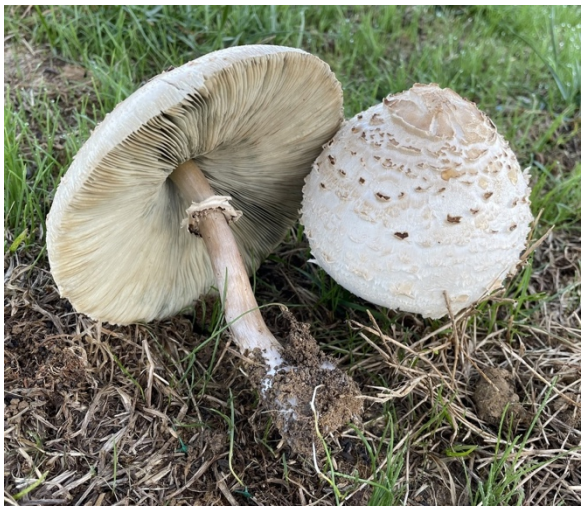

Photo credit: Penny Firth

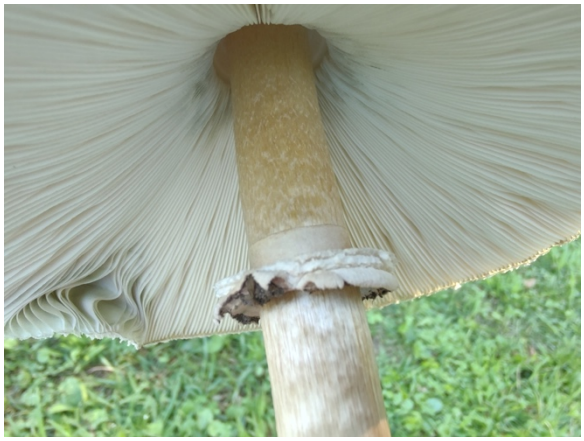

Photo credit: Adam Boring

Photo credit: John Plischke

What makes it poisonous
This mushroom contains the toxin **molybdophyllysin** which causes severe gastrointestinal distress if ingested. This toxin is a protein that is very similar to **metalloendopeptidases**, which are enzymes that break down other proteins.

Potential symptoms
If eaten, severe gastrointestinal upset can occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea that can be resistant to medical treatment. Due to these symptoms, patients often develop dehydration and **electrolyte** loss. Poisoning from eating *Chlorophyllum molybdites* has been documented for the past 100 years; historically, numerous fatalities were reported in the absence of modern hydration and electrolyte replacement therapy. The main cause of poisoning is confusion with edible species or, more often, young children exploring the world with their mouths.

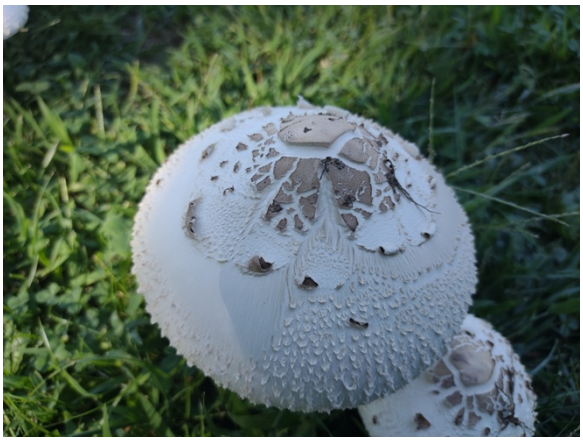

Photo credit: Adam Boring

Look-alikes
After the growth stage, *Chlorophyllum molybdites* closely resembles the edible *Macrolepiota procera*, the parasol mushroom. The gills and spores of the parasol are white, with no hint of green, and the parasol is much taller, the stem up to 10 inches (25 cm) tall. Other look-alikes include *Chlorophyllum rhacodes* (very similar in appearance but smaller than *Chlorophyllum molybdites*), and various *Agaricus* species, including *Agaricus campestris*, known as the meadow mushroom, as well as *Agaricus abruptibulbus*, known as the abruptly-bulbous *Agaricus*, or the flat-bulb mushroom. These two *Agaricus* mushrooms are edible. The greenish gills of the *Chlorophyllum molybdites* identify it as a poisonous mushroom and distinguish it from similar species, which have pink gills and a brown spore print.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Clitocybe Species

(Also known as *Collybia* – all known toxic species are in genus *Collybia,* subgenus *Collybia*)

Funnels

Description

Because they are all similar, these mushrooms are often difficult to distinguish by appearance alone. They can be white to whitish, brownish, cream, greenish, or grayish in color. They typically have a funnel shape, and their spores cause the gills to change color from off-white to pinkish to brownish as the mushroom matures. The caps can be flat, wavy at the edges, or have upturned edges, depending on the species and how mature they are. In dry conditions, or after being picked, they may become paler. The gills can be broadly attached, attached with an indentation at the stem, or run down the stem. The stems don't have a ring and are solid when young but become hollow as they mature. They are usually the same color as the cap or paler and have whitish fibers running along them. The base of the stem may be enlarged and covered with white or whitish hairs. *Clitocybe* mushrooms can grow in clusters, groups, scattered, or singly.

Where they may be found

Clitocybe grow in and on woody hardwood or pine debris, soil, decaying logs, decaying mushrooms, or even stumps. They are most frequently found in summer and autumn. Species found in Virginia include: *Clitocybe aperta, Clitocybe cirrhata, Clitocybe cookei, Clitocybe dealbata, Clitocybe glaucoalba, Clitocybe rivulosa,* and *Clitocybe tuberosa.*

Photo credit: John Plischke

Photo credit: John Plischke

Photo credit: Annie Weissman

What makes them poisonous
Species of the *Clitocybe* genus contain **muscarine**, a toxin that activates a receptor in the human nervous system and leads to symptoms of **cholinergic syndrome.** Muscarine stimulates the parasympathetic nervous system and affects the organs supplied by those nerves. This effect predominantly affects smooth muscles, glands, and the cardiovascular system.

Potential symptoms
Symptoms of cholinergic syndrome develop quickly (15 minutes to 2 hours) but are usually reported as mild. The potential clinical effects include **miosis** (small pupils), blurred vision, increased salivation, excessive sweating, **lacrimation** (excessive tear formation), increased breathing airway secretions, wheezing, **bradycardia** (slow heart rate), nausea, vomiting, abdominal cramping, diarrhea and **polyuria** (excessive urination). Muscarine may rarely affect the brain and cause tremor and seizures. Death is possible, depending on a person's pre-existing health conditions and the amount ingested.

Notes
In 2023 many *Clitocybe* were reclassified into the genus *Collybia*. With DNA testing, it was found that the *Clitocybe* species containing muscarine were all related and, as a result, were placed together in *Collybia*, subgenus *Collybia*, with all species but one (*Clitocybe odora*), testing positive for muscarine. Since many references and guides online and in print still refer to the toxic species as *Clitocybe*, this name has been used in this publication instead of *Collybia*.

Photo credit: Penny Firth

Photo credit: Huafang Su

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Conocybula smithii

(Synonyms: *Conocybe cyanopus, Conocybe smithii, Galarula cyanopus, Pholiotina cyanopus, Pholiotina smithii*)
Blue Foot Conecap, Bog Conocybe

Photo credit: John Plischke

Description

These are small, fragile mushrooms with cinnamon-brown cone-shaped caps and slender, whitish stems, often bluish at the base. The cap is 0.25 to 1 inch (0.7–2.5 cm) wide, convex, and expands to broadly convex with age. The cap color is cinnamon-brown to dark-brown, fading to tan when dry. The cap surface is moist at first and appears translucent and **striate**, drying quickly, and becoming smooth to slightly wrinkled with age. The edge of the cap may initially have tiny pieces of **partial veil,** which disappear quickly. The cap flesh is thin and fragile. The stem is 0.75 to 1.5 inches (2–4 cm) tall and 0.06 to 0.03 inches (1.0–1.5 mm) thick, typically straight, but sometimes slightly curved at the base. The stem is fragile, whitish at first, with no **annulus** (partial veil) remaining. The stem becomes grayish or brownish at the top and often shows white **mycelium** at the base. The base of the stem bruises blue. The gills are close, attached to the stem, and dull rust-brown. The spore print appears as rusty brown. The odor and taste are not distinctive.

Photo credit: Alan Rockefeller

Where it may be found

Conocybula smithii is rare and the authors have been able to find only one reported sighting in Virginia. Potential habitats are grassy areas and fields as well as mossy areas and bogs. It is most likely to be found at higher elevations in early summer and fall.

What makes it poisonous
This mushroom is known to contain the toxins **psilocybin** and **aeruginascin**. These two toxins have similar clinical effects caused by activating **serotonin receptors** in the brain, with resulting mind-altering or psychedelic effects.

Potential symptoms
The most likely clinical effects are psychological, and can vary following exposure to psilocybin. The most common described are euphoria, a feeling of intense happiness, an altered sense of time and space, and altered perception. **Synesthesia** (a condition in which stimulating one sense (e.g., vision, hearing) triggers a perception in another (e.g., taste, smell) can occur. Negative psychological effects associated with psilocybin can include extreme fear, paranoia, agitation, combativeness, and panic. Physical effects may include changes to vital signs, such as increased heart rate, respiratory rate, and blood pressure. Nausea, vomiting, and abdominal cramps are also possible.

Look-alikes
These mushrooms may be confused with the deadly toxic *Pholiotina* and *Galerina species* that have a partial veil which usually leaves a ring on the stem, commonly identified as *Pholiotina rugosa* and *Galerina marginata* (both of which are also covered in this publication). All are little brown mushrooms and have similar rust-brown spore prints.

Photo credit: Alan Rockefeller

Observing bluing at the base of the stem, the absence of a veil or ring, and noting the habitat may help differentiate this mushroom from deadly look-alikes.

Notes
The taxonomy of many mushrooms are changing as DNA evidence reveals new relationships. This mushroom was recently moved into the genus *Conocybula* from *Pholiotina* (formerly *Conocybe*). Published field guides and many online resources show this mushroom with older names: *Pholiotina cyanopus, Pholiotina smithii, Conocybe cyanopus, Conocybe smithii, and Galarula cyanopus.*

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Coprinopsis Genus Introduction

The mushrooms known as ink caps include several genera, including *Coprinus*, *Coprinopsis*, *Coprinellus*, *Tulloseus*, *Narcissea*, and *Parasola*. One of those, *Coprinopsis*, has three divisions, or sections, that contain toxins: These sections are *Atramentariae*, *Picaceae*, and *Alopeciae*. Many species of ink caps undergo a process known as **deliquescence,** where the caps self-digest and turn into a black goo. Because of this, the study of ink caps is time sensitive and thus proper documentation of species can be difficult. However, species in *Coprinopsis* section *Atramentariae* and section *Picaceae* have been documented in Virginia. To date these species include *Coprinopsis atramentaria, Coprinopsis romagnesiana, Coprinopsis strossmayeri,* and *Coprinopsis variegata.* Species in *Coprinopsis* often emerge rapidly in their habitats and then deliquesce and vanish just as quickly.

These mushrooms contain **coprine**. When an individual ingests coprine and then subsequently drinks alcohol, an enzyme called **aldehyde dehydrogenase** causes what is known as a **disulfiram**-like effect or **Antabuse** reaction. **Disulfiram**, or **Antabuse**, was in the past prescribed by doctors to treat alcoholism.

The interaction with alcohol can occur for up to five days after ingestion of coprine. The potential symptoms include abdominal pain, nausea, vomiting, flushing, headache, rapid heart rate, low blood pressure, tingling, seizures, and various other neurological symptoms.

Coprinopsis atramentaria

(Synonyms: *Agaricus atramentarius*, *Coprinus atramentarius*)
Alcohol Ink Cap, Common Ink Cap

Photo credit: John Plischke

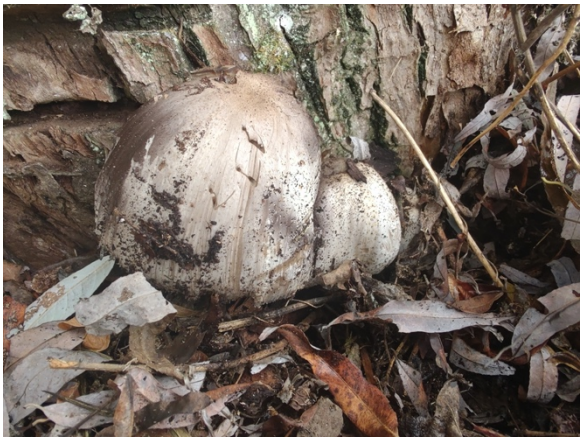

Photo credit: Adam Boring

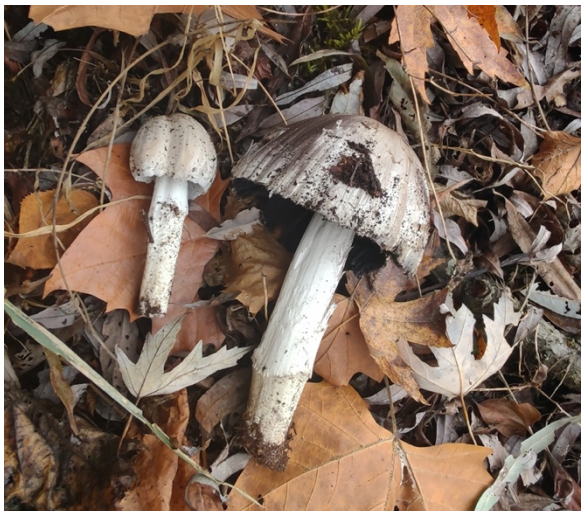

Photo credit: Adam Boring

Description

The alcohol ink cap is a commonly encountered mushroom belonging to the general group of ink caps. The cap of this mushroom self-digests in a process known as **deliquescence**, where the gills and cap flesh turn to a black inky sludge over a period of a few hours. The cap is a shade of gray to gray-brown with some fine scales possible over the center of the cap. Early in its growth the cap is oval in shape; it opens to a cone shape and can be as wide as nearly four inches (10 cm) across. The edge of the cap is faintly lined. The whitish to pale gray flesh is soft and without an odor or taste. As it matures and turns to liquid, the cap edges become tattered, curl upward, or may have hanging globs of black spores and partially digested gill/cap flesh. The stem is white and may range from 3 to 6 inches (8–15 cm) tall and 0.23 to 0.47 inches (6–12 mm) thick. It remains the same thickness from top to bottom and can be smooth to finely hairy. The hollow stem is fibrous when broken. A ring zone may be visible on the lower stem. The gills may be attached to the stem or free from it. They are white at first and change to a pinkish color as they deliquesce, before finally turning black and liquid. They are closely spaced.

Where it may be found

Coprinopsis atramentaria typically grows in clusters on wood above or below the ground. They are often encountered around decaying hardwood stumps or in wood chips. They can be found in urban

areas and in the forest. They fruit in the spring, summer, and fall.

What makes it poisonous
These mushrooms contain **coprine**. When an individual ingests coprine and then subsequently drinks alcohol, an enzyme called **aldehyde dehydrogenase** is inhibited and causes what is known as a **disulfiram**-like effect or **Antabuse** reaction, with symptoms described below. The interaction with alcohol can occur up to five days after ingestion of coprine.

Potential symptoms
The symptoms of coprine poisoning include nausea, vomiting, abdominal pain, flushing, headache, rapid heart rate, low blood pressure, tingling, altered mental status, seizures and various other neurological symptoms.

Look-alikes
Both *Coprinopsis romagnesiana* and *Coprinopsis acuminata* are look-alikes. The former can be distinguished by the prominent brownish to orangish scales on its cap. The latter is distinguished by a narrow **umbonate** cap with brown **striations**. These mushrooms also contain coprine.

Notes
Coprinopsis atramentaria is listed as edible in older field guides and in various online resources. Most say that it is edible with caution. However, the North American Mycological Association warns readers that coprine has been shown to be cancer-causing and they suggest avoiding consumption of this mushroom altogether.

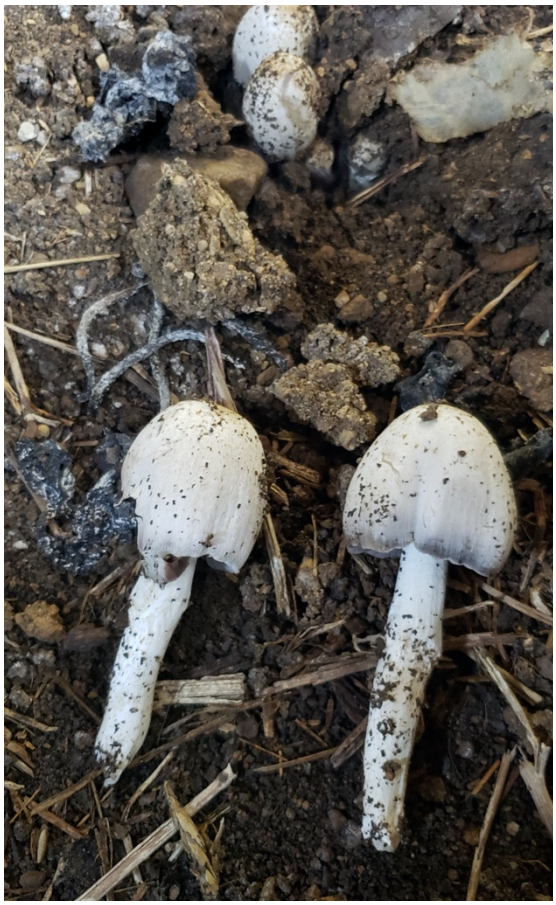

Photo credit: Lee Borg

Fun fact
The black liquid that the cap turns into can be used as an ink to draw with. Who would have thought? Ink cap ink!

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Coprinopsis variegata

(Synonyms: *Coprinus atramentarius var. variegatus*, *Coprinus atramentarius var. crassivelatus*, *Coprinus variegatus*, *Coprinus quadrifidus*, *Coprinus bulbosus*)
Scaly Ink Cap

Photo credit: Penny Firth

Photo credit: Byron Meade

Photo credit: John Plischke

Description

Coprinopsis variegata is a common mushroom belonging to the ink caps group. When young its cap is entirely covered by a whitish to yellowish **universal veil** which breaks apart into patches that remain on the cap as the mushroom matures. Like other ink caps, it **deliquesces**, meaning the gills and cap flesh eventually turn to a black inky sludge. As the cap deliquesces and darkens from brownish-yellow to gray-brown, the patches of veil on the cap remain pale in color. When the mushroom is young and still covered by the universal veil, its overall shape is oblong to oval. As it matures and the cap expands it becomes bell-shaped. The cap measures 1.18 to 3.15 inches (3–8 cm) across. The white stem ranges from 1.96 to 5.11 inches (5–13 cm) tall, and up to 0.4 inches (1 cm) thick, and narrows slightly at the top. It has a rimmed bulb at the base, often buried in the wood it grows in. The initially crowded gills may be narrowly attached to the stem or free from it. They are white at first and change to a grayish color as they deliquesce, finally turning black and liquid. Black spores may be present on the stem. The flesh is thin, white, does not bruise when sliced, and has no distinctive odor.

Where it may be found

While other ink caps grow on grasses, dung, or wood chips, *Coprinopsis variegata* grows in large loose clusters on well decayed hardwood logs.

What makes it poisonous
These mushrooms contain **coprine**. When an individual ingests coprine and then subsequently drinks alcohol, an enzyme called **aldehyde dehydrogenase** is inhibited and causes what is known as a **disulfiram**-like effect or **Antabuse** reaction. The medication disulfiram (Antabuse), was in the past prescribed by doctors to treat alcoholism. The interaction with alcohol can occur for up to five days after ingestion of coprine.

Potential symptoms
The symptoms of disulfiram-like effect include nausea, vomiting, abdominal pain, flushing, headache, rapid heart rate, low blood pressure, tingling, altered mental status, seizures and various other neurological symptoms.

Look-alikes
Coprinoposis variegata closely resembles *Coprinopsis strossmayeri*, but the latter can be distinguished by its habitat on recently cut tree roots, stumps, or in urban woodchip areas. Additionally, *Coprinopsis strossmayeri* has smaller scales on the cap and a stem base that is not typically bulbous and is attached to reddish brown **rhizomorphs**.

Notes
Like *Coprinopsis atramentaria*, *Coprinopsis variegata* is listed as edible in older field guides and in various Internet resources. Most resources note that it is edible with caution. The North American Mycological Association warns that coprine is carcinogenic and advises against consuming this mushroom.

Photo credit: Penny Firth

Consuming poisonous mushrooms can be dangerous.
*For appropriate medical advice, call your local poison center at **1-800-222-1222.***

Cortinarius orellanosus
Deadly Oak Webcap

Photo credits: Pat Mitchell

Description
Once thought to be extremely rare, this mushroom has presented itself multiple times recently in Virginia. Though it bears a close resemblance to its cousin, *Cortinarius rubellus*, it is actually more closely related to the similarly named European species, *Cortinarius orellanus. Cortinarius orellanosus* will typically have a cap that is 1.2 to 2 inches (3-5 cm) wide with a moderate **umbo**, lighter in color towards the center. Covered in tiny **scales/fibrils**, the cap will start off orange-brown, reddish-brown or yellow-brown, then darken with age. The stem will be about 2.6 to 3.0 inches (6.5-7.5 cm) tall and 0.3 to 0.5 inches (0.8-1.3 cm) wide. It will also have fibrils; remnants of the web-like structure covering the gills called a **cortina.** The stem will be pale yellow to pale ochre, becoming brown or reddish-brown with age. The gills are thick, moderately to widely spaced and orange-brown to brown, darkening with age. The cap, stem and gills of this mushroom are dry.

Where it may be found
This is a **mycorrhizal** mushroom that is associated with oak trees.

What makes this mushroom poisonous
The toxin in this mushroom is **orellanine**, which was first documented in the 1950s, following a mass poisoning of over 100 people in Poland, 11 of whom died. Its chemical structure is similar to that of the herbicides **paraquat** and **diquat**. The mechanism of orellanine is not fully understood, but, like the above herbicides, it causes stress to cells, leading to their damage and death. The kidney is the primary organ injured by this toxin.

Potential symptoms
The initial symptoms of orellanine poisoning consist of nausea, vomiting, abdominal cramps, and diarrhea. These symptoms can be delayed, even up to several days after consuming the mushroom. Due to the delayed onset of symptoms, individuals who have consumed the mushrooms often do not associate their initial symptoms with the ingestion, resulting in delayed medical care and underreporting. The associated kidney failure can be delayed even more than the gastrointestinal symptoms, typically occurring several days to several weeks after ingestion. The symptoms associated with kidney failure include decreased urine output, water retention leading to body swelling, and shortness of

breath if fluid accumulates in the lungs. Patients with severe and irreversible kidney damage may require dialysis, or undergo kidney transplantation. Numerous fatalities have been reported following the ingestion of orellanine-containing mushrooms.

Look-alikes

Cortinarius orellanosus is a part of a section called Orellani which includes all the orellanine containing mushrooms in the genus *Cortinarius*. Many of the mushrooms within this section can look very similar. Historically, some mushrooms sought by foragers, such as chanterelles (*Cantharellus*), porcini (*Boletus edulis*) and liberty caps (a species of *Psilocybe* mushroom) have all been confused with orellanine-containing mushrooms like *Cortinarius orellanosus*. The most likely edible mushroom in Virginia to pose a risk would be a species called *Suillus spraguei*, the painted suillus. With reddish-yellow tones on the stem and cap, and a fibrous web-like partial veil, new mushroom hunters searching for *Suillus spraguei* could mistakenly collect *Cortinarius orellanosus*. When young, the *Suillus spraguei* veil completely covers the pore surface, similar to the cortina covering the gills in *Cortinarius orellanosus.* The most notable difference is that *Suillus spraguei* has pores, whereas *Cortinarius orellanosus* has gills. In addition, *Cortinarius orellanosus* grows with oak, whereas *Suilus spraguei* grows with white pine.

Notes

Cortinarius orellanosus was first documented in Michigan in 2010 after a 53 year-old woman ingested what she thought were edible chanterelles. She consumed the caps and stems of about 6 mushrooms and shared them with a male companion who reportedly did not eat as many. Within three days they were both ill with gastrointestinal symptoms. Though his symptoms apparently resolved, hers progressed into kidney failure within a few weeks. After one year, the patient reported experiencing depression and needing peritoneal dialysis five days a week. This case study indicates that orellanine is very much dose dependent. It was the first confirmed case of kidney failure caused by *Cortinarius* in North America. Since then, this mushroom has been quite elusive with only a small handful of promising sightings, mostly in Michigan. Shortly before the Claudius Project was finalized for publication, two separate fruitings were documented under oak trees in Virginia. This greatly expands the known fruiting range of the species, suggesting that it may be more widespread, and perhaps more common, than previously thought.

This mushroom is striking when observed in daytime, but at night it can be even more surprising. Possibly due to a unique reaction that orellanine has with ultra-violet (UV) light, orellanine-containing *Cortinarius* will appear fluorescent blue after several seconds to a minute of exposure to UV light. If exposed again later, they will fluoresce blue immediately. This phenomenon was first described in 1981.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Cortinarius rubellus
Deadly Webcap

Photo credit: John Plischke

Photo credit: Pat Mitchell

Photo credit: Pat Mitchell

Description
Cortinarius rubellus is as beautiful as it is toxic. The cap, which measures 1.2 to 2.4 inches (3–6 cm) across, is cone-shaped when young. The cap flattens out as the mushroom ages but retains a distinct **umbonation**, a raised area in the center. It is typically dry, with fine scales, and its color is pale orangish brown when young, becoming reddish brown with age. The stem is 1.6 to 4 inches (4–10 cm) tall, is **fibrillose** and sometimes shows veiled bands. *Cortinarius rubellus* has a unique **partial veil**. All members of the genus *Cortinarius* have a **cortina**, a weblike structure that forms at the edge of the cap and stretches to the stem, covering the gills when young. In this species, the cortina is pale white to yellow. The gills are well-spaced, beginning as yellowish brown and turning rusty brown with age.

Where it may be found
This is a somewhat rare mushroom in the eastern U.S., with verified observations associated with red spruce in West Virginia in the summer months. Because of this association, it is likely that any of the red spruce habitats throughout Virginia could contain *Cortinarius rubellus.*

What makes it poisonous
The toxin in this mushroom is **orellanine**, which was first documented in the 1950s, following a mass poisoning of over 100 people in Poland, eleven of whom died. Its chemical structure is similar to that of the herbicides **paraquat** and **diquat**. The mechanism of orellanine is not fully understood, but, like the above

herbicides, it causes stress to cells, leading to their damage and death. The kidney is the primary organ injured by this toxin.

Potential symptoms
The initial symptoms of orellanine poisoning consist of nausea, vomiting, abdominal cramps, and diarrhea. These symptoms may be delayed, even up to several days after consuming the mushroom. Due to the delayed onset of symptoms, individuals who have consumed the mushrooms often do not associate their initial symptoms with the ingestion, resulting in tardy medical care and underreporting. The time lag to kidney failure can be even longer than that for the gastrointestinal symptoms, typically occurring several days to several weeks after ingestion. The symptoms associated with kidney failure include decreased urine output, water retention leading to body swelling, and shortness of breath if fluid accumulates in the lungs. Patients with severe and irreversible kidney damage may require dialysis, or kidney transplantation. Numerous fatalities have been reported following the ingestion of this mushroom.

Look-alikes
Historically, some mushrooms sought by foragers, such as chanterelles (*Cantharellus*), porcini (*Boletus edulis*) and liberty caps (a species of *Psilocybe* mushroom) have all been confused with orellanine-containing mushrooms. While this has happened, it is difficult to understand how any of these could be confused with *Cortinarius rubellus*. The most likely edible mushroom in Virginia to pose a risk would be *Suillus spraguei*, the painted suillus. With fibrous reddish yellow tones on the stem and cap, and a fibrous web-like partial veil, inexperienced mushroom hunters searching for *Suillus spraguei* could accidentally collect *Cortinarius rubellus*. When young, the *Suillus spraguei* veil completely covers the pore surface, similar to the cortina covering the gills in *Cortinarius rubellus.* The most notable difference is that *Suillus spraguei* has pores, whereas *Cortinarius rubellus* has gills.

Notes
This mushroom is striking when observed in daytime, but at night it can be even more surprising. Possibly due to a unique reaction that orellanine has with ultra-violet (UV) light, *Cortinarius rubellus* mushrooms will appear fluorescent blue after several seconds-to-a-minute of exposure to UV light. If exposed again later, they will fluoresce blue immediately. This phenomenon was first described in 1981.

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Echinoderma asperum

(Synonyms: *Lepiota asperum, Lepiota acutesquamosa)*
Freckled Dapperling, Sharp-Scaled Lepiota

Photo credit: Alan Rockefeller

Description

The freckled dapperling is a small to medium-sized, white-gilled mushroom with a 1.5 to 4 inch (3–11 cm) wide cap that is bun-shaped when young and becomes widely rounded to flat when mature. The cap has somewhat concentrically arranged brown prickles or scales rising up from a light to dark brown smear on the pale-colored cap. The cream-colored, hairy (not shaggy) stem is 1.25 to 4 inches (3–11 cm) tall and 0.3 to 0.6 inches (4–10 cm) thick, with light brown discolorations near its base. The white to cream-colored gills are shallow, free and crowded. A flimsy but persistent white **veil** or remnants thereof are often present. There may be no smell or just a mild smell, either pleasant or unpleasant.

Photo credit: Alan Rockefeller

Where it may be found

They are found from July to November, on the ground among leaf or wood litter, in humus-rich woodlands or along the woodland edge. They may be solitary or scattered with a few in the area.

What makes it poisonous

These mushrooms contain **coprine**. When an individual ingests coprine and then subsequently drinks alcohol, an enzyme called **aldehyde dehydrogenase** is inhibited and causes what is known as a **disulfiram**-like effect or **Antabuse** reaction. The medication disulfiram (Antabuse), was in the past prescribed by doctors to treat alcoholism. The interaction with alcohol can occur for up to five days after ingestion of coprine.

Photo credit: John Plischke

Potential symptoms
The symptoms of coprine poisoning include nausea, vomiting, abdominal pain, flushing, headache, rapid heart rate, low blood pressure, tingling, altered mental status, seizures and various other neurological symptoms.

Look-alikes
Lepiota subincarnata, the deadly parasol mushroom, is a toxic look-alike (and is also described in this publication). Atkinson's lepidella (*Amanita atkinsoniana*) and gunpowder amanita (*Amanita onusta*) have similar prickles but are more robust, lack any veil remnants and differ in patterns and colors.

Photo credit: John Plischke

Photo credit: Huafang Su

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Entoloma Species

Pinkgills

Photo credit: John Plischke

Description

Entoloma is a large genus of gilled mushrooms that are commonly called pinkgills because they have pink spore prints and the gills are covered with pink spores at some stages of growth. The gills are attached to the stem, but otherwise there is wide variation in their characteristics, making them extremely difficult to identify without the use of a microscope or DNA testing. There are about 200 species reported in the U.S. and more than 30 reported in Virginia. Many local records for *Entoloma* species are questionable due to the difficulty in proper identification.

Only one *Entoloma* species is known to be consumed – the shrimp-of-the-woods, *Entoloma abortivum*, which occurs in two forms: an "aborted" form and an "unaborted" form. The aborted form has no gills and is actually a parasite on the honey mushroom (*Armillaria* species). The aborted form, also called "hunter's heart" or "ground prunes," is an irregular blob of tissue, 0.4 to 4 inches (1–10 cm) tall. It is white and pink inside, turning brown with age, and often has a depressed cavity in the center of the mushroom cap.

Photo credit: Penny Firth

The unaborted form does have gills, and while edible, it is very difficult to distinguish from other *Entoloma* species that are poisonous. Mushroom experts state that, with the exception of the aborted form of *Entoloma abortivum*, all other Entoloma species should be avoided because of lookalikes and the fact that their toxicity is largely unknown.

The following *Entoloma* species, reported from Virginia, are considered toxic: *Entoloma luridum, Entoloma quadratum, Entoloma rhodopolium, Entoloma sinuatum, Entoloma strictius,* and *Entoloma vernum.*

Photo credit: Lee Borg

Where it may be found
Pinkgills are mostly **saprobes**, decomposing forest litter, and typically grow on the ground, but some are parasitic, as described above. They are found in many habitats, including forests, bogs, grasslands and dunes. *Entoloma* species typically appear from summer through fall.

What makes them poisonous
For the vast majority of *Entoloma* species there are no published records of poisonings that identify the toxin. Research indicates that *Entoloma rhodopolium* and *Entoloma nidorosum* (a European species) have been found to contain the toxins **muscarine**, muscaridine and **choline**. Muscarine stimulates the parasympathetic nervous system and affects the organs supplied by those nerves. This effect, called the **cholinergic syndrome**, predominantly targets smooth muscles, glands, and the cardiovascular system.

Potential symptoms
Entoloma species' symptoms are gastrointestinal, resulting in nausea, vomiting, diarrhea and abdominal pain, as well as **miosis** (small pupils), excessive tear formation, blurred vision, chills, muscle spasms, and sweating. Muscarine may rarely impact the brain and cause tremor or seizures. Onset of symptoms have been found to range from 20 minutes to 12 hours, which appears to depend on which species may have been consumed. Some fatalities have been reported in Europe but not North America.

Look-alikes
The deer mushroom (*Pluteus cervinus*), is widespread in Virginia and is reported to be a look-alike in coloration to some species of *Entoloma.* This mushroom is harvested and eaten when fresh and firm. *Entoloma* species and *Pluteus cervinus* differ in their gill attachment; *Pluteus cervinus* has gills that are detached from the stem, but those of *Entoloma* are attached. In *Pluteus*, but not *Entoloma*, the cap breaks from the stalk in a ball-and-socket fashion. As mentioned above, many of the different *Entoloma* species look like each other, so all should be avoided.

Consuming poisonous mushrooms can be dangerous.
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Galerina marginata

(Synonyms: *Galerina autumnalis, Galerina cinnamomea, Galerina oregonensis, Galerina unicolor, Galerina venenata, Pholiota autumnalis*)

Deadly Galerina, Funeral Bell, Skullcap

Photo credit: Lee Borg

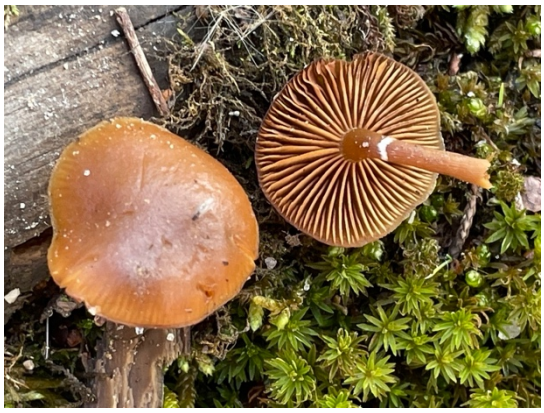

Photo credit: Penny Firth

Photo credit: Penny Firth

Description

This potentially deadly mushroom is often mistaken for other "little brown mushrooms" (**LBMs**) due to its small size and dull coloration. The cap ranges from honey-yellow to dark brown, often appearing two-toned with age as it pales to tan. Initially dome-shaped, it matures to convex or helmet-shaped, sometimes developing a slight **umbo**, a raised knob or protrusion at the center of the cap. The cap can be smooth, or sticky when moist. Young specimens have a partial **veil** that may leave a white ring on the stalk; this veil can darken from spores, be lost, or be absent altogether. Cap width ranges from 0.3 to 2.5 inches (1–5 cm), with edges that are smooth or subtly furrowed and semi-transparent (translucent-**striate**). The flesh is thin and pale, a watery brown, with a mild to slightly starchy odor and a mealy to bitter taste.

The stem (or stalk) measures 0.75 to 3 inches (2–7.5 cm) long and 0.1 to 0.3 inches (3–8 mm) thick, typically thicker at the base. It is dry and hollow, displaying lengthwise fibrous streaking. Color ranges from whitish at the top to dark reddish-brown towards the base. Whitish **mycelium**, resembling root-like interwoven strands, is often visible where the mushroom emerges from its **substrate**, the organic material it grows in. The gills are **adnate**, broadly attached to the stem, or **subdecurrent** -- slightly running down from the top of the stem -- and may detach with age. They are close together with many **short gills**, gills that may not connect from the stem to the cap edge. Gills are yellowish at first, becoming rusty brown with age as the spores ripen. The **spores** and the **spore print** are also rusty brown.

Where it may be found
These common **saprobic** (wood-rotting) mushrooms may be found anywhere in Virginia, scattered in small groups or occasionally singly, on rotting wood that is sometimes moss-covered. Found on both hardwood and conifer debris (with or without bark), at different stages of decay, they cause a white rot. They are most often encountered in spring and fall when the weather is cooler in woodlands, but are also found any time of the year in urban and suburban environments where wood chips are used. If found growing from soil it is because there is a rotting root or wood debris below the surface.

What makes it poisonous
These mushrooms contain deadly **amatoxins.** Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6 to 24 hours following ingestion. Immediately after ingestion, the victim will likely be symptom free. The second phase, the gastrointestinal phase (which may begin as early as 6 hours after ingestion, but typically within 24 hours) is defined by nausea, vomiting, abdominal cramps, and diarrhea. During the third, or latent phase of poisoning, gastrointestinal symptoms can improve briefly. The fourth, or multisystem organ failure phase is characterized by liver and kidney injury, and often peaks 3 to 5 days after ingestion. Recovery can occur but fatalities have been reported following the ingestion of this mushroom.

Look-alikes
Galerina marginata is a look-alike for most **LBMs**. Extreme care must be taken when collecting edible look-alikes. There are confirmed deaths from confusion with members of the *Armillaria mellea* group. *Galerina marginata* can grow near and even mingle with some similar-looking edible mushrooms. The overlapping growing seasons (and habitat) of the edible *Flammulina velutipes* (velvet foot, wild enoki, velvet stem, or velvet shank) and the hallucinogenic *Psilocybe ovoideocystidiata* may lead to confusion; when young, both look similar to *Galerina marginata* and they may be found growing close together. Deadly amatoxin-containing *Galerina marginata* look-alikes can also be found growing in moss, and even moss covered rocks where no wood is present.

Notes
While the amatoxins found in *Galerina marginata* can be lethal, few deaths are attributed to its consumption, likely because it is rarely eaten. Individual mushrooms are usually small, with lower toxin doses compared to the much larger and perhaps more tempting deadly amanitas.

Consuming poisonous mushrooms can be dangerous.
*For appropriate medical advice, call your local poison center at **1-800-222-1222.***

Gymnopilus Species

Laughing Cap, Laughing Gym, Laughing Jim

Photo credit: Lee Borg

Photo credit: Adam Boring

Photo credit: Lee Borg

Description

Worldwide there are over 200 identified *Gymnopilus* species, at least two of which are found in Virginia. *Gymnopilus* is Latin for "naked cap," referring to the smooth cap of many of these species, which contributes to their attractive appearance, particularly when found in large clusters. These species are of similar size and color, and may be difficult to distinguish from each other. It is best to assume that all may be potentially toxic. Two of the more typical species known to contain toxic substances are:

Gymnopilus luteus, the "Yellow *Gymnopilus,"* is a small to medium sized mushroom with a yellow to yellow-orange cap 2 to 4 inches (5–10 cm) wide, and a stem 1.5 to 3.5 inches (4–9 cm) tall. As it ages the cap may show a reddish tinge. The cap initially has an outer edge that curves inward and under and may be slightly scaly. The stem will show a rusty-yellow color when bruised, and there may be a ring or ring-remnant present. This mushroom may have a prominent spicy aroma.

Gymnopilus spectabilis (also called *Gymnopilus junonius*), is similar to *Gymnopilus luteus* but has a cap that is yellow to orange-brown. Unlike *Gymnopilus luteus,* its gills are slightly **decurrent** (extending down the stalk from the cap). Its cap can be 2 to 5 inches (5–18 cm) or larger in diameter, with a stem 1 to 7 inches (3–7.5 cm) tall. The cap may become reddish and scaly with age. Observing intact mushrooms on site may show large amounts of orangish spores

scattered on adjacent mushrooms or leaves.

Where they may be found
These mushrooms are **saprobic**, getting nutrients from dead or decaying organic matter. They appear on decaying wood such as stumps and fallen trees, as well as some standing trees. They may also grow on wood fragments under the soil. They appear as scattered mushrooms, as well as in impressive groups.

What makes them poisonous
While not all *Gymnopilus* species are known to be poisonous, these two species contain **psilocybin**, a hallucinogenic compound found in many species of mushrooms. After ingestion, the liver converts psilocybin into **psilocin**, which activates **serotonin receptors** in the brain, causing psychedelic effects. There is also evidence that one or more other compounds called **gymnopilins** may also contribute to intoxication from these species.

Potential symptoms
Symptoms of *Gymnopilus* ingestion will likely differ depending on whether eating it was deliberate or accidental. Accidental ingestion is rare, possibly due to the mushrooms' notable bitter taste. Physical symptoms may include nausea, vomiting, and abdominal cramps. Psychological symptoms vary, but the most commonly described are **euphoria** (a feeling of intense happiness), an altered sense of time and space, and altered perception.

Synesthesia, a neurological condition in which stimulation of one sense (e.g., vision, hearing) involuntarily triggers a perception in another sense (e.g., taste, smell) can occur. Negative psychological effects can include extreme fear, paranoia, agitation, combativeness, and panic. Fatalities associated with the ingestion of psilocybin-containing mushrooms are rare.

Look-alikes
Omphalotus illudens, the jack-o-lantern (also described in this publication) is a bold orange mushroom, which, like *Gymnopilus spectabilis*, has similar, slightly decurrent gills, and grows in groups on wood. Ingestion of this mushroom leads to hours of gastrointestinal misery.

Notes
Analysis of *Gymnopilus* species has revealed that many historical methods used to classify these mushrooms, based on their structures and pores, were inaccurate. Reclassification of many *Gymnopilus* species using more precise genetic analysis is ongoing; several previously accepted species names may be inaccurate and could change with further study.

The Japanese traditional stories, *Konjaku Monogatarishū*, from the 12th century, include references to monks and nuns exhibiting unusual behaviors, likely due to *Gymnopilus* intoxication.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Gyromitra esculenta Group

(Synonym: *Helvella esculenta*) **Beefsteak Morel, Calf's Brain, False Morel, Lorchel, Turban Fungus**

Description

Brain-like in appearance, and one of the first fleshy mushrooms to appear in the spring, these mushrooms' fruiting period overlaps with that of true morels (*Morchella* genus), with which they are often confused. Despite the name *esculenta*, which means "edible," these mushrooms have been known to cause fatalities when consumed. Caps are reddish-to-blackish-brown and shiny, with a more or less globular or irregular shape. The outer surface is wrinkled, folded, or convoluted. The fruiting bodies, which include the cap and stem, measure 1.5 to 4 inches (4–10 cm) tall. The flesh is thin and brittle, and the odor is mild to somewhat fruity. The stem is round, sometimes compressed, often enlarged at the base, and hollow, or nearly so, dingy-white to tan or pinkish-tan and has a smooth or granular surface. It does not have gills. The spore deposit is a pale yellow.

Where it may be found

This mushroom is **saprobic** (meaning it grows in dead or decaying organic matter) but it may also act as a **mycorrhizal** fungus (forming a relationship with the roots of nearby plants), similar to true morels, which can fulfill both ecological roles during their life cycle. It is found primarily in the spring under evergreen, and sometimes hardwood trees, and is widely distributed across northern and mountainous regions of North America.

Photo credit: Lee Borg

What makes it poisonous

Gyromitra esculenta contains **gyromitrin**, which the body turns into a more potent **cytotoxin** (kills or harms cells) called **monomethylhydrazine** (MMH), which is colorless, **volatile**, highly toxic, and **carcinogenic** (causes cancer). This toxin was first discovered and used by NASA, and because of its ability to ignite spontaneously, has been used as rocket fuel. It is this toxin which causes **gyromitra syndrome**. MMH inhibits the enzyme in the body that converts glutamate to gamma-aminobutyric acid (GABA), which plays a crucial role in calming the nervous system. Gyromitrin has a low boiling point and therefore its toxicity may be decreased by heating or cooking. Poisoning effects have been shown to be more pronounced when the

mushroom is consumed raw or poorly cooked, and severe poisoning may occur if the cooking juices are consumed instead of discarded. Eating this mushroom may affect some people but not others, and the difference between a safe dose and a deadly one is very small.

Potential symptoms

Gyromitra syndrome consists of early gastrointestinal upset, consisting of nausea, vomiting, abdominal cramps, and diarrhea. These symptoms appear within 2 to 24 hours. Confusion often occurs after eating *Gyromitra* mushrooms and is a common sign of acute central nervous system poisoning. In more severe poisonings, seizures may occur which are often prolonged, recurrent, or resistant to medical treatment. Acute liver and kidney injury may occur. Numerous fatalities have been reported following the ingestion of this mushroom. Gyromitrin is a known carcinogen and consuming a less-than-toxic dose may also cause future medical complications. Very recent research into unusually high incidence of Amyotrophic lateral sclerosis (ALS) in some European Alpine communities has been traced to well-cooked *Gyromitra esculenta*. The apparently heat stable neurotoxin is unknown. It is now clear that consumption of members of the *Gyromitra esculenta* group can have devastating long-term consequences even if well cooked.

Photo credit: John Plischke

Look-alikes

Look-alikes for *Gyromitra esculenta* include the true morels (*Morchella* species) which are edible mushrooms that are highly sought after in early spring. Species of *Verpa*, which belong to the same family as true morels and are considered edible when properly identified and cooked, are also look-alikes. Others in this group include *Gyromitra caroliniana* and *Gyromitra brunnea*, both of which are eaten by some people, although this is controversial and potentially dangerous, as their levels of gyromitrin are unknown.

Notes

Most *Gyromitra* poisonings are reported in eastern Europe, particularly in Germany, Poland, and Finland's evergreen forests. According to the North American Mycological Association (NAMA), there were 27 reported cases of *Gyromitra esculenta* poisoning in over 30 years before 2006. From 2006 to 2017, NAMA recorded 22 additional cases of gyromitrin poisoning, with no fatalities.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Hapalopilus rutilans

(Synonym: *Hapalopilus nidulans. Polyporus nidulans*)

Cinnamon Bracket, Purple Dye Polypore, Tender Nesting Polypore

Photo credit: John Plischke

Description

Hapalopilus rutilans is a **polypore**, commonly called a bracket or shelf fungus. It has a dull orange-brown, roughly semicircular fruiting body, which attaches directly to hardwood tree trunks or branches. The cap size measures from 1 to 6 inches (3–15.5 cm) wide and 0.4 to 1 inch (1–3 cm) deep, thicker near the attachment to the wood. When young, the orange-brown upper surface feels fuzzy or suede-like. With age the color may fade or turn more reddish and the surface may smooth out. Like all polypores, the undersurface of the cap is perforated with many small pores instead of gills or gill-like structures. The pores of *Hapalopilus rutilans* are angular in shape and the pore surface is similar in color to the upper surface. The flesh is also a pale orangish brown and has a soft or watery texture which becomes dry or cork-like with age. The mushroom has no distinctive odor. The spore print is white.

Photo credit: Penny Firth

Where it may be found

Hapalopilus rutilans is **saprobic**, growing from wood. It occurs singly or in small clusters on decaying hardwoods from summer through fall. Though less common than other polypores, *Hapalopilus rutilans* has been observed throughout Virginia; observations have been concentrated in the northern and central regions.

Photo credit: Penny Firth

What makes it poisonous

Hapalopilus rutilans contains **polyporic**
acid which inhibits an enzyme that plays

a crucial role in cell growth and replication. Polyporic acid has been investigated for its potential to treat autoimmune diseases and cancer, but no studies on the clinical impact on humans have been performed.

Potential symptoms
If ingested, gastrointestinal upset has been reported to occur, sometimes delayed by up to 12 hours. Nausea, vomiting, abdominal cramps, and diarrhea have been reported, followed by **diplopia** (double vision), blurred vision, impaired balance, hallucinations, and weakness. Liver and kidney injury have also been described. The urine following poisoning by this mushroom temporarily turns violet. Reported cases recovered fully within one week.

Look-alikes
A popular edible polypore similar in appearance to *Hapalopilus rutilans* is chicken-of-the-woods (*Laetiporus sulphureus*), which typically grows in multiple overlapping, bright yellow-orange clusters. In contrast, *Hapalopilus rutilans* has a duller, brownish appearance. Chicken-of -the-woods typically grows on hardwood trees, logs, or stumps, sometimes high above ground. Individual mushrooms can reach up to 12 inches in size, with a wrinkled surface and blunt, often wavy edges. The underside is bright yellow with indistinct, round to oblong pores.

Notes
Hapalopilus rutilans has been used to produce a deep purple dye for wool.

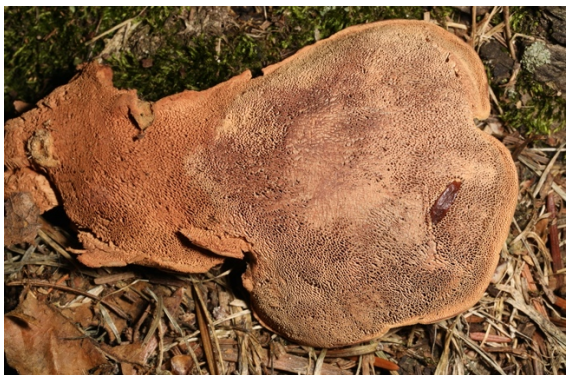

Photo credit: John Plischke

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Hebeloma crustuliniforme

Fairy Cakes, Poison Pie

Photo credit: John Plishke

Photo credit: John Plischke

Photo credit: Alan Rockefeller

Description

This is a medium-sized mushroom with a smooth, white-to-pale-cream colored cap, that is typically more brown towards the center and sticky-to-slimy when wet. The cap measures from 1.25 to 3.75 inches (3–11 cm) wide and is convex, with an in-rolled edge, flattening as it ages. The flesh at the center is thick and white. The gills are pale gray to light tan, close together, attached to the stem, and have fringed edges. Droplets form on young gills and become brown dots with age. A spore print will show brown spores. The taste is bitter. This mushroom emits a distinct radish odor when the cap is crushed. There is no **veil**. The stem is solid and often bulbous at the base, with **mycelial** threads. There are distinctive white particles on the upper part of the stem.

Where it may be found

This mushroom grows on the ground and is found scattered singly or in groups, sometimes as **fairy rings**. It is often seen in residential areas and at the edge of woods. This mushroom is **mycorrhizal** growing in association with the roots of both pine trees and hardwoods. It is most likely to occur in Virginia's Appalachian regions from September to November.

What makes it poisonous

This mushroom contains unknown gastrointestinal irritants. No causative toxin has been identified and isolated from this mushroom.

Potential symptoms
If ingested, gastrointestinal upset has been reported to occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea. Recovery is typically within 3 days.

Notes
The common name "poison pie" has been used to include all mushrooms in the large genus *Hebeloma*. If a mushroom has a sticky cap, pale brown or gray/tan gill color, brown spores and a fleshy stalk, it is likely a *Hebeloma*. Determining the specific species is often difficult. Because many mushrooms in this genus have been confirmed as having gastrointestinal irritants, avoid eating all *Hebelomas*.

Hebeloma crustuliniforme, the specific mushroom described here, is actually one of a group which includes several recently-recognized subspecies, as revealed through DNA analysis. These subspecies are indistinguishable from each other to the naked eye, but are recognizable as part of this group. Most published field guides and many online sources still show this mushroom as a species rather than a group.

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Photo credit: Alan Rockefeller

Consuming poisonous mushrooms can be dangerous.
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Hypholoma fasciculare

(Synonym*: Naematoloma fasciculare)*
Clustered Woodlover, Sulphur Tuft

Photo credit: John Plischke

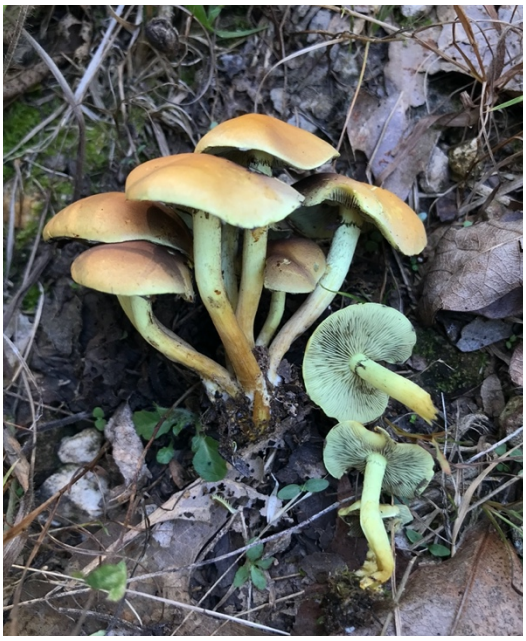

Photo credit: Kerri McCabe

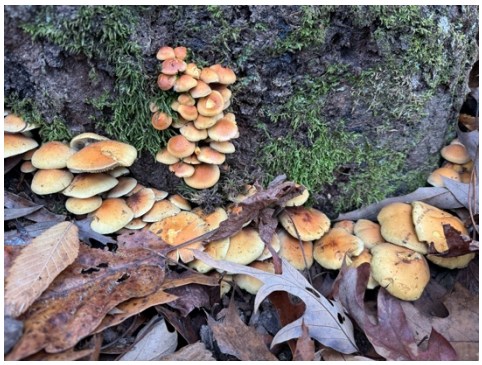

Photo credit: Kerri McCabe

Description

The cap ranges from 0.75 to 3.25 inches (2–8 cm) wide, initially broadly conical, convex or bell shaped, occasionally with a low broad hump in the middle, becoming more flattened with age. The edge of the cap is incurved at first. The cap color is sulfur-yellow, often with reddish, orange and brown tones at first, then greenish and olive tones later, especially in the center which is often darker. Because of the clustered growth, spores fall onto caps underneath, so that, as the mushroom ages, the caps may be tinged purplish, gray or brown from the purple-brown spores. The gills are usually attached to the stem and crowded; gills are also variable in color, changing with time from yellow to greenish, olive, gray, and eventually, to a dingy purplish brown, and nearly black when very mature. The cap surface is dry, or sometimes slightly sticky, but not slimy; the cap is smooth, sometimes with remnants of a thin web-like **partial veil** hanging from the edge of the cap. This hairy or weblike veil may leave a zone towards the top of the stem that over time becomes dark from a dusting of spores. The stem is 1.25 to 4.75 inches (3–12 cm) tall and 0.1 to 0.4 inches (0.3–1 cm) thick, sometimes tapering toward the base. The stem is pale to bright yellow to rusty-brown; towards the base it is often darker, sometimes with flattened hairs, darkening and becoming hollow with age. The flesh of this mushroom is thin and yellowish or greenish yellow, bruising brown. A very bitter taste is one of the key identifying features of *Hypholoma fasciculare*. This

bitter taste often discourages consumption of this mushroom.

Where it may be found
This mushroom grows in dense clusters from individual points of attachment on logs and stumps, on the dead wood of evergreens (or less commonly, broadleaf hardwoods). They can sometimes be found growing from buried wood, old roots, or even wood chips in any environment that has woody debris, in Virginia, from early spring to late fall.

What makes it poisonous
The primary toxins found within this mushroom are the steroids **fasciculol E** and **F**, which cause paralysis and death in mice. There are limited scientific reports of human poisonings, but these toxins could lead to nerve paralysis and potentially death.

Potential symptoms
Symptoms may be delayed for 5 to 10 hours, at which time gastrointestinal upset has been reported to occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea. The gastrointestinal symptoms may be followed by paralysis.

Look-alikes
Three look-alikes have been observed in Virginia: *Hypholoma subviride*, which is presumed to be poisonous, is very similar, but smaller, with caps that measure 0.4 to 1.2 inches (1–3 cm) wide. *Hypholoma*

Photo credit: Kerri McCabe

capnoides, an edible look-alike (common names include conifer tuft or smoky-gilled hypholoma), is also similar in size and grows in clusters, but the caps are yellowish to brownish with yellow, orange, rose, and cinnamon tones, and no green or olive tones. There is no partial veil, even when young, though there may be tiny remnants of it on the edge of the cap. It also grows on evergreen tree wood, and does not have a bitter taste. *Hypholoma lateritium* (common names include brick caps, kuritake, or chestnut mushroom), is similar in size but grows on the wood of broadleaf trees. It can be distinguished by its brick red cap (darker in center, paler at edges) and gills that start out pale, covered by a cobwebby partial veil, then becoming gray, purplish, and finally purplish brown. It is edible and if it tastes bitter at all, it is only slightly.

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Inocybaceae Family

Inocybaceae is a family of mushrooms that officially includes six genera, representing about 700 species worldwide. Four of these genera are found in Virginia: *Inocybe*, *Inosperma*, *Mallocybe*, and *Pseudosperma*. These mushrooms are generally small to medium-sized, with fibrous or scaly caps. They have brownish to yellowish-brown gills with fine, hairy edges, and produce brown spores. Most are brown (though some can be white), grow in soil rather than on wood, and have smells that range from green corn or fish, to pears or geranium leaves. These mushrooms are often confused with other small brown mushrooms such as *Cortinarius* or *Hebeloma* species. The four genera in Virginia can be told apart based on visible characteristics.

Inocybe

Although typically identified by microscopic features, some *Inocybe* species differ from other *Inocybaceae* due to unusual physical characteristics. These include the lilac-colored *Inocybe lilacina*, the stark white *Inocybe geophylla*, and the yellowish *Inocybe subochracea*. The whitish-brown *Inocybe dulciolens* has an odor similar to that of *Tricholoma matsutake* (matsutake), a popular edible mushroom, often described as spicy, fruity, or reminiscent of cinnamon and spice. Its complex aroma may also include citrus notes. At least one species in Virginia, *Inocybe insignis*, even bruises blue.

Inosperma

The mushroom caps of this genus can have a **rimose** texture, meaning they

Photo credit: Penny Firth

Photo credit: Byron Meade

appear to be made of fibers extending from the center to the edge, and are far enough apart to expose the flesh underneath. Caps may also be hairy or scaly, and stems are longer than the cap is wide. The flesh of the cap and/or stem may bruise reddish or brownish, and the base of the stem is often **bulbous**. *Inosperma* species often have strong odors, such as green corn, geranium leaves, pears, or fish. One group, the *Inosperma calimastratum* group, has a greenish stem-base.

Pseudosperma
The cap of this genus is also often rimose in texture. The stems may be somewhat velvety in appearance at the top, and lack a bulbous base. The stem base itself is often easily broken and the flesh does not bruise red, unlike the *Inosperma*.

Mallocybe
The cap of this genus is often hairy to scaly to touch, with a stem that is shorter or equal to the cap width. *Mallocybe* do not bruise reddish in the flesh and do not typically have an identifiable odor.

Toxins
The primary toxin of concern in *Inocybaceae* is **muscarine,** which is present, or assumed to be present, in many of the species that have been identified in or around Virginia. It is a toxin that activates a receptor in the human nervous system and leads to symptoms of **cholinergic syndrome**. The rarely seen *Inocybe insignis* also contains **psilocybin**, and some species of *Inosperma* have been found to contain **ibotenic acid** and **muscimol**.

The species of concern include:
• *Inocybe apiosmotum, Inocybe armeniaca, Inocybe avia, Inocybe cincinnata group, Inocybe cryptocystis, Inocybe geophylla* group, *Inocybe hystrix, Inocybe lilacina, Inocybe microteroxantha, Inocybe mutatum, Inocybe napipes, Inocybe nucleata, Inocybe notodryinum, Inocybe occulta, Inocybe perlucida, Inocybe sindonia* group*, Inocybe sphagnophila, Inocybe stellatospora, Inocybe stuntzii, Inocybe subradiata, Inocybe tubarioides, Inocybe xanthomelas* group*.*
• *Inosperma vinaceobrunneum*
• *Pseudosperma mimicum, Pseudosperma notodryinum, Pseudosperma sororium*, and many unnamed species identified by DNA sequencing.

Due to the difficulty in differentiating species, and the inconsistent distribution of muscarine-containing species within the family, consumption of all *Inocybaceae* should be avoided.

Fun Fact
There is an *Inocybe* that appears to have been lost to time. It was described from the lawn of the home of the first president of Cornell University in 1902, a home that stands to this day. The mushroom was not photographed and the initial author passed away before the species description was published by a friend. Where is *Inocybe olpidiocystis*?

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Lepiota Genus Introduction

Lepiota is a genus of mushrooms that resemble the more widely known *Amanita,* a genus containing some of the most toxic and deadly fungi. Despite their similarities, these two groups are not closely related evolutionarily; *Lepiota* belongs to the family *Agaricaceae*, while *Amanita* belongs to the family *Amanitaceae*.

Worldwide there are hundreds of described *Lepiota* species in temperate and tropical regions, though they are rare in desert or arctic-alpine habitats. As of 2024 at least fifty species have been recorded in the United States. Increased field collecting, improved microscopic identification techniques, and especially DNA sequencing, have revealed vast diversity within most fungal groups, with *Lepiota* being no exception. Many groups, including *Lepiota*, are continually being redefined, as new species are regularly discovered. Additionally, newer research techniques have shown that some species, previously considered widespread, are, in fact, distinct, more localized species. Our understanding of *Lepiota* ecology and distribution remains extremely incomplete, and there has been no comprehensive review of the genus in nearly a century.

Mature *Amanita* mushrooms are generally larger than *Lepiota,* and *Lepiota* lack the **volva** (cup-like structure) that is typical of *Amanita* species*. Lepiota* are typically characterized by a scaly (sometimes smooth) stem, free gills, a partial veil or **annulus**, and a **universal veil,** along with other distinguishing microscopic features.

Ecologically, most A*manita* species are **mycorrhizal**, forming associations with trees, while most *Lepiota* are **saprotrophic**, meaning that they live on the forest floor and on decomposing lignin and cellulose, organic compounds in plants.

Some *Lepiota* species are known to be toxic, including some found in Virginia and across North America. The primary toxin is an **amatoxin** called **amanitin**. Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

A number of *Lepiota* species have been tested and found to contain amatoxins. Several of these small scaly species are reported from Virginia, including the chestnut parasol (*Lepiota castanea*), the shield dapperling (*Lepiota clypeolaria*), the stinking dapperling (*Lepiota cristata*) and the deadly parasol (*Lepiota subincarnata*). There have been several confirmed deaths from *Lepiota subincarnata*, and it is common and widespread. Due to limited data about similarities between *Lepiota* species the current recommendation is to avoid eating any of them. Most of these mushrooms are small and have generally been overlooked by foragers–a trend that should continue!

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Lepiota subincarnata

(Synonym: *Lepiota josserandii*)
Deadly Parasol, Fatal Dapperling

Photo credit: Alan Rockefeller

Photo credit: Alan Rockefeller

Photo credit: John Plischke

Description

Lepiota subincarnata is a small, stout, gilled mushroom with scales covering the entire cap. The cap is 0.6 to 2.3 inches (1.5–6 cm) wide and convex, or dome-shaped, when young but flattens out with age. When young it is covered with a pink-brown velvety covering, but this breaks open as the cap grows and expands, resulting in concentric rings of red-brown to pink-brown scales, or warts, on a white background. The center remains covered by tufted, velvety material. The shape of the cap may be round or uneven with the edge somewhat undulating. The stem is 0.75 to 2.3 inches (2–6 cm) tall and 0.75 to 2 inches (2–5 cm) wide, with a visible jagged pattern of little broken-up clumps of **fibrils** (thread-like fibers). There is no ring on the stem, but remnants of a partial veil that connects the margin of the cap to the stem may be seen. The gills are white and either free from or attached narrowly to the stem. The odor may be sharp but sweet to fruity.

Where it may be found

This mushroom is often found in lawns and on mulch as well as in forests. It is a **saprotroph**, getting its nutrients from dead and decaying organic matter. It appears most often from late summer to early winter.

What makes it poisonous
These mushrooms contain deadly **amatoxins.** Amatoxins are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
There are no symptoms immediately after ingesting mushrooms containing amatoxins. Symptoms are typically delayed for 6–24 hours. Amatoxin poisoning occurs in four phases: Immediately after ingestion, the victim will likely be symptom free. The gastrointestinal phase is defined by the onset of nausea, vomiting, abdominal cramps, and diarrhea, which may begin as early as 6 hours after ingestion, but typically occur within 24 hours. Note that onset of gastrointestinal distress before 6 hours is an indicator of a non-amatoxin containing mushroom species. During the third, or latent, phase of poisoning, gastrointestinal symptoms can improve briefly. The multisystem organ failure phase is characterized by liver and kidney injury and often peaks 3–5 days after ingestion. Recovery can occur, but numerous fatalities have been reported following the ingestion of this mushroom.

Photo credit: Alan Rockefeller

Look-alikes
Marasmius oreades, the harmless fairy ring mushroom, is quite similar to the highly poisonous *Lepiota subincarnata.* Its cap surface is smooth and tan, where the *Lepiota subincarnata* surface breaks up into concentric rings of brownish scales on a white background. The stem is smooth, and that of *Lepiota subincarnata* has bands of fibrils on it. *Echinoderma asperum*, the freckled dapperling (also covered in this publication), is also similar, but its cap is much larger and the scales on the cap are much more distinct. It is reported to be poisonous. Any small mushroom with white, detached gills and pink-brown to orange-brown or brown caps may contain amatoxins. Although many smell unpleasant and would not be collected for food, the most dangerous are among the sweet-smelling ones. None of these should be eaten.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Mycena pura Group
Lilac Bonnets

Photo credit: John Plischke

Description

The *Mycena pura* group is a large group of mushrooms commonly referred to as lilac bonnets. Although most adults would probably not mistake them for food, children may be attracted to them for their delicate form and pastel colors. The term "group" indicates closely related species sharing common characteristics, making them look similar, or even identical at times. (For simplicity, "group" will be omitted in the remainder of this discussion.)

Photo credit: Penny Firth

Mycena pura species are small but attractive mushrooms that are brown, pink and/or purple in color, and have the odor of radishes. Their caps are 0.75 to 1.5 inches (2–4 cm) wide, begin with a bell shape, then become flattened with upturned edges as they age. The color starts as purple, then matures to pinkish or purplish brown, and possibly white, or even yellowish. The cap may have a pattern of concentric circles and a central **umbo** (bump or protuberance). The surface is fairly smooth, with lines or grooves along the edges. The stem is hollow, 1.5 to 4 inches (4–10 cm) tall, and less than 0.25 inch wide (2–6 mm). The surface is smooth or covered with tiny hairs, and is whitish or faintly colored, like the cap. Vertical lines may be visible on the stem and white downy **mycelia** at the base. The gills are white, gray or pale lilac, moderately spaced with cross veins at maturity. The gills partially attach to the stem at right angles, and may separate with age. The spore print is white.

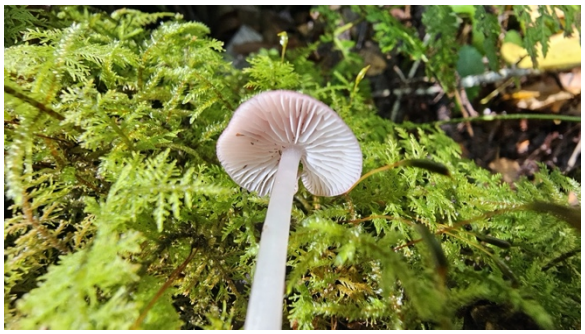

Photo credit: Adam Boring

Where they may be found
Mycena pura species are **saprobic** mushrooms, breaking down the leaf litter of pine forests (less often in hardwood forests). They occur singly or in small clusters throughout Virginia from spring through fall.

What makes them poisonous
Mycena pura species contain **muscarine**, a toxic substance that activates a receptor in the human nervous system which leads to symptoms of **cholinergic syndrome**. Muscarine stimulates the parasympathetic nervous system and affects the organs supplied by those nerves. This effect predominantly targets smooth muscles, glands, and the cardiovascular system.

Potential symptoms
Symptoms of cholinergic syndrome develop quickly (15 minutes to 2 hours) but are usually reported as mild. Potential clinical effects include **miosis** (small pupils), blurred vision, increased salivation, excessive sweating, **lacrimation** (excessive tear formation), increased breathing, airway secretions, wheezing, **bradycardia** (slow heart rate), nausea, vomiting, abdominal cramping, diarrhea and **polyuria** (excessive urination). Muscarine may rarely affect

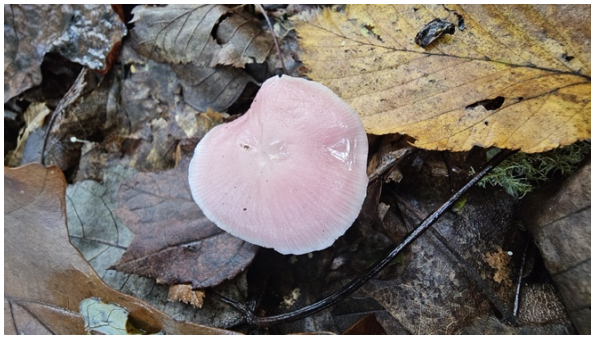

Photo credit: Adam Boring

the brain and cause tremor and seizures. Death is possible, depending on a person's pre-existing health conditions and the amount ingested.

Look-alikes
Mycena rosea, known as the rosy bonnet mushroom, is similar to *Mycena pura* but is pinker and lacks any lilac tint. This mushroom is slightly larger and more robust, and the stem has a bulbous base. It too smells of radish. This species also contains muscarine, but is uncommon in Virginia. The many species of the *Mycena pura* group all look very similar.

Notes:
Recent studies have shown that in addition to being saprobic, *Mycena pura* mushrooms are **mycorrhizal**; their **mycelia** form attachments to the roots of flowering plants and promote plant growth.

Consuming poisonous mushrooms can be dangerous.
*For appropriate medical advice, call your local poison center at **1-800-222-1222.***

Omphalotus illudens

(Synonym: *Clitocybe illudens*)
Jack-o'-lantern

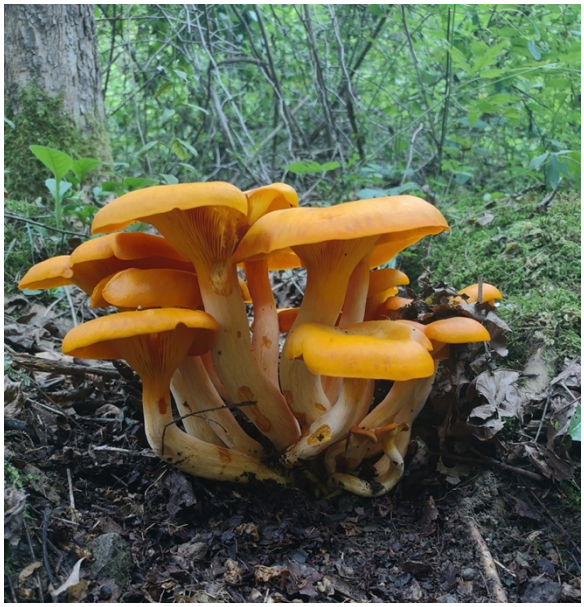

Photo credit: Adam Boring

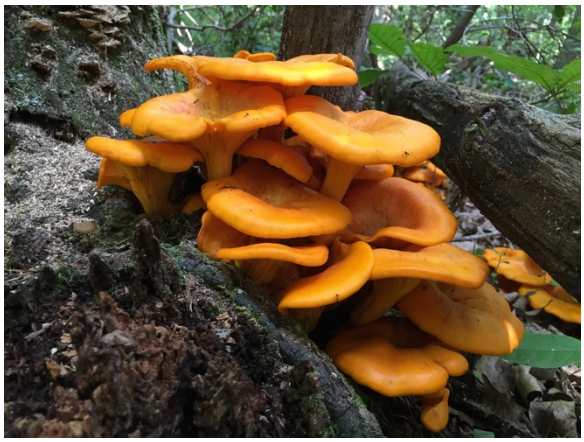

Photo credit: Penny Firth

Photo credit: Penny Firth

Description
This very striking mushroom is bright orange or yellow/orange, which fades to a brownish orange with age. They are found in clusters, and the individual caps are 1 to 8 inches wide (3–20 cm). When young, each cap is convex or dome-shaped, with a central bump and edges that curve inward. As it ages, the cap flattens and then may depress, becoming concave or cup-shaped. The edges straighten out and may become wavy. The cap surface is smooth. The stem of this mushroom is slim, smooth, and solid, often narrowing at the base. It can be up to 8 inches (3–20 cm) tall and less than one inch (1–2 cm) wide. The stem is the same color as the cap or lighter. The gills are close together and may be attached to and extend down the stalk, with some short gills not reaching the stem. The gill color matches the cap. The spore print is white to cream or pale yellow.

Where it may be found
The jack-o'-lantern mushroom can be found in hardwood forests throughout Virginia, growing in large clusters on well-decayed stumps, logs, or underground roots, especially those of oaks. It appears from summer to fall.

What makes it poisonous
Omphalotus illudens mushrooms contain **illudin,** a family of **sesquiterpenes**. Illudin injures human cells by damaging DNA. Illudin is considered a potent gastrointestinal irritant toxin.

Potential symptoms
If ingested, gastrointestinal upset may occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea. Other reported symptoms include headache, double vision, excessive salivation and dizziness. Infrequently, mild liver injury has also occurred. Symptoms typically occur within 1 to 3 hours of ingestion, vary in intensity, and resolve fairly rapidly (within 12 hours).

Look-alikes
The jack-o'-lantern is most frequently mistaken for edible chanterelles (*Cantharellus* species). Both are orange, but chanterelles are found in very small groups (no more than 2–3), not in large clusters like the jack-o'-lantern. Chanterelles are **mycorrhizal**, not **saprobic**, so will be growing in soil or grass and not on rotting wood. In addition, chanterelles have gill-like ridges or folds that are not separate from the cap, not true gills.

Jack-o'-lanterns may also be mistaken for the edible chicken-of-the-woods, *Laetiporus sulphureus*. Both have an orangish color and grow in clusters in hardwood forests, summer to fall. Chicken-of-the-woods is fan shaped and grows in tiers directly onto the tree, often without a stem. The underside does not have gills but a relatively smooth surface with many pores.

Photo credit: John Plischke

Some *Gymnopilus* species (also covered in this publication) have large orangish caps and grow in large clusters on rotting wood. They can be distinguished by their spore prints, which are bright orange or orange-brown in *Gymnopilus,* and pale cream-colored in *Omphalotus illudens*. These are both toxic mushrooms, but consumption of *Gymnopilus* causes hallucinations rather than severe gastrointestinal symptoms.

Notes
Although it is orange, the jack-o'-lantern is named for a green glow that can be seen emanating from the gills in the dark. The purpose of this bioluminescence is not certain, but it has been suggested it may be to attract insects to aid in spore dispersal. To observe the green light, you will need to find young mushrooms and observe carefully in very dark surroundings.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Paxillus involutus

Brown Roll Rim, Common Roll Rim, Naked Brimcap, Poison Pax

Photo credit: John Plischke

Photo credit: Adam Boring

Photo credit: Adam Boring

Description

This medium-sized mushroom has a brown cap which ranges in width from about 1.5 to 6 inches (4–15 cm). The characteristic rolled-edge margin gives it several of its common names; *involutus* means rolled-up or curled in Latin. The convex cap may also include areas of red, yellow or olive coloration, and may appear somewhat hairy when dry, and sticky when moist. The stem is smooth, colored similarly to the cap, and typically 1 to 4 inches (2–10 cm) tall. The gills are highly crowded and **decurrent** (extending part way down the stem below the cap and stem junction), and show a reddish-brown discoloration when damaged**.** Spores are yellowish-brown to dark or reddish-brown.

Where it may be found

This mushroom is **ectomycorrhizal,** meaning it grows in association with tree roots; it is found in woodlands or urban areas from summer through fall, as an isolated mushroom or in groups. It can also be found growing directly from wood at times. Found in Virginia and adjacent states, it has a broad international distribution across the U.S., Europe, and Asia. Ectomycorrhizal mushrooms can absorb and store substances from the soil, including beneficial ones that they may later share with nearby plants. They can also help remove harmful chemicals like heavy metals and radioactive substances from the soil. For instance, *Paxillus involutus* has been shown to accumulate notable amounts of radioactive cesium, particularly from atmospheric atomic

tests and, more recently, from the Chernobyl nuclear accident.

What makes it poisonous
This mushroom contains the toxin **involutin** and other unknown antigens that cause **hemolysis** (the breakdown of red blood cells). A rare adverse complication may occur after ingestion of *Paxillus involutus*, known as the **Paxillus syndrome**, which can lead to anemia due to red blood cell destruction. Kidney damage and bleeding may also occur. People can react differently when they eat this mushroom, and the relationship between the amount eaten and the severity of illness is unclear. Paxillus syndrome appears to occur after repeated exposure.

Potential symptoms
If ingested, gastrointestinal upset can occur within the first two hours, consisting of nausea, vomiting, abdominal cramps, and diarrhea. This typically occurs after consuming the raw or insufficiently cooked mushroom, although similar reactions have occurred less frequently even if thoroughly cooked. Paxillus syndrome may not occur the first time it's eaten, but may develop after repeated consumption of this mushroom. The resulting **anemia** is associated with pale skin, weakness, shortness of breath, and fatigue. Kidney damage is signaled by flank pain, decreased urination, and fluid retention. Numerous fatalities have been reported following the ingestion of this mushroom.

Look-alikes
Foragers might mistake this mushroom for the potentially edible *Phylloporus leucomycelinus* or *Clitopilus prunulus. Phylloporus leucomycelinus* has yellow decurrent gills that don't redden when damaged and which sometimes branch with connecting veins. *Clitopilus prunulus* has white gills with a pinkish hue matching its spore color, and which are also decurrent but quite different from those of *Paxillus*. Several *Lactarius* species, or "milky caps" also resemble *Paxillus involutus;* both have funnel-like caps, however the *Lactarius* species usually produce a milky latex when its gills are scraped. Some *Lactarius* species that superficially resemble *Paxillus involutus* are considered edible.

Notes
In 1944, the renowned German mycologist Julius Schäffer died 17 days after eating this mushroom. His doctors believed that preexisting kidney disease made his case particularly severe. His wife also ate the same mushroom but didn't show any symptoms, demonstrating how the mushroom's toxicity can vary widely.

Consuming poisonous mushrooms can be dangerous.
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Pholiotina rugosa Group

(Synonyms: *Conocybe filaris, Conocybe rugosa, Pholiotina filaris)*

Common Conecap, Deadly Conocybe, Fools Conecap, Ringed Cone Head, Ringed Conocybe

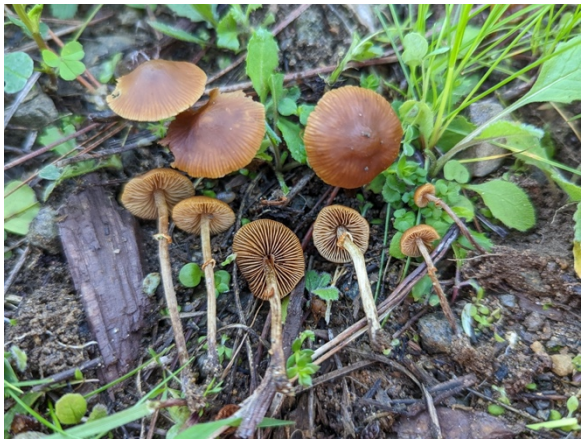

Photo credit: Alan Rockefeller

Photo credit: Adam Boring

Photo credit: Alan Rockefeller

Description

The most frequently named, but not necessarily the most common species in this group of mushrooms, is *Pholiotina rugosa*. The cap is cone to bell-shaped at first, then becomes more convex to nearly flat, and usually has an **umbo,** or hump, in the center. The cap is 0.2 to 1 inch (0.5–2.5 cm) wide and may be smooth or a little wrinkled. The thin flesh of the cap is brownish, with a surface that is darker in the center; brown with orangish or tawny tones. The yellowish-brown edges of the cap may be finely lined. The stem is 0.4 to 2.4 inches (1–6 cm) tall and 0.04 to 0.12 inches (1–3 mm) thick, fragile, smooth or **pruinose** (appears frosted) to **fibrillose** (covered with thin fibers). The stem is pale or yellowish-brown to brown with a base that is darker and slightly swollen. The gills are pale at first and covered by a whitish **partial veil**, becoming brownish to rusty brown. Gills are close together and narrowly attached to the stem; sometimes with a notched connection and sometimes detached from it, with frequent **short gills.** The partial veil becomes brownish, and forms an upward-flared ring on the middle to upper part of the stem. This ring sometimes has a grooved upper edge, and though delicate, can be movable. The ring is often stained by the rusty to cinnamon-brown spores, and sometimes falls off entirely, which is why this species may be difficult to identify without a microscope.

Where it may be found
This mushroom is **saprobic**, breaking down dead or decaying organic matter, and may be found growing alone or in large groups on the ground. It is found in the woods, in lawns and grassy areas and even in mossy areas, as well as on well-decayed wood, wood chips, compost, mulch, and woody debris, but not on intact, fresh logs. In Virginia, it has been observed in different parts of the state from late fall to early spring.

What makes it poisonous
There are a number of different *Pholiotina* species with a partial veil and all, so far, are known to contain amatoxins. **Amatoxins** are potent liver-damaging toxins found in several mushroom genera. Amatoxins inhibit an enzyme called **RNA polymerase II**, which can stop cells from making important proteins, and lead to cell death and liver injury.

Potential symptoms
Symptoms are typically delayed for 6–24 hours following ingestion. Immediately after ingestion, the victim will likely be symptom free. The gastrointestinal phase may begin as early as 6 hours after ingestion, but typically within 24 hours, and is defined by the onset of nausea, vomiting, abdominal cramps, and diarrhea. Onset of gastrointestinal distress before 6 hours is an indicator of a non-amatoxin containing mushroom species. During the third phase, referred to as the latent phase, gastrointestinal symptoms can improve for a time. The multisystem organ failure phase is characterized by liver and kidney injury and often peaks 3-5 days after ingestion. Recovery can occur but numerous fatalities have been reported following the ingestion of this mushroom.

Look-alikes
It can be confused with the hallucinogenic *Psilocybe ovoideocystidiata* (also covered in this publication) due to a similar-looking cap and growth on wood debris. *Galerina marginata*, also poisonous (and also covered in this publication), is similar, but often larger, and grows on fallen logs instead of on the ground. Other "little brown mushrooms," such as species in the genera *Conocybe, Agrocybe* and *Tubaria* could also be considered look-alikes. *Pholiotina rugosa* is unlikely to be eaten by children or pets due to its small size and drab colors.

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Psilocybe ovoideocystidiata

Ovoid, The River Teacher

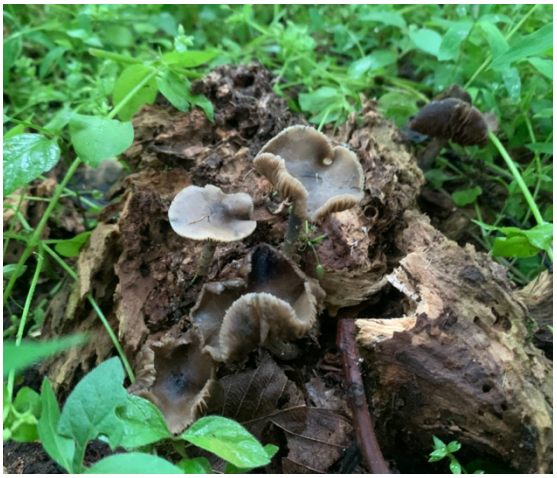

Photo credit: Pat Mitchell

Photo credit: Pat Mitchell

Description

Psilocybe ovoideocystidiata is a small wood-loving mushroom. A quick glance will place it in the broad category of "**LBMs**" (little brown mushrooms). Upon closer inspection, it will prove to be a strikingly beautiful organism. The cap is **hygrophanous**, meaning the color changes as it loses or absorbs water. The cap begins as caramel-colored, or tannish brown, and even dark blueish-brown at times, lightening as it ages, fading to white, and eventually becoming dark brown. Caps range in size from 0.4 to 1.77 inches (1.0–4.5 cm) wide. The gills begin as pale brown, becoming dark brown with age. The pale brown stem is hollow and can be 0.6 to 3.5 inches (1.5–9 cm) tall. There may be faint remnants of a **partial veil** on the stem or covering the gills. Below, or sometimes above the **substrate**, there will be **rhizomorphic**, root-like, **mycelium**. All parts of this mushroom, including the mycelium, may bruise blue when disturbed, usually several seconds or minutes after handling.

Where it may be found

Psilocybe ovoideocystidiata are **saprobic** wood lovers that favor maple trees, typically found growing on very decayed wood, and frequently the wood has been buried under the soil by a flood. Recently *Psilocybe ovoideocystidiata* have been called by a new common name: The River Teacher, partly a reference to its preferred habitat, river- and creek-side floodplains. Another common habitat is a partially shaded bed of wood chips. They are most commonly encountered in spring, as early as March, and as late as June. *Psilocybe ovoideocystidiata* may occasionally have a fall season as well.

What makes it poisonous

Psilocybin and **psilocin** are the main active compounds in this mushroom. After ingestion, the liver converts psilocybin into psilocin, which activates **serotonin receptors** in the brain, causing psychedelic effects.

Potential symptoms
The most commonly reported effects are psychological. Pre-existing mental health and expectations ("set"), environment and people ("setting") significantly influence the experience. Effects range from **euphoria**, intense happiness, and an altered perception of time and space, to **synesthesia,** where one sense involuntarily triggers another (e.g., seeing sounds). Negative effects may include fear, paranoia, agitation, combativeness, and panic. Vital sign changes may include increased heart rate, respiratory rate, and blood pressure. Physical symptoms such as nausea, vomiting, and abdominal cramps are also reported.
The effect, "Wood Lovers Paralysis" (WLP), can cause temporary full or partial paralysis without affecting breathing. Secondary injuries are possible.

Look-alikes
There are several edible look-alikes to *Psilocybe ovoideocystidiata,* and an accidental consumption of this mushroom could be a psychologically traumatizing event. It could be physically dangerous if machinery and motor vehicle use are involved. The most notable edible look-alike is *Flammulina velutipes*, the velvet foot, cold weather mushrooms with caramel-colored caps that grow on wood. They have a dark colored, velvety stem-base and a white spore print. In contrast, *Psilocybe ovoideocystidiata* will have a light brown to bluish stem base, with rhizomorphic mycelium and a dark spore print. Most other features are very similar.

The most dangerous characteristic of *Psilocybe ovoideocystidiata*, however, is its close resemblance to *Galerina* species, specifically *Galerina marginata* (also described in this publication). Galerinas share the caramel cap color, general size, wood-loving habitat, and also fruit in spring. Potentially more alarming is the fact that Galerinas can appear within inches of *Psilocybe ovoideocystidiata* on the same log or piece of wood. Unlike *Flammulina velutipes*, the differences are more subtle, and with younger specimens these differences can be hard to spot. *Galerina* species will typically have a visible **annulus ring** which will often collect their rust-colored spores, noticeably different from *Psilocybe ovoideocystidiata's* dark purple-brown spore deposit. Galerinas will never bruise blue, unlike *Psilocybe ovoideocystidiata*, which will unless they are very old and dry.

Notes
First described in 2007, in the Latin species name, *ovoideo* means egg-like, and *cystidiata* refers to a microscopic part of this mushroom, called a **cystidia**. Prior to 2007, and occasionally since, *Psilocybe ovoideocystidiata* was thought to be the same species as *Psilocybe caerulipes* by many amateurs. In 2009 a paper was published that sought to correct this misconception: *Psilocybe caerulipes* is a less common, cold-weather mushroom which occurs on wood in deciduous forests. Because it contains psilocybin, it attracts the attention of recreational users.

Consuming poisonous mushrooms can be dangerous.
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Russula emetica

Brittlegills, Emetic Russula, The Sickener, Vomiting Russula

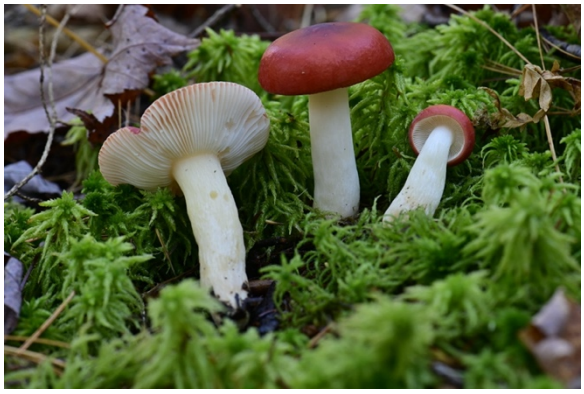

Photo credit: Alan Rockefeller

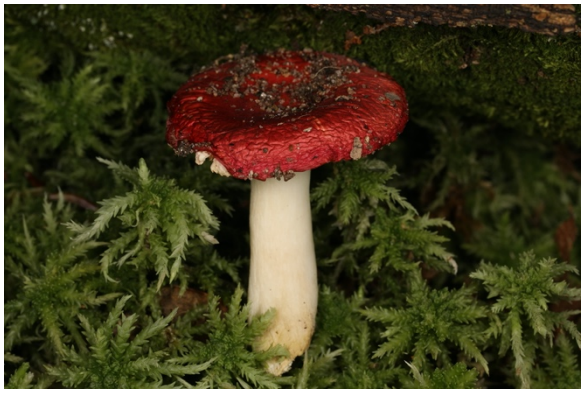

Photo credit: John Plischke

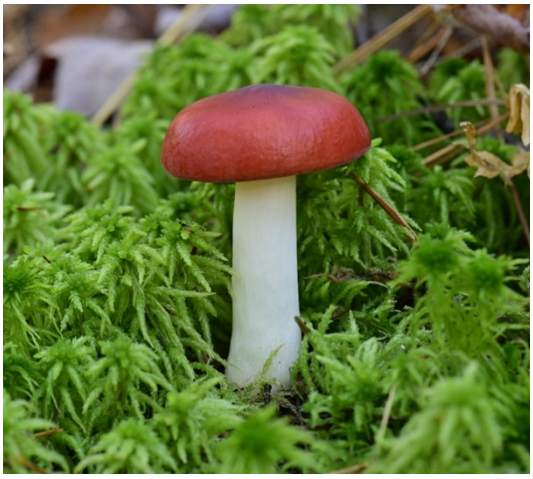

Photo credit: Alan Rockefeller

Description

Russula emetica has a bright red cap, a white stem and white gills. The bright red color fades with age, and some caps exhibit a lighter yellowish color in the center. The cap is 2 to 3.5 inches (5–9 cm) wide and the stem is 1.5 to 3 inches (4–8 cm) tall and 0.4 to 0.8 inches (1–2 cm) thick. The thin red cap is often sticky and can be peeled off, almost to the center. It is often grazed by slugs and other animals, revealing the white cap flesh underneath. The stem is smooth with no veil or scales, and is occasionally marked by faint vertical grooves. The stem is the same width from top to bottom, but can be somewhat thicker near the base. It is reported that *Russula emetica* has one of the hottest, most acrid tastes among all mushrooms – though it should not be tasted, or eaten, of course!

All *Russula* species are called "brittlegills" because the gills are brittle. Most cannot be bent without breaking into pieces that look like slivered almonds. If this mushroom is drop-kicked or thrown against a tree, it will shatter. When fresh, the stem will also snap like a piece of chalk, or a carrot.

Where it may be found

Russula species are **mycorrhizal** and are found growing with conifers and hardwoods, usually in mossy bogs or moist woodlands. They are occasionally seen growing on the ground or on very rotten wood. They may occur singly or in groups during the summer through fall, and are found throughout North America, Europe, Russia and a few other Northern

Hemisphere locations, rarely in the Southern Hemisphere.

What makes it poisonous
This mushroom is reported to be toxic if eaten. The primary toxins are **sesquiterpenes**, a naturally occurring class of chemicals called **terpenes**.

Potential symptoms
If eaten, gastrointestinal upset has been reported to occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea. Symptoms reportedly appear quickly (within 15 minutes to 3 hours), last for several hours, and then appear to stop after the ingested mushrooms have been expelled from the intestinal tract (about 24 hours). No fatalities have been confirmed due to ingestion of this mushroom.

Look-alikes
Species of the *Russula* group of red-capped mushrooms are extremely difficult to identify and while *Russula emetica* is known to be a toxic species in Virginia, any red-capped mushroom fitting the above description should be considered poisonous. Virginia has recorded over 15 species of red-capped *Russula* species. The look-alike *Russula nobilis* (the beech sickener), has been recorded in Virginia and also causes gastrointestinal issues.

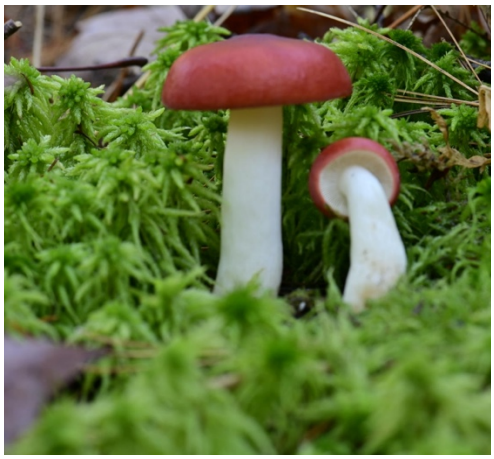

Photo credit: Alan Rockefeller

Fun facts
Although humans should avoid this mushroom, American red squirrels not only eat it but appear to relish it; they have been observed actively foraging-for and storing them for later eating. The squirrels often lay the mushroom cap down on the branches of conifers, apparently to allow them to dry.

In the words of the late great mycologist Tom Volk of the University of Wisconsin, the species name *emetica* refers to the gastrointestinal "unpleasantness" caused by eating this mushroom. In other words, if you eat it, you will almost certainly undergo **emesis**, that is – throw up, puke, ralph, buick, upchuck, hurl, heave, spew, have a Technicolor yawn, toss your cookies, worship the porcelain goddess, or maybe even vomit!

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Scleroderma citrinum

(Synonyms: *Scleroderma aurantium, Scleroderma vulgare*)
Common Earthball, Earthball, Pigskin Poison Puffball

Photo credit: John Plischke

Photo credit: Adam Boring

Photo credit: Adam Boring

Description

Scleroderma citrinum, commonly called earthballs, are similar in appearance to the various familiar and edible puffballs; both are ball-shaped mushrooms with a tough outer skin. Both *Scleroderma citrinum* and puffballs have spores inside their ball-shaped fruiting bodies, but the spores are dispersed in different ways: *Scleroderma citrinum* splits open to expel its spores, and most puffballs expel theirs through a hole on top. *Scleroderma citrinum* is yellow to golden brown or tan in color and from 0.75 to 4 inches (2–10 cm) wide. The skin surface is finely cracked and covered with raised, separated, scales that make it look like a warty potato. It is sometimes described as a small cantaloupe. When young, the inside flesh is white, but it darkens to purple, and then black, when fully mature. The flesh becomes a mass of black spores which burst forth when the skin breaks open. The outside of the mushroom looks the same at all stages of growth. There are reports that it smells like rotten eggs, although some young specimens are also reported to smell waxy, like crayons. These mushrooms do not have stems, but grow directly from a **mycelium** base.

Where it may be found

Scleroderma citrinum are commonly found throughout Virginia, appearing from summer through fall. They are **mycorrhizal** and almost always grow singly or in small groups on the ground near moss and leaf litter, but appear occasionally on well-decayed stumps or

logs. Their main habitat is acidic soils, especially on compacted forest paths, fields, meadows and disturbed lands. They are found in all regions of North America and on all continents except Antarctica.

What makes it poisonous
There are no scientific reports documenting human toxicity associated with this mushroom. However, there are reports in the media of gastrointestinal distress associated with eating this mushroom, either raw or cooked. No specific toxin has been found or isolated in this mushroom.

Potential symptoms
Eating this mushroom can cause gastrointestinal problems like nausea, vomiting, cramps, and diarrhea. There are also limited reports of **lacrimation** (tearing), rhinitis (nose irritation) and **rhinorrhea** (nose drainage), **conjunctivitis** (red, irritated eyes) due to breathing in the mushroom's spores. The symptoms appear quickly, within minutes. No fatalities have been confirmed due to ingestion of this mushroom.

Look-alikes
All of the *Scleroderma* species look alike and may easily be confused with edible puffballs. Edible puffballs lack the cracked skin, and the raised and separated scales. The flesh of a young *Scleroderma* is very

Photo credit: Adam Boring

hard and firm while the flesh of a puffball is spongy like a marshmallow (though not sticky). The onion earthball, *Scleroderma cepa*, has also been recorded in Virginia, but seems to be less common. There are reports that it has a sharp and spicy, almost chemical, smell.

Notes
The scientific name, *Scleroderma*, comes from the Greek *skleros*, meaning hard, and *derma*, meaning skin. The *Scleroderma* mushroom has no connection to the chronic autoimmune disease of the same name.

Fun facts
The poisonous nature of the common earthball was written about in 1868 in a British weekly publication called the Gardeners' Chronicle. Further, it is reported that unscrupulous French chefs substituted the cheaper *Scleroderma* for much more expensive truffles.

Consuming poisonous mushrooms can be dangerous.
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Sutorius eximius

(Synonyms: *Boletus eximius*, *Leccinum eximium*, *Tylopilus eximium*)
Lilac-brown Bolete

Photo credit: John Plischke

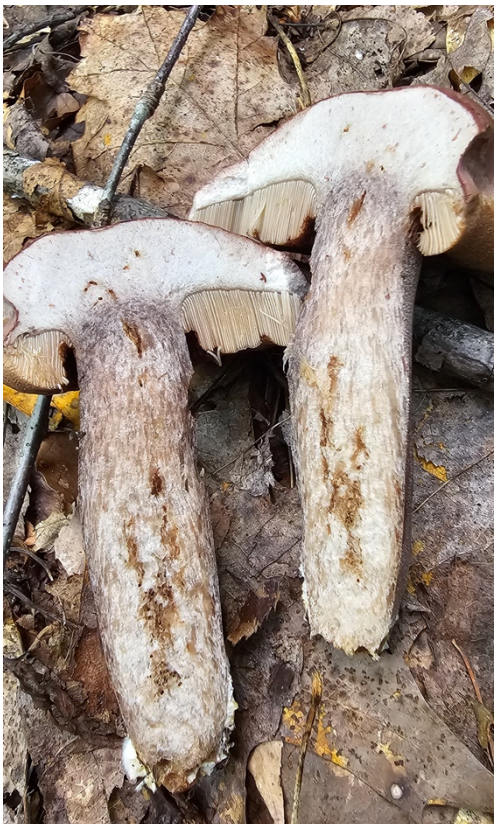

Photo credit: Lee Borg

Description

Sutorius eximius is a **bolete**, a type of mushroom which has a spongy surface on the underside of the cap, with **pores** and tubes instead of gills. The pores are connected to the tiny round tubes. *Sutorius eximius* has a purple-brown to grayish-brown cap with dark purple-brown pores that become reddish brown as it matures. The tubes are tiny, only 0.4 to 0.9 inches (9–22 mm) deep, and the same color as the pores. The cap has white flesh mottled with grayish, reddish or brownish lilac; it is almost dome-shaped at first, flattening with age. Its edge curves inward at first, its surface is dry and smooth to velvety. The cap width ranges from 2 to 4.75 inches (5–12 cm). The odor is slightly pungent or not distinctive, and the taste is not distinctive or slightly bitter. The stem is stout, nearly equal in width or sometimes enlarged downward. It is solid with a dry, pale purplish-gray surface, and densely covered with tiny darker purple-brown scales. The stem flesh is colored like the cap flesh. The spore print is pinkish brown.

Where it may be found

These mushrooms appear alone, scattered, or in groups under pine trees,

especially hemlocks, or in mixed woods with oak. They are found in eastern North America from summer through fall.

What makes it poisonous
This mushroom was previously regarded as a safe edible, but a series of poisonings from some northeastern collections has raised questions about its edibility. The first warning appeared in 1991, but with limited evidence to substantiate the claim of significant toxicity. No causative toxin has been identified and isolated from this mushroom.

Potential symptoms
If ingested, gastrointestinal upset has been reported to occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea. Symptoms generally last less than 24 hours.

Look-alikes
Edible look-alikes include *Leccinum* species, which resembles *Sutorius eximius* due to the fine scales on its stem. *Tylopilus plumbeoviolaceus* is an inedible mushroom, similar to *Sutorius eximius*, but with a smooth stem and intensely bitter flesh.

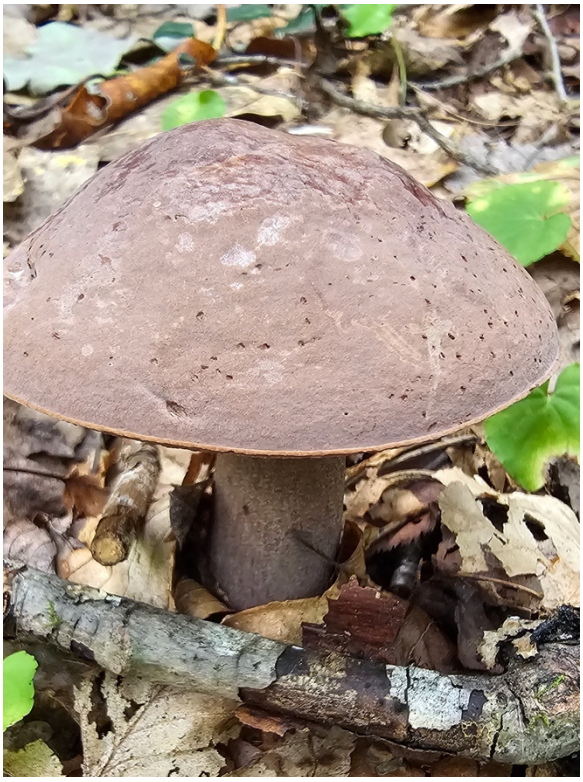

Photo credit: Lee Borg

Notes
The Latin term *eximius* means distinguished, or excellent in size or beauty. The genus *Sutorius*, created in 2012, is small, but is currently being expanded by discoveries in China, Thailand, Africa and Costa Rica.

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Tapinella atrotomentosa

(Synonym: *Paxillus atrotomentosus)*
Velvet Foot, Velvet Paxillus,
Velvet Roll Rim, Velvet-footed Tap

Photo credit: Penny Firth

Description

This large mushroom features a brown cap, buff-colored gills, and a dark brown, velvety-textured stem. The cap can grow up to 6 inches (15 cm) wide. When young, the cap ranges in color from brownish-yellow to yellow-brown or reddish-brown, darkening as it ages. Mature caps may retain a yellowish margin with a velvety, felt-like texture. Initially convex with an incurved margin, the cap flattens or becomes scalloped as it matures, sometimes developing matted hairs and cracks. The gills start off whitish but turn pale tan or yellowish-brown as they mature. They are often forked, with or without cross-veins near the stem, and may run deeply down the stem. These gills can be separable as a layer. The thick, firm flesh is whitish to yellowish. The stem can be up to 4 inches (10 cm) tall and 1 inch (2.5 cm) thick, and is white near the top and velvety dark brown to blackish-brown below, covered in dark hairs. There is no **veil**, and the spore print is dull yellowish-brown to brownish-yellow. This mushroom has no distinctive odor.

Photo credit: Lee Borg

Where it may be found

Tapinella atrotomentosa is commonly found throughout Virginia, primarily in the summer and fall. It is **saprobic**, and can be found individually or in small clusters on living conifer trees, stumps or decaying or partially buried conifer wood.

What makes it poisonous
In addition to often being classified in various media as inedible, there are a few published reports in the European literature documenting human toxicity associated with this mushroom. No causative toxin has been identified and isolated from this mushroom.

Potential symptoms
If ingested, gastrointestinal upset has been reported to occur, consisting of nausea, vomiting, abdominal cramps, and diarrhea.

Look-alikes
The brown roll rim, *Paxillus involutus* (also poisonous and also described in this publication), is similar but smaller, has a fibrous stem that is not velvety, and has brownish gills that darken when disturbed. It is considered more toxic than *Tapinella atrotomentosa.*

Notes
In parts of Europe, young *Tapinella atrotomentosa* mushrooms are considered edible, although poisoning incidents have been reported in European literature. Older mushrooms have an unpleasantly bitter or inky flavor. This mushroom can be easily identified because its cap and stem turn a bright purple when exposed to household ammonia.

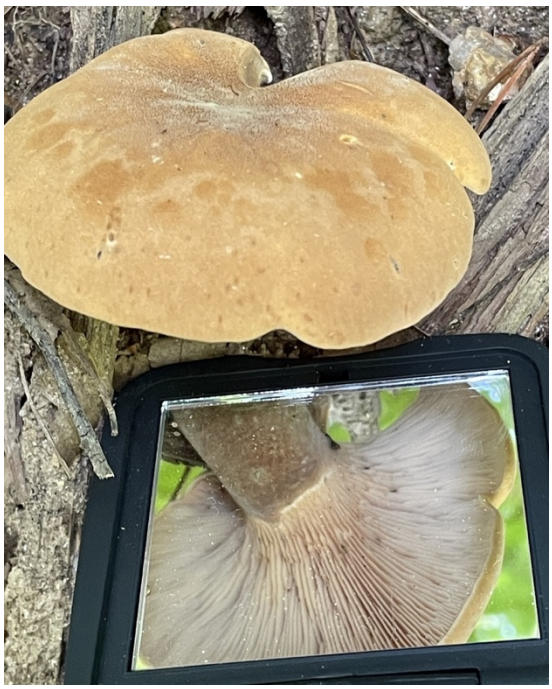

Photo credit: Penny Firth

Photo credit: Penny Firth

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

Tricholoma equestre

(Synonyms: *Tricholoma flavovirens*, *Tricholoma auratum*)

Man on Horseback, Yellow Knight

Photo credit: Alan Rockefeller

Description

A member of a large genus of 100 or so species described in North America, the caps are 2 to 4 inches (5–10 cm) across, slightly dome-shaped and become broadly dome-shaped when mature. When fresh, caps are sticky, but dry quickly. The cap color is bright sulfur-yellow to green when fresh, gradually turning brown to reddish-brown in the center, spreading towards the edges as it ages. The gills have a small notch where they are attached to the stem and are pale to bright sulfur-yellow. Stems are 2 to 2.75 inches (5–7 cm) tall and 0.5 to 1 inch (1.5–2.5 cm) thick, maintaining a consistent thickness along the length, with a slightly enlarged base. There is no **partial veil**, and thus no ring on the stem. The stem can be slightly hairy or smooth, pale yellow near the top, becoming more yellow near the base. The mushroom flesh is white and does not change color when sliced. The spores are white. The mushroom odor is described as very slightly mealy and like coconut.

Photo credit: John Plischke

Where it may be found

Tricholoma equestre and related species are found throughout the United States, in both mountainous and lowland areas. They are typically found under pine trees. The cap may be partially hidden under pine needles. This species prefers poor sandy soil and grows in late summer and fall.

Photo credit: Adam Boring

What makes it poisonous
The toxicity of this mushroom has been controversial. *Tricholoma equestre* has a long tradition of collection in various regions where it is consumed and the overall number of reported human poisonings remains low. Prior to the 1990s, textbooks described it as edible and good tasting. After 2000, several cases were documented in the medical literature where people became ill after eating large quantities of this mushroom over several days. Although the specific toxin involved has not been identified, it has inflammatory properties that damage muscle cells (a condition called **rhabdomyolysis**). Products of muscle breakdown that enter the bloodstream can also cause kidney injury or failure. Research continues in an effort to isolate and identify the toxin.

Photo credit: Alan Rockefeller

Potential symptoms
Many people who eat these mushrooms develop no adverse symptoms, but others have been reported to become ill. In documented cases, the onset of illness occurred 24 to 72 hours after eating large quantities, or several consecutive meals, of these mushrooms. Initial symptoms may include fatigue and muscle weakness with pain. Other symptoms may include facial flushing, nausea, and sweating. In more severe cases patients may develop respiratory failure, heart injury, and kidney damage. Few deaths have been associated with its consumption.

Photo credit: Adam Boring

Look-a-likes
Tricholoma equestre can be mistaken for other members of the genus, such as the acrid knight (*Tricholoma aestuans*).

Consuming poisonous mushrooms can be dangerous.
For appropriate medical advice, call your local poison center at ***1-800-222-1222.***

GLOSSARY

Adnate
Gills that are attached to the stem.

Adnexed
Gills that reach the stem but are not attached to it.

Aeruginascin
A chemical found in the *Conocybula smithii* mushroom that can cause euphoric experiences. Similar to Psilocybin.

Aesthesia
The ability to experience sensation, perception, or sensitivity.

Aldehyde dehydrogenase
An enzyme inhibited by the toxin coprine.

Allenic norleucine
A toxin found in some mushrooms that can cause kidney damage.

Amanitins
Potent liver-damaging toxins found in several mushroom genera.

Amatoxins
Toxic compounds in some mushrooms that cause severe liver damage and death.

Amygdaliform
Almond-shaped, referring to spores.

Anemia
A lack of healthy red blood cells or hemoglobin to carry oxygen to the body's tissues.

Annular
Ring-shaped, or relating to a ring, in reference to an annulus on a mushroom.

Annular zone
A thin ring zone on a mushroom stem; less substantial than an annulus.

Annulus, Annulus Ring
A covering or veil over mushrooms in the early development stage; a ring or skirt on

the stem; a remnant of a partial veil from the margin of the cap.

Antabuse

The brand name for disulfiram, a synthetic compound used in the treatment of alcoholics to make drinking alcohol produce unpleasant aftereffects.

Apex

Top of the stem closest to the gills.

Appendiculate

A description of the cap edge of a mushroom; the edge is ragged with remnants of a partial veil hanging down.

Basidiomycetes

A group of fungi that produce spores on special structures called basidia. This group includes mushrooms, puffballs, and shelf fungi; mushrooms that have spores produced on basidia.

Basidium, (pl. basidia)

A basidium is a small structure found in certain fungi that produces spores. It helps the fungus reproduce by releasing these spores into the environment.

Bolete

A type of mushroom with pores and tubes rather than gills on the underside of the cap.

Bradycardia

A condition where the heart rate is abnormally slow, typically below 60 beats per minute (bpm).

Bulb, Basal

A bulbous structure at the base of a mushroom's stem. It may be covered in veil remnants, which can be in the form of scales, patches, or rings.

Cap (pileus)

The expanded, umbrella-like top of common mushrooms.

Carcinogen

A substance or agent that can increase the risk of developing cancer.

Cholinergic Syndrome

A condition caused by an over stimulation of the cholinergic system, the part of the nervous system that controls involuntary bodily functions such as sweating, salivation, and urination caused by muscarine.

Close Gills

Gills that are somewhat close together but not crowded.

Conjunctivitis

Commonly known as "pink eye," is an inflammation of the clear membrane that covers the white part of the eye and the inside of the eyelids.

Coprine

A mushroom toxin that occurs in mushrooms in the genus *Coprinopsis*.

Cortina

A weblike that forms at the edge of the mushroom cap and stretches to the stem, covering the gills when young.

Cystidia

Microscopic structures found on the gills of psilocybin mushrooms. Since cystidia have so many shapes, and these shapes hold (fairly) constant for a given species, they are useful in identifying mushrooms.

Cytotoxin

Something that is toxic to human cells.

Decurrent Gills

Gills that are attached to and extend at least partway down the stem.

Decurrent Tooth

A narrow end of a gill which runs down the stem. See Adnate.

Deliquescence

A condition in which some mushrooms become liquid or melt down.

Diplopia

Double vision, a condition where a person sees two distinct images of a single object

Disulfiram

See Antabuse.

Ectomycorrhiza (pl. Ectomychorrihizae)

Ectomycorrhizae are one type of mycorrhiza that do not penetrate into plant cells, but instead form a structure that penetrates between cells.

Electrolyte

A substance that conducts electricity through the movement of ions. Electrolyte replacement is needed when a person has prolonged vomiting or diarrhea.

Emesis

The action or process of vomiting.

Euphoria

A feeling or state of intense excitement and happiness.

Fairy Ring

Also known as fairy circle, elf circle, elf ring, or pixie ring, it is a naturally occurring ring or arc of mushrooms. They are found in older forested areas, grasslands and often in lawns around old trees even after an old tree has been removed.

Farinaceous

Mealy; smells or tastes like freshly ground flour.

Fasciculol E, F

A toxic steroid in the mushroom *Hypholoma fasciculare.*

Fibril

A growth that looks like a tiny, thread-like fiber. *Fibrillose*
Covered in fibrils; appearing to be covered or composed of tiny thread-like fibers.

Gamma-aminobutyric acid (GABA)

A neurotransmitter that slows down the brain by blocking specific signals in your central nervous system (your brain and spinal cord). GABA is known for producing a calming effect.

Gills

Thin, papery structures that hang vertically from the underside of the mushroom cap. Their primary purpose is to produce and release spores, which help the mushroom reproduce.

Glabrous

Smooth, unadorned, bald.

Glutamic Acid

An amino acid that helps nerve cells communicate with each other. It's a non-essential amino acid, meaning the body can produce it on its own. It helps nerve cells send and receive information.

Gymnopilins

Poisonous compounds found in some *Gymnopilus* mushrooms that can harm the nervous system.

Gyromitra Syndrome

Poisoning caused by eating *Gyromitra* mushrooms, also known as false morels.

Gyromitrin

A toxic, volatile, and water-soluble compound found in certain mushrooms. It's the main toxin in *Gyromitra esculenta* and responsible for Gyromitra Syndrome.

Hemolysis

Destruction of red blood cells. See Paxillus Syndrome.

Hygrophanous

The color change of mushroom tissue (especially the cap surface) as it loses or absorbs water.

Hyperaesthesia

A heightened sensitivity to touch, temperature, pain, or other sensory stimuli.

Hypha (pl. hyphae)

A thread-like fungal cell, the basic root-like structural unit of any mushroom (fungus); branching filaments that bundle together to make up the mycelium of a fungus

Ibotenic Acid

A chemical compound and psychoactive drug that is found in certain mushrooms.

Illudin

A group of toxic compounds, specifically "illudin S" and "illudin M", found in the mushroom species *Omphalotus illudens*; these compounds are considered the primary reason why consuming this mushroom is poisonous to humans.

Involutin

An organic compound that can be found in mushrooms belonging to the genus *Paxillus*

Jaundice

A condition of the liver, with symptoms of yellowing of skin or whites of the eyes.

Lacrimation

Abnormal or excessive secretion of tears

LBM

"Little Brown Mushroom"

Margin

Edge of mushroom cap

Mealy
Smelling like cucumber, watermelon rind or flour (See: Farinaceous).

Membranous
Membrane-like; skin-like.

Metalloendopeptidases
Enzymes that help break down other proteins. Similar to the toxin found in *Chlorophyllum molybdites.*

Miosis
Narrowing of the pupils in the eye. Also called pinpoint pupils.

Molybdophyllysin
A toxic protein found in the mushroom *Chlorophyllum molybdites.*

Monomethylhydrazine (MMH)
Gyromitrin is converted in the body into the more potent cytotoxin monomethylhydrazine. A colorless, flammable, and highly toxic liquid with a strong ammonia smell.

Muscarine
A highly toxic substance found in some mushrooms.

Muscimol
A psychoactive compound found in *Amanita muscaria* and other mushrooms. Although both muscimol and ibotenic acid are present in mushrooms, muscimol is produced by processes that can occur during dehydration of the mushroom, digestion in the stomach, or after absorption in a variety of tissues.

Mycelium (pl. mycelia)
Bundles of hyphae at the bottom of a mushroom forming an often root-like network most of which is underground or hidden inside decaying wood.

Mycorrhizal
A mutual relationship between a plant (from ferns to all vascular plants) and a fungus; a fungus whose root structure is a network of thread-like mycelium that attaches to the roots of plants to absorb nutrients and water. Frequently this is of benefit to both plant and fungus.

Mydriasis

Dilation of the pupil of the eye.

Neurotransmitter

The body's chemical messengers. They carry messages from one nerve cell across a space to the next nerve, muscle or gland cell.

Orellanine

A mushroom toxin produced by some members of the *Cortinarius* genus. It is unique among the known mushroom toxins in that it is the only one to selectively target the kidney and frequently causes acute kidney injury.

Panther, pantherinoid

A term used to describe mushrooms that share similar characteristics with *Amanita pantherina*, called the panther cap, particularly in their appearance and potential toxicity. The name "pantherinoid" implies a relationship or similarity to the panther cap, suggesting a shared set of traits, such as a brown cap, white warts, and a potentially poisonous nature.

Paraquat, diquat

A toxic chemical that is commonly used as an herbicide (plant killer).

Partial Veil

Protective membranous tissue stretching from the stem to the cap edge in many young mushrooms; a temporary tissue that covers and protects the immature gills. Remnants of the partial veil are leftover as the ring/skirt or material hanging from the cap edge. When it hangs from the cap edge, it is said to have an "appendiculate margin."

Paxillus Syndrome

Caused by the toxin in the *Paxillus involutus* mushroom, Paxillus Syndrome can lead to anemia due to red blood cell destruction.

Phenol

Also known as carbolic acid, is both a manufactured chemical and a natural substance. Phenol has a distinct odor that is sickeningly sweet and tarry. You can taste and smell phenol at levels lower than those that are associated with harmful effects.

Phenolic

Having the characteristic smell or taste of phenol.

Pileus

The cap of common mushrooms

Polypore

A mushroom that has many pores (or tubes) on the underside of an often tough or even woody fruiting body, and found chiefly on trees or decaying wood.

Polyuria

A condition characterized by excessive urine production.

Pores

The open end of the tubes of a bolete or polypore.

Pruinose

A "frosted" or dusty-looking coating on top of a surface.

Psilocybin

A substance in some mushrooms, which converts in the body to psilocin.

Psilocin

The active substance in some mushrooms which activates serotonin receptors in the brain, causing psychedelic effects.

Receptor

Chemical structures in the brain that receive and convert signals. Specialized protein structures on the receiving neuron that capture and respond to those chemical signals from the neurotransmitter.

Rhabdomyolysis

A serious medical condition where muscle tissue breaks down rapidly, releasing harmful substances into the bloodstream.

Rhinorrhea

A medical term that refers to a runny nose.

Rhizomorph

A cord-like structure in fungi made up of filaments, that makes up the body of a typical fungus. Rhizomorphs act as an absorption and translation organ for nutrients.

Rhizomorphic

A type of mycelial growth characterized by its dense, root-like, and highly branched structure.

Rimose

Having a surface that is cracked, fissured, or covered in a network of small crevices.

RNA polymerase II:
A complex enzyme that transcribes DNA into messenger RNA (mRNA) and other small RNAs.

Saccate
Having the form of a sac or pouch. A description of the base of some mushrooms.

Saprobic
Organisms that obtain their nutrients by breaking down dead or decaying organic matter. They secrete enzymes that digest the organic matter, and then absorb the resulting nutrients. Many types of mushrooms are saprobic.

Saprophytic
A type of saprobic organism. Many mushrooms are considered saprophytic because they feed on dead plant matter. The key difference is that saprobic is a broader term, covering any organism that obtains nutrients from dead or decaying organic matter, while saprophytic or saprotrophic specifically refers to those that feed on dead plant material.

Saprotroph, Saprotrophic
A fungus that gets nutrients from dead and decaying organic matter.

Serotonin
A brain chemical that affects mood, emotions, sleep, and many other functions.

Serotonin receptors
Tiny structures in the brain and body that respond to signals between nerve cells and play a big role in how we feel and behave.

Sesquiterpenes
A class of terpenes that are found in plants, fungi, and marine organisms.

Short Gills
Gills that don't extend from the cap edge to the stem; found amidst the longer gills.

Spore
The reproductive unit of a fungus, usually a single cell.

Spore print
A mass deposit of spores; a key identifying characteristic is spore color.

Sporocarp
A fungal structure that produces spores; also referred to as a fruiting body or fruit body.

Sporophore
The spore-producing part of a mushroom, also called the fruiting body.

Stem
The stalk that supports the cap of the mushroom (See: Stipe). Stems have different base types and characteristics.

Striate
Parallel stripes on the cap margins; marked with lines or grooves.

Stipe
The stalk, or stem, which supports the cap of a mushroom.

Subdecurrent Gills
Gills that are tending toward being decurrent, but don't run as far down the stem.

Subdistant Gills
Also referred to as Close Gills.

Subellipsoid
Shape between ellipsoid (elliptical or egg-shaped) and round shaped.

Subglobose
Not perfectly ball-shaped.

Substrate
The material a mushroom grows on or in—such as the ground, leaves, woody debris, trees, etc.

Synesthesia
When the brain routes sensory information through multiple unrelated senses, causing you to experience more than one sense simultaneously.

Terpenes
A type of strong smelling chemical substance found in some organisms

Umbilicate
Having a depressed area in the center of the mushroom cap

Umbo

A raised knob or protrusion at the center of a cap.

Umbonate

Having a raised area in the center of a mushroom cap.

Veil

A protective membrane, a layer of tissue covering all or part of the gills on a young mushroom; as the mushroom grows, the veil detaches and remnants may adhere to the cap margin and/or to the stem, appearing as a ring or skirt. A mushroom may have more than one type of veil.

Veil, Partial

A temporary tissue structure in some mushrooms that protects the developing spore-producing surface of the cap.

Veil, Universal

A protective layer of tissue that envelops all or most of the young fruiting body of certain mushrooms; a temporary tissue that fully envelops some gilled mushrooms when young and which disintegrates with age but often leaves tissue remnants which appear as patches of tissue on the cap or on the stem.

Verrucose

Warty, not smooth.

Viscid

Slimy or sticky (at least when moist).

Volatile

A substance easily evaporated at normal temperatures.

Volva

A sac-like cup or tissue at the stem base of a mushroom – a remnant of the universal veil.

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