SPORE PRINTS

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DRONE CAMERAS HELP SCIENTISTS DISTINGUISH BETWEEN DROUGHT STRESS AND FUNGUS IN OAKS

Abhishyant Kidangoor
https://news.mongabay.com/, April 18, 2024

How do you identify sick oaks?

For a long time, detecting unhealthy oaks and identifying the disease afflicting them required a lot of manual labor. Scientists often looked out of airplanes or walked through forests in a bid to detect and find visible symptoms. Even then, one couldn't really be sure.

New research attempts to find a solution to this long-standing problem.

A study published in the journal *Proceedings of the National Academy of Sciences* describes how a team of scientists used remote sensing, spectroscopy, and machine learning to not only identify unhealthy oaks before visual symptoms appeared, but to also distinguish between drought stress and oak wilt, a deadly fungal disease.

The model can not only detect sick oaks but also distinguish between drought stress and oak wilt, a fatal fungal disease.

The team monitored sick trees and, as symptoms progressed, observed physiological changes in them while also keeping an eye on how they reflected light. Once the researchers established a link between the two, they used the data to train a machine learning model that can now tell if an oak is sick and if it suffers from drought stress or oak wilt.

"We obtained spectroscopic information in many wavelengths from light reflected from plants," Jeannine Cavender-Bares, a co-author of the study and Distinguished McKnight University Professor of ecology, evolution, and behavior at the University of Minnesota, told Mongabay in a video interview. "When we do this, we get a spectral fingerprint of the plant, which allows us to detect disease when we couple it with machine learning models."

North America is home to the highest number of oak species in the world. According to the United States Forest Service, oaks comprise close to 11 percent of the total tree population in the country. Vital for climate regulation and carbon sequestration, oaks also support diverse biodiversity, filter pollutants from the air, and prevent soil erosion.

However, these critical trees face an onslaught of threats. In particular, oak wilt, a fatal fungal disease, continues to ravage oak trees in the U.S. and Canada. Rising temperatures due to climate change also contribute to drought stress.

Early detection of oak wilt, and distinguishing it from drought stress symptoms, is key to protecting these trees. Once afflicted by oak wilt, it's nearly impossible to save oaks. "The fungus goes down into the roots and into the vascular system," Cavender-Bares said. "If undetected, it will kill all the neighbors, and then you've got a pocket of infested trees, which is harder to manage."

Cavender-Bares and her team aim to address this gap with their work.

"We tried to get remote sensing signals tied to physiological processes that are happening within the plants," Gerard Sapes, lead author of the study and research scientist at the University of Florida, told Mongabay in a video interview.

To get started, the team inoculated red oaks on the University of Minnesota campus with oak wilt fungus. A few trees were also subject to drought conditions. As the disease progressed, Sapes and his team measured a suite of physiological traits such as photosynthetic rates, chlorophyll fluorescence, and transpiration while simultaneously gathering data on how the trees reflected light as the symptoms changed. This was done both at the leaf level by clamping a device on the leaf, as well by flying a sensor-attached drone over the top of the canopy.

"These two stressors have a similar effect on the tree. Basically, the leaves dry, and so there is a high chance of confusing a tree that is under drought with a tree that might be experiencing oak wilt," Sapes said.

Both oak wilt and drought block water transportation to leaves through the tree's xylem. However, oak wilt affected the conduits only in localized regions where the fungus was present. This was in contrast to trees subject to drought where the impaired pipes were not concentrated in any one region and were present all over.

"If the pipes that are nonfunctional are all lumped, chances are as you travel up to the tree, those connect to the same place in the canopy. The canopy's patterns of stress mirror what's happening inside, and in the case of oak wilt, the stress is concentrated in a few areas of the canopy," Sapes said. "We can detect it by using a drone with a spectral signal that is sensitive to water and photosynthesis."

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CALENDAR

May 4	Field trip (see website)
May 10	Field trip (see website)
May 14	Membership meeting, 7:30 pm, CUH
May 20	Board meeting, 7:30 pm, CUH board room
May 21	*Spore Prints* deadline
May 24	Volunteer-only field trip (see website)
June 1	Field trip (see website)
June 11	Membership meetings and social event

BOARD NEWS — Carolina Kohler

Greetings PSMS members!

Monday, April 15, was the first official board meeting for our newly elected and fully vested officers and trustees.

Cindy Brewster has replaced Brenda Fong as treasurer, while Joe Zapotosky has stepped down from his position as trustee to take on his new role as vice president. Tara Henry will be taking over his spot and completing his term, at the end of which she will have the opportunity to run for reelection. Megan Brewster, Amy Foster, and Andy Iwata are replacing the outgoing Marian Maxwell, Anne Polyakov, and Marcus Sarracino, while Kelsey Hudson and Peg Rutchik have been reelected to a second term. Clay Dawson, Shaojung Wang, and Vern Hodgson are our alternates and will be filling in for any board member who might need to step down before the end of their term.

To all of them, welcome! We look forward to working together!

To our outgoing board members, thank you for your generous and indefatigable dedication! You will be truly missed.

The first tasks of the evening were, as usual, the approvals of the March meeting minutes and the treasurer's report. To ensure a smooth transition, Brenda has been generously assisting Cindy and showing her the ropes of a job that is daunting to most of us. Thank you, Brenda!

The next order of business was once again the lease renewal of PSMS's space at CUH. Since some of the original lease options and terms had seen slight modifications, things needed to be revisited. After an engaging and thorough discussion, the board voted to move forward and lease a new and larger space within CUH, which will allow much better access to our learning and research materials, among other benefits. Our volunteer identifiers just can't wait to have the microscopes readily available for the Hildegard Hendrickson ID Clinics!

Plans are under way for our upcoming June social gathering! Since replacing our March Survivor's Banquet a couple of years ago, this event has become a favorite, and we are looking forward to getting together, enjoying some drinks and tasty bites, and having a fun time. Keep your eyes open for the email invitation to this members-only event!

Almost hard to believe, but it is May already! Spring is here, mushrooms are out, and our field trips are on. Happy hunting to you all!

PROGRAM — Joe Zapotosky

Ron Post and friend.

This spring the Puget Sound Mycological Society turns sixty—that's right 60!—years old. Please join us at our next general meeting Tuesday, May 14th, when one of our estimable past presidents (Ron Post, 2004–2006) tells a story that is one that all members, past and present, should be proud of. From the founding members in 1964, through the decades, PSMS volunteers and members have a story that is both as unique and diverse as our membership. Doors open at the Center for Urban Horticulture at 7:00 pm. Ron Post will give this presentation in person, but if for some reason you are not able to attend, the meeting will also be available to view live via Zoom. Just click on the home page (psms.org) then scroll down to "Upcoming Events" the zoom link will be found there.

Here is what Ron has to say about his presentation:

"I joined the society in 1988, the same year my son was born. That was 36 years ago but not the first encounter I had with the club. I attended two of the annual exhibits at the Pacific Science Center in the 1970s, one of them in 1978 when about 6.000 other

people came to see the mushrooms. But I had to turn around and leave that show because I was living on Bainbridge at the time and needed to get home, and the mass of humans in front of me crowding in to examine the tables of specimens was so deep, I knew I would either get a parking ticket or miss the ferry I wanted.

"I was encouraged to visit the exhibit again by a UW graduate student/friend who was familiar with Dr. Stuntz, the club's founder and scientific adviser. Word of mouth was important in those days, as it still can be. I did join the society, but not until 1988 when I came back from two years in Alaska working on a newspaper. Very quickly I was swept up in the club's social and scientific undertakings. That same sudden immersion can happen to any new PSMS member.

"A notice about my son's birth in 1988 appeared in the January 1989 *Spore Prints*, and at the next meeting I went to, long-time PSMS member Millie Kleinman came up and presented me with booties, mittens, a cap, and a sweater for my infant son. Millie knitted blue ones for boys and pink ones for girls, over time handing them to some one hundred other members who had children while they were active in PSMS. At a membership meeting soon after that, I dressed my son in his blue knitwear and brought him to the CUH hall. Ben Woo took him from my arms and carried him around for 10 or 15 minutes, introducing him around.

"I hope you will come and join me as I reminisce about my experiences with PSMS over the past 36 years. One of my goals in giving this talk is for people to think about how social forces and habits have changed in the 60 years we have been a club, though our mission and scientific practices haven't varied much."

GET TO KNOW THE PSMS WEBSITE

Randy Richardson

Hello, especially to new members. There is an enormous amount of info on our website. I'll admit it can be troublesome to find it sometimes, and there is some talk within the board about finding a better solution. But for now, I encourage you to spend some time reading and exploring.

The home page (psms.org), for example, tells you about whether the Monday ID clinics are yet in session and who the speaker at the upcoming membership meeting will be (posted shortly before the meeting). "Resources" accesses *Spore Print*s newsletters and mushroom-harvesting rules (currently getting an update). Field Trips under "Events" has wonderful info to know before you go; some longer-term members have gone to considerable effort to answer all the questions you may have. There is information about attending field trips—no, you don't need to register beforehand—what to expect when you go, how to "stay found" when you venture into the woods, what kind of gear to bring, etc.

All the information on the website is public except for the password-protection Members' Page* (under Membership). Here, for example, you'll find the members directory and a calendar with field trip *locations*. Here, too—and there would be no way to know they existed—are videos made by a number of PSMS members to try to help you with cooking, cultivation, dyeing, woods safety, ID, etc. You'll find the videos at the bottom of the members' page under the heading "Multimedia."

One gem appropriate right now is the video Wren Hudgins and I recorded a couple of years ago on how to spot promising habitat for "natural" morels. It's a bit clunky, but we hope it can help you to find those most-elusive little treasures.

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*PSMS members enter the Members' Page by typing in their user name and password; email Marian at outreach@psms.org or Pacita at membership@psms.org if you have trouble getting in.

Oak Wilt vs Drought Stress, *cont. from page 1*

The analysis of reflection patterns enabled the researchers to identify drops in the trees' photosynthesis efficiency and rehydration capacity almost 12 days before visual symptoms appeared.

Using the data, the team then built a model that could take in remotely sensed spectral data and then predict physiological symptoms. When applied to a science reserve, the model was able to identify unhealthy oaks before any visual symptoms had appeared. "They looked like perfectly healthy plants," Cavender-Bares said. "But the model was telling us, 'No, this one is sick.' And two weeks later, you could see it."

The team now plans to further develop the model to include other tree diseases. They also aim to make it more widely available to ensure widespread use.

"We're applying similar kinds of modeling approaches to other tree diseases by developing predictive maps," Cavender-Bares said.

TWO TEENAGERS DIE, ONE INJURED AFTER STEPPING ON LANDMINE WHILE SEARCHING FOR MUSHROOMS IN PAKISTAN

Shankhyaneel Sarkar

https://www.news18.com/, April 21, 2024

At least two teenage boys were killed and another one was injured in a landmine explosion in Pakistan's restive Khyber Pakhtunkhwa province bordering Afghanistan on Sunday, police said.

The boys were searching for wild mushrooms in the nearby Tirah Valley mountains in the tribal Khyber district when one of them stepped on the landmine triggering a huge blast.

One boy died on the spot while another succumbed to his injuries in the hospital, the police said. Another 16-year-old boy, who sustained critical injuries in the blast, is receiving treatment at the hospital.

An investigation has been initiated into the incident, a police official said.

Scenic Tirah Valley is heavily mined due to its proximity to the Afghan border. The movement of tribesmen on both sides of the Afghan border continues unabated daily.

The lush green valley remained a hotbed of Taliban since the emergence of the group and the local administration usually remained ineffective in maintaining law and order in Tirah.

STEREUM SANGUINOLENTUM: Profile of a Red-Staining Fungus

Brian S. Luther

We have a number of native species of fungi that quickly stain red or reddish when bruised. *Stereum sanguinolentum* is one of these. The species name literally means staining blood-red. It's quite variable in form, often being resupinate, meaning the basidiocarp is completely confluent with the substrate, or it can also be effused-reflexed, having a short horizontal section of pileus that projects somewhere on the upper margin. In this article I've made a point of detailing and emphasizing the natural variation seen in this species, because it can look totally different based on specific growing conditions. It can be found most of the year and is only known to decay conifer wood or debris.

The genus *Stereum* has a smooth fertile portion (the hymenium), lacking lamellae, pores, or teeth; they can be very finely roughened or slightly wrinkled, but this trait is never pronounced. Although many species in this genus are effused-reflexed, with the pileal surface often zonate and superficially resembling Turkey Tails (*Trametes versicolor*), they're easily distinguished because of this smooth spore-bearing surface. Turkey Tails have a distinct layer of fine pores under the caps.

Description of species

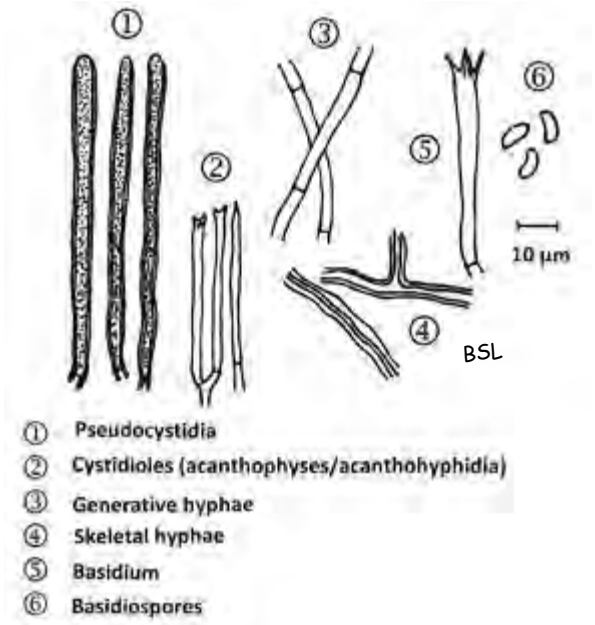
Stereum sanguinolentum (Alb. & Schwein. ex Fr.) Fr.

Basidiocarp

Annual, resupinate, or effused reflexed, at first forming small orbicular patches up to 5 cm, but usually smaller, these often coalescing with growth, coriaceous (leathery) when mature, up to 1–2 mm thick; hymenium smooth to slightly tuberculate or finely wrinkled, varying from grayish-white to gray to pale grayish-tan when fresh, staining various shades of red (Scarlet-Red to Nopal Red) slowly to fairly quickly where cut or bruised, these disturbed areas becoming darker with age and the colors fading over time to dull brownish reds and finally drying to shades of dark brown (Pecan Brown); margin often whitish at maturity and contrasting with the hymenium; if effused-reflexed, then the pileus can be up to 2 cm or more in length and usually projects 2–10(15) mm out from the substrate, various shades of light to warm or dark buff to olivaceous-buff, often with an irregular or lumpy surface, becoming finely pubescent or tomentose, with narrow zonate bands when larger and the margin undulating. Colors in parentheses are from Ridgway, 1912.

Microstructures

Hyphal system dimitic; generative hyphae 1.5–3.5 µm wide, thin to slightly thick walled, hyaline, simple septate (lacking clamps) and frequently branched; skeletal hyphae thick walled, infrequently branched, without septa, up to 8 µm wide. Pseudocystidia in the hymenium up to 200 × 6–8 µm, mostly cylindric to subfusiform, thick walled for most of the length, with brownish granular contents, extending beyond the basidial layer and arising from skeletal hyphae. Cystidioles (aka acanthophyses or acanthohyphidia) 20–40 × 2–3.5 µm, narrowly cylindric, thin walled, hyaline, simple septate and often having apical protuberances. Basidia 30–50 × 5–8 µm, narrowly clavate, hyaline, lacking a basal clamp connection and 2–4 sterigmate. Basidiospores 6-8 × 2.5–3.5 µm (if on four-spored basidia), ellipsoid-cylindric and some slightly curved, hyaline, smooth, thin walled and lightly amyloid.



Microscopic features of Stereum sanguinolentum.

Discussion

This species is common worldwide on conifer debris. I often find it on Douglas Fir (*Pseudotsuga menziesii*) in western Washington, but here in central Washington I most frequently find it on Ponderosa Pine (*Pinus ponderosa*), often colonizing freshly cut branches, etc. After doing tree work on our property, it's usually one of the first species to start growing on limbs or trunk sections of this species of pine, appearing only a few months after the wood having been cut and stacked or left directly on the ground. It's most often found growing on the underside of conifer wood or bark, but can also occur in a more exposed position on the substrate.

How rapidly it stains red depends on the age and moisture level of the fungus.

Fresh, actively growing, moist specimens stain the fastest, decreasing in this reaction and color intensity as they lose moisture after either getting older or drying out; at this latter stage in its development there is no color reaction at all when bruised. This remarkable color change is due to microscopic cells called pseudocystidia (described above), which contain pigments that become various shades of vivid red when initially bruised and exposed to air (oxidized). Because the pseudocystidia often extend in the hymenium slightly above the basidia, these cells are the first exposed when disturbed or bruised. Jahn (1979) provides an excellent color photo showing the red staining.

Peck (1875) described *Stereum balsameum* as a new species from New York not realizing that this fungus had been previously described and published many years earlier in Europe as *S. sanguinolentum*. He noted that his collection was only resupinate. Then in 1893 Peck described *S. balsameum* form *reflexum* for a collection that was presumably effused-reflexed, still unaware that this fungus had already been named. So, some earlier researchers as noted above were not aware that this same fungus could be totally resupinate or effused-reflexed based on habitat, site, and situation. And some of the earliest mycologists studying this fungus failed to observe certain microscopic details or characters and they used different names for structures seen. Burt (1920) gives a very good account of this species and he documents many spec-

imens from the Pacific Northwest, including five collections he observed from Washington State, but makes no mention of the two different hyphal systems. Lentz (1955) also provides a detailed description and line drawings of this species in his monograph and notes that there are two distinct types of hyphae, which he describes but does not give distinct names to. Skovsted (1956) discusses this species from Denmark in detail and provides line drawings, but also does not mention two different types of hyphae present. As we've learned more over the years about these different micro-structures, appropriate and officially recognized names have been given to them. Hansen & Knudsen (1997) state that the hyphal system for the genus *Stereum* is monomitic, which is incorrect and in contrast to other modern authors. Burt (1920) states that there are "no cystidia," refers to the pseudocystidia as "conducting organs," and makes no mention of cystidioles at all. Skovsted (1956) describes the pseudocystidia in his text as "coloured tubes," then "cystidia" in his illustration, and also does not differentiate or mention cystidioles. Snell & Dick (1971) provide a good illustration and description of a pseudocystidium as used in modern mycology. The cystidioles in this fungus were thought to be "basidioles" by Lentz (1955) and can also be called acanthophyses or acanthohyphidia in modern fungal terminology. Lentz (1954) discusses in detail the differences between almost all of these microscopic structures. More recently Price (1973) provides a detailed study of cystidia and the appropriate modern names applied, specifically in reference to the resupinate Basidiomycetes. These last two authors also give some historical information related to the evolution of the naming of these structures in the literature over time.

Gilbertson (1974) puts this species in the genus *Haematostereum*, but this has been synonymized under *Stereum*. Although Gilbertson (1974), Breitenbach & Kranzlin (1986), and Hansen & Knudsen (1997) state that the basidiospores are amyloid, Burt (1920), Lentz (1955), and Skovsted (1956) make no mention of this spore reaction to iodine reagents. However, these last three references were during a time when amyloidity (color reactions of fungal tissues to iodine reagents) were just being recognized. Lentz (1955) does detail the variation in basidiospore size based on whether the basidia have two or four sterigmata. On two-spored basidia, the spores for this species can be quite a bit larger, up to 8–14 × 3–5 µm, thus overlapping in size with some of the other related red-staining species.

We do have a couple of other red-staining species of *Stereum* here, but these are found almost exclusively on hardwood debris, rarely on conifers, and some have slightly larger basidiospores, assuming that the basidia are all four-spored, as well as other distinguishing features. The two others staining red are *S. gausapatum*, which is often an annual fungus just as the fungus discussed in this article, and *S. rugosumm* which is perennial. Both generally have a darker brown hymenium, not shades of gray. If you're interested, Gibson (2019) has a key specific to the species of *Stereum* in the Pacific Northwest and he compares them all.

For completeness sake I'm providing five of my photos of this fungus, in order for you to see *all* the stages of development and the different forms of growth that may be encountered. I show the resupinate form, both unbruised and bruised, as well as the appearance of an old dried up basidiocarp for comparison. Another photo shows a transitional form that's mostly resupinate, but also slightly effused-reflexed, having a very narrow pileal margin. Finally my last photo shows the effused-reflexed form of this species with a prominent pileus. If you found only the extremes of these growth forms and set them side by side, you'd think you had totally unrelated fungi.

This and other species of *Stereum* are known to be parasitized by some species of *Tremella*, a genus of jelly fungi. It's not uncommon in fall to find logs covered with both fungi and this is the reason why.

Because there are several species of *Stereum* that are similar, identifying them with certainty requires microscopic examination of the specimens.

Stereum sanguinolentum resupinate form before being bruised.

Stereum sanguinolentum staining red after bruising.

Stereum sanguinolentum appearance when old or dried out.

Stereum sanguinolentum. Mostly resupinate, but with a slight pileal margin.

Stereum sanguinolentum. Effused-reflexed form having a distinct pileus.

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FUNGUS MAKES CICADAS HYPERSEXUAL

Laura Baisas

https://www.popsci.com/, April 16, 2024

As we wait for this spring and summer's "cicadapocalypse" when trillions will emerge across the Southern and Midwestern United States, some of the bugs may face a predicament that sounds straight out of science fiction. A sexually transmitted fungal pathogen exclusive to these periodical insects called *Massospora cicadina* can control them like "a puppet master." It causes the infected cicadas to act hypersexual and infect others before they eventually die.

Abdomens Pierced Open by a Fungus

Massospora cicadina can affect both broods of periodical cicadas set to emerge in the coming weeks and months. Brood XIII—the Northern Illinois Brood—will emerge for the first time since 2007 and stretches across parts of Indiana, Wisconsin, Iowa, and northern Illinois. Some of Brood XIX—the Great Southern Brood—will overlap with Brood XIII. The Great Southern Brood last emerged in 2011 and is primarily located in Arkansas, Missouri, Tennessee, Alabama, Georgia, North Carolina, South Carolina, and southern Illinois.

When they emerge, the cicadas molt into adults. Within a week to 10 days, this fungus opens up the backs of their abdomens. Scientists are still not sure when in their life cycle cicadas can initially become infected with *Massospora cicadina*, but the prevailing hypothesis is that they are infected on their way up from the ground.

According to West Virginia University mycologist Matt Kasson, the infected cicadas look like they have "a gumdrop that's gotten wet and dropped in chalk dust," on them.

"If you look at a fungus-infected cicada, you'll see that basically, the backside of the body has been replaced by this chalky white fungal plug," Kasson tells *PopSci*. "Now, if you or I had our abdomens pierced open by a fungus or a third of our body was replaced by some parasite, we probably wouldn't feel well. We probably wouldn't attempt to mate. We would just feel awful, lay down, and die."

However, infected cicadas continue to fly around as if nothing is wrong with them even as their genitalia have been consumed by a fungus. They can do this because the fungus has sent them into a period of prolonged wakefulness—a time of increased stamina.

Matt Kasson

A periodical cicada infected with the fungal pathogen Massospora cicadina.

"A hypothesis for that prolonged wakefulness is that the fungus is producing an amphetamine called cathinone," says Kasson. Kasson says it is similar to one of the synthetic stimulants commonly found in "illegal bath salts that were banned because of the aggressiveness that [they] would cause."

A Quiet Fungal "Puppet Master"

It makes the cicadas act hypersexualized, where males will continue to try to unsuccessfully mate with females and also mimic female behaviors to attract other males to mate with them. This then doubles the number of cicadas that will eventually become infected and is why it can be considered sexually transmitted.

Massospora cicadina's ability to keep the host alive long enough to maximize the number of cicadas infected makes it a biotroph. It does not work like the *Ophiocordyceps unilateralis* fungus that takes over ants and makes them act like zombies or the fictional fungi from the television show and video game *The Last of Us* that pops out in a dramatic fashion.

"It's a trick of the fungus and it's like a puppet master," says Kasson. "It's pulling the strings to maximize its own survival."

Infection rates can reach 20 percent of cicadas if the environmental conditions are perfect, but some older studies suggest that [the fungus] affects about five percent of cicadas in a given brood.

Optimizing its Genome

Massospora cicadina was first discovered in the mid to late 1800s. Since periodical cicadas emerge only every 13 or 17 years, studying this fungus is difficult. It also can't be cultured on a Petri dish, so mycologists have a limited window to study them and are still not really sure where it comes from.

In 2016, Brood V emerged near Kasson's office in West Virginia and some of his graduate students suggested they look for signs of this fungus. They were able to sequence parts of its genome

to see what makes it special. What they found was the largest genome ever sequenced for a fungus at about 1.5 billion bases.

"It's about 20 times bigger than the average human genome and it's mostly filled with these repetitive sequences called transposable elements," says Kasson.

They indicate that *Massospora cicadina* has essentially spent millions of years optimizing its genome right alongside the cicada. The fungus and insect appear to have coevolved so that it can manipulate its host in a specific way to not kill it, but ensure its own survival. According to Kasson, their data on this coevolution hasn't been published yet, but shows some interesting evolutionary dynamics.

"What we see is a pattern where basically cicadas evolved in parallel to the fungus all together," says Kasson.

Massospora cicadina is not transmissible to humans, but it would be smart to avoid eating any cicadas that have the white, chalky plugs on their abdomens. The infected bugs will not come with any sort of high or buzz, but do have several toxins that could be dangerous if eaten.

"We found 1,000 other chemical compounds, some of which are known mycotoxins," says Kasson. "So proceed with caution if you're thinking about consuming one of these cicada fungi."

SIDE EFFECTS OF "MAGIC MUSHROOMS" SIMILAR TO THOSE OF REGULAR ANTIDEPRESSANTS

Ernie Mundell

https://www.upi.com/, April 24, 2024

Many people with tough-to-treat depression may be trying psilocybin, the active ingredient in magic mushrooms, as an alternative to antidepressants.

"Magic mushrooms," Psilocybin cubensis.

Thinking that it's a "natural" drug, folks might assume it comes without side effects.

That assumption would be wrong.

People in a new study who took psilocybin often experienced headache, nausea, anxiety, dizziness, and elevated blood pressure—side effects similar to those seen with regular antidepressants, according to a team from the University of Georgia in Athens (UGA).

The good news: Such side effects were only temporary. It's less clear if longer-term side effects might emerge with time, the researchers noted.

The short-term side effects "are what we may expect from your traditional antidepressants because those medications work in a similar fashion to psilocybin. They both target serotonin receptors," explained senior study author Dr. Joshua Caballero, an associate professor in UGA's College of Pharmacy.

"It's very encouraging," he added in a university news release, "because the studies we examined consist of just one or two doses per patient, and we're finding that the beneficial effects of psilocybin may stay for months when treating depression."

Psilocybin was shunned by the medical community for decades because, at higher doses, it can have hallucinatory properties. But used under the guidance and supervision of a therapist, the drug is having a comeback as a new form of antidepressant.

But what about any side effects?

To answer that question, Caballero's group looked at data from six different studies on the supervised use of single doses of psilocybin against depression. The studies included a total of 528 people. They found a number of side effects, among which nausea, dizziness, and elevated blood pressure were most common. These effects appeared to dissipate within 48 hours.

Importantly, "psilocybin use was not associated with risk of paranoia and transient thought disorder," the researchers said.

The findings were published recently in the journal *JAMA Network Open*.

"At some point, I do think that psilocybin will become a treatment option, and when it does, we need to know what the side effects and potential long-term complications are," Caballero said.

Always use the drug under the supervision of a trusted therapist, he said. One recent study found this was key to successful treatment.

"I would urge caution for people that are thinking this is a magic cure and then go out and take excess mushrooms," Caballero said. "Without proper monitoring, you won't know the concentration of psilocybin in those mushrooms and you could have a bad trip or other negative outcome."

The researchers added that the longer-term effects, if any, of psilocybin therapy are unknown.

"There is still a lot we don't know about the potential long-term side effects and more serious rare side effects of psilocybin use," Caballero said. He noted that standard antidepressants already carry a boxed warning from the U.S. Food and Drug Administration regarding the potential for an increased risk of suicidal thoughts and suicide in young adults.

Could psilocybin use have a similar risk? It's just not clear yet, Cabellero and colleagues said.

Still, the overall news is good for folks battling tough depression. "If we can safely use this drug in a controlled environment, I think it could be groundbreaking for a lot of patients that need it," Caballero said.

I once knew a gal from Nantucket
One time she picked 50 buckets
She couldn't get them too far
They wouldn't fit in her car
So she made an arrangement to truck it.

GEOPORA COOPERI

Dick Sieger

Geopora cooperi.

The *Geopora cooperi* at first looked like a mushroom stump that a morel hunter forgot to hide. But no, it was a truffle that I had found in Sequim Bay State Park several decades ago and had finally found there again. The first time I saw it, there were an abundance of them and there were even more empty holes left by untidy rodents that had dug them up, eaten them, and left scraps all around. This time there was just the one.

Geopora cooperi is a truffle that occurs along the western coast of North America and can also be found in Europe and Asia. It may grow underground or be partly exposed. Its size is one to three inches across, it is bumpy, and it has a dark brown skin with hairs that may be seen with a 10× hand lens. When it is cut open one sees sinuous folds that are pale brown and white and that have gaps in between them.

One expects truffles to be passive fungi that depend on the animals that eat them to scatter their spores in droppings. However, *G. cooperi* hasn't quite finished evolving from its origin as a cup fungus. So, like cup fungi and the other mushrooms we gather, its spores are forcibly discharged even though they can't escape. I've seen tiny explosions on a microscope slide as its spores were blasted out, and that's pretty darned exciting!

And yes, folks, it's edible. I tried a raw nibble and found it to have a strong mushroomy flavor, so I assume the cooked ones are tasty.

As hunters we are drawn to and compelled
Every year in Spring; like a moth to the flame—Zombielike,
into orchards, fields, and forests, over rivers and hills,
in search of tiny spongelike growths
that are as unpredictable in habit as they are difficult to spot.

—stranger636

MOREL SPECIES

Puget Sound Mycological Society COOKBOOK, 2019

Morels have hollow stems and caps that are attached to the stems along the edge or up the underside of the caps instead of at the top. Morel species vary in color, pit shape and size, and whether they have a narrow overhang at the stem and cap connection.

Morchella americana - Blonde Morel (1)

Formerly known as *M. esculenta*, these morels have whitish to pale gray to tan colors, and more rounded pits that are haphazardly arranged. There is no overhang between the stem and cap. They grow under cottonwood trees.

Morchella importuna - Landscape Morel (2)

Formerly known as *M. elata*, these morels have dark gray to black colors and often have narrow pits with elongated ridges. They are quite large, but are not considered to be as tasty as other species. They grow in yards and disturbed areas, usually clustered and in large numbers.

Morchella snyderi - Natural Black Morel (3)

Natural black morels often have ribs and holes on their stems. They are yellow in youth and become dark brown to black with age. They may grow in clusters outside recent burned areas, but are the most difficult to find. They appear in early spring.

Morchella tomentosa - Western Gray Morel (4)

Western gray morels have dark, hairy, rounded ridges that lighten, grow bald, and flatten with age. They fruit in the spring after a fire the previous year, usually above about 3,000 feet in elevation. They are more common than "naturals," which grow outside fire areas.

About ten other less-common morel species can be found in the Pacific Northwest. All of them are edible, but most are difficult to tell apart without a microscopic or genetic analysis.

MORELS WITH ASPARAGUS

Wild Mushroom Cookery, Oregon Myco. Soc., 1987

A very nice spring dish. Our gratitude goes again to Kurt Grasing, Chef of the restaurant 231 Ellsworth in San Mateo, California.

1/2 pound fresh *Morchella,* cleaned
1 shallot, finely chopped
I cup white wine
28 pieces large asparagus, peeled
1 cup cream
1/4 pound butter

Sweat* the Morels with the shallot; season with salt and a grind of pepper. Deglaze with wine; cover and let stew until morels are soft.

Cook asparagus in seasoned water. Remove when al dente.

Remove morels from liquid. Reduce liquid with some stock from the asparagus. Add cream and reduce to sauce consistency. Slowly stir in butter off the heat. *Yields 4 side dish servings.*

*Sweat means to cook over a low to medium heat until the food's juices appear.

MAY IS MOREL MONTH!