SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 546 November 2018

HOW THE MUSHROOM DREAM OF A "LONG-HAIRED HIPPIE" COULD HELP SAVE THE WORLD'S BEES

Evan Bush
Seattle Times, Oct. 4, 2018

The epiphany that mushrooms could help save the world's ailing bee colonies struck Paul Stamets while he was in bed.

"I love waking dreams," he said. "It's a time when you're just coming back into consciousness."

Years ago, in 1984, Stamets had noticed a "continuous convoy of bees" traveling from a patch of mushrooms he was growing to his beehives. The bees actually moved wood chips to access his mushroom's mycelium, the branching fibers of fungus that look like cobwebs.

"I could see them sipping on the droplets oozing from the mycelium," he said. They were after its sugar, he thought.

Decades later, he and a friend began a conversation about bee colony collapse that left Stamets, the owner of a mushroom mercantile, puzzling over a problem. Bees across the world have been disappearing at an alarming rate. Parasites like mites, fast-spreading viruses, agricultural chemicals, and lack of forage area have stressed and threatened wild and commercial bees alike.

Waking up one morning, "I connected the dots," he said. "Mycelium has sugars and antiviral properties," he said. What if it wasn't just sugar that was useful to those mushroom-suckling bees so long ago?

In research published Thursday in the journal *Scientific Reports*, Stamets turned intuition into reality. The paper describes how bees given a small amount of his mushroom mycelium extract exhibited remarkable reductions in the presence of viruses associated with parasitic mites that have been attacking, and infecting, bee colonies for decades.

The Sociable

Bees sipping mushroom mycelium.

Mites Contribute to Colony Collapse

Bee infested with Verroa mites.

In the late 1980s, tiny Varroa mites began to spread through bee colonies in the United States. The mites—which are parasites and can infect bees with viruses—proliferate easily and cause colony collapse in just years.

Over time, colonies have become even more susceptible, and viruses became among the chief threats to the important pollinators for crops on which people rely.

"We think that's because the viruses have evolved and become pathogenic and virulent," said Dennis vanEngelsdorp, a University of Maryland professor in entomology, who was not involved in the mycelium research. "Varroa viruses kill most of the colonies in the country."

He likened the mites to dirty hypodermic needles; the mites are able to spread viruses from bee to bee.

The only practical solution to date has been to keep the number of Varroa mites within beehives "at manageable populations."

Stamet's idea about bee-helping mycelium could give beekeepers a powerful new weapon.

At first, mushrooms were a hard sell.

John Lok / Seattle Times

Paul Stamets of Fungi Perfecti.

When Stamets, whose fascination with fungi began with "magic mushrooms" when he was a "long-haired hippie" undergraduate at The Evergreen State College, began reaching out to scientists, some laughed him off.

"I don't have time for this. You sound kind of crazy. I'm gonna go," he recalled a California researcher telling him. "It was never good to start a conversation with scientists you don't know saying, 'I had a dream.'"

When Steve Sheppard, a Washington State University (WSU) entomology professor, received a call in 2014 from Stamets, however, he didn't balk. He listened.

Sheppard has heard a lot of wild ideas to save bees over the years, like harnessing static electricity to stick bees with little balls of Styrofoam coated in mite-killing chemicals. Stamets' pitch was different: He had data to back up his claims about mycelium's antiviral properties and his company, Fungi Perfecti, could produce it in bulk. "I had a compelling reason to look further," Sheppard said.

Together with other researchers, the unlikely pair have produced research that opens promising and previously unknown doors in the fight to keep bee colonies from collapsing.

cont. on page 4

Spore Prints

is published monthly, September through June by the
PUGET SOUND MYCOLOGICAL SOCIETY
Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 http://www.psms.org

CALENDAR

Nov. 13 Membership meeting, 7:30 pm, CUH
Nov. 13 *Spore Prints* deadline (**early**)
Nov. 19 Board meeting, 7:30 pm, CUH board room

BOARD NEWS — Luise Asif

A million thanks to all of you wonderful volunteers who gave up your weekend to work on this year's show. Without your energy there would be nothing to present to the public. As always with a new venue, there are challenges, but you pitched in with a smile and created a success. Thank you to Kim Traverse, Derek Hevel, and Milt Tam for organizing the event. Thank you to James Nowak for again organizing a fabulous Ben Woo Foray the weekend before the show.

Bravo to you all for your energy in creating a such a wonderful club.

A rare specimen,
PSMS Annual Show.
Fruits in morning,
Next nightfall—gone!

—Judith Cederblom

MEMBERSHIP MEETING

Tuesday, November 13, 7:30 pm, Center for Urban Horticulture, 3501 NE 41st Street, Seattle

Our next meeting highlights mushroom cooking, featuring our own Jamie Notman, who will be cooking dishes with two cultivated mushrooms—"Pioppini" (*Agrocybe aegerita* aka Poplar Mushroom) and Shiitake (*Lentinula edodes*). He promises there will be enough for everyone to taste!

Jamie came to Seattle in 1986. He caught his first mushroom show that year and promptly joined PSMS. Although he has gone to all the shows since 1986, he did not attend monthly meetings until 2000, but he has been attending them ever since. Jamie has cooked at every mushroom show since 2000, and in 2008 he took over the organization of the cooking demonstrations In recent years he was organizing chair of Mushroom Maynia. Jamie studied culinary arts at South Seattle Community College and worked at several restaurants including Lowell's in Pike Place Market, Liams, and Stanford's. Afterwards he worked as a chef for fraternities for several years.

Would people with last names beginning with the letters A–K please bring a plate of refreshments to serve after the meeting?

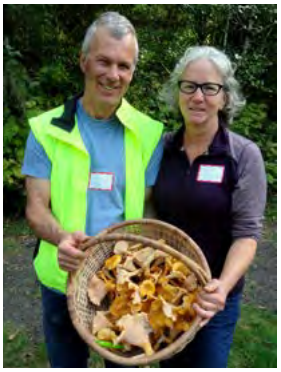
FIELD TRIP REPORT, Sept. 29 — Brian S. Luther

For our first fall field trip, it was cloudy in the morning, but became sunny later in the afternoon, and all our members hoping for good weather and some success at finding some edible fungi were not disappointed.

Our host was Paul Hill, and he got lots of assistance setting up the great assortment of breakfast snacks and hot coffee he'd planned for. Thanks, Paul, for your contribution, which was much appreciated by all. Our Mason Co. campground hosts, Bernie & Heather, provided us with extra chairs and more firewood and always look forward to our field trip there.

Seventy-five members signed in, of which about 20 were brand new. Our field trip guides included Wren Hudgins, Jesse Clark, Dave & Wuqi Weber, and Andrew White. Since each guide takes out up to ten members, all of the newbies had a chance to go out for the first time and get advice from experienced members.

Most members found at least some chanterelles, but a few, like Eric Paerels & Laurie St. Aubin, did very well (see photo). Other edibles included several different species of boletes in different genera, Cauliflower Mushrooms (*Sparassis radicata*), and Angel Wings (*Pleurocybella porrigens*).



Brian S. Luther

Eric Paerels & Laurie St. Aubin with their basket of chanterelles.

I documented 92 different species of fungi on two picnic tables that were covered with fungi (including their benches). Interesting or unusual species found included *Mycena rutilantiformis* and *Turbinellus kauffmanii*. One of the prettiest mushrooms

brought in was *Pholiota flammans*, with brilliant yellow and orange colors.

The 3:00 pm potluck was delightful, and the day ended with members working together to pack up the hosting supplies and clean up the shelter. This is the third fall we've gone to this location, and I received many thanks from those attending, so everyone seemed to have a good experience.

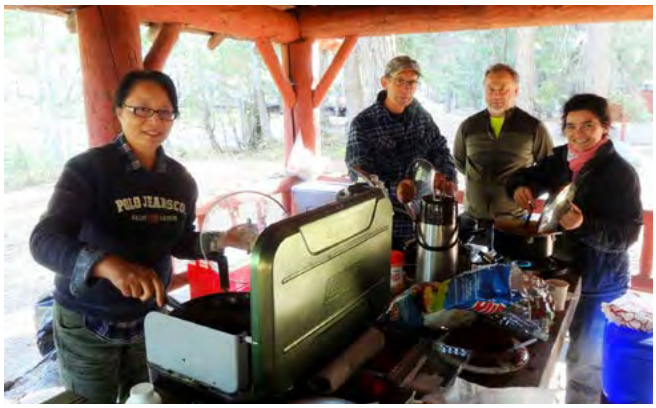
FIELD TRIP REPORT, Oct. 6 — Brian S. Luther

I arrived at this location around 3:30 in the afternoon on Friday (spending two nights in the campground). It had been raining steadily from about a half hour before I got there and until 5:00 pm. Everything was wet, but the ground underneath the top surface was dry, indicating this was the first rain in quite a while. As a result, mushrooms were few and far between. It did not rain the rest of the weekend.

The old CCC shelter had been recently re-roofed with cedar shingles, and it was in good shape and a welcome place for our members to congregate. We had called the Naches Ranger Station early Friday to see if we could have camp fires, and luckily the burn ban had just been lifted that morning!

Wren Hudgins got there early Saturday morning, and the first thing we did was go cut a load of firewood for the shelter fireplace (I had thrown in a chain saw from home). As we were finishing up getting wood on the main road, our hosts, David & Wuqi Weber, came up and briefly stopped to greet us.

Dave & Wuqi not only made coffee and put out a delightful selection of morning snacks, fruit, and juices, but made everyone a hot breakfast of sausages and scrambled eggs—wow, what a deal! Thank you, Wuqi and Dave. They often volunteer as hosts twice a year (spring and fall) ,and we hope they'll be an inspiration for other members to follow.



Brian S. Luther

Hosts Wuqi & Dave Weber along with members Jamie Rumbaugh & Carolina Kohler making potluck in the shelter.

Forty members signed in. Of those 16 were brand new and were about to experience their first PSMS field trip. I kept a big fire going in the shelter, and many remarked how inviting it was. Wren, Jesse Clark, and Iain McConnell were our field trip guides for the day. It was "slim pickin's" because of the overall dry conditions, but a few members found some White Chanterelles (*Cantharellus subalbidus*), and I found two Rainbow Chanterelles (*C. roseocanus*); a lovely large Bear's Head (*Hericium abietis*) in excellent condition was also brought in. I counted 63 different species of fungi displayed around the shelter ledge, and if conditions had been more favorable then there would have been many more. Thanks to Wren Hudgins and Jesse Clark for writing colored ID tags for the specimens as I identified and discussed them for our members.

Our end-of-day potluck was not a large group, but everything was tasty and appreciated after a day of combing the woods. We had cleaned up and packed up by about 5:00 pm. No one else, except me, spent Saturday night camping there. I used up the rest of the firewood and had a relaxing evening by the warm fire.

FIELD TRIP REPORT, Oct. 12–14 — Brian S. Luther

Beautiful weather greeted us during the days at this location up in the mountains in Chelan Co., but it was quite cold at night, so the campfire that Jamie Rumbaugh and I started Friday evening (and kept going all weekend) was very welcome and a popular gathering place.

Thanks to our field trip host, Paolo Assandri, we had a wonderful spread of hot coffee and breakfast snacks Saturday morning and munchies all day long. Volunteers like Paolo are who make PSMS what it is—thank you!

We had 29 members sign in, and two were brand new. With seven volunteer field trip guides, some doubled up Saturday taking members out. Guides included Wren Hudgins, Jesse Clark, Erin O'Dell, Julia Benson, Dave & Wuqi Weber, and Sweta Agrawal. Good edible fungi included two species of chanterelles, but mostly whites (*Cantharellus subalbidus*), abundant *Hypsizygus tessellatus* on downed Cottonwood, some Matsutake, Bear's Head (*Hericium abietis*), a few Pig's Ears (*Gomphus clavatus*), and one very large *Boletus edulis* that was surprisingly free of bugs for its size. I counted 109 different species. Some unusual species included *Hygrophorus gliocyclus*, *Clitocybula familia*, and the fragrant polypore *Ischnoderma benzoinum*, smelling like anise.

The 3:00 pm potluck was delightful, and some tasty dishes were prepared with the help of the campfire. Ben & Natalya Moore's wild-caught and smoked King Salmon was a special treat. When Pam & I left for home at about 4:15 pm, everyone was settling in close to the campfire after a great day out in the woods with friends, and 18 members spent the night Saturday.

Brian S. Luther

Morning meeting on Oct. 13.

Mycelium Saves Bees, *cont. from page 1*

"This is a pretty novel approach," vanEngelsdorp said. "There's no scientist who believes there's a silver bullet for bee health. There's too many things going on. … This is a great first step."

Experiments, More Research Planned

To test Stamets' theory, the researchers conducted two experiments: They separated two groups of mite-exposed bees into cages, feeding one group sugar syrup with a mushroom-based additive and the other syrup without the additive. They also field-tested the extract in small, working bee colonies near WSU.

For several virus strains, the extract "reduced the virus to almost nothing," said Brandon Hopkins, a WSU assistant research professor, another author of the paper.

The promising results have opened the door to new inquiries.

Researchers are still trying to figure out how the mushroom extract works. The compound could be boosting bees' immune systems, making them more resistant to the virus. Or, the compound could be targeting the viruses themselves.

"We don't know what's happening to cause the reduction. That's sort of our next step," Sheppard said.

Because the extract can be added to syrups commercial beekeepers commonly use, researchers say the extract could be a practical solution that could scale quickly.

For now, they are conducting more research. On Wednesday, Hopkins and Sheppard spent the day setting up experiments at more than 300 commercial colonies in Oregon.

Meanwhile, Stamets has designed a 3D-printable feeder that delivers mycelia extract to wild bees. He plans to launch the product, and an extract-subscription service, next year to the public.

Stamets said he hopes his fungus extract can forestall the crisis of a world without many of its creatures, including bees. He is alarmed at how fast species are going extinct.

"The loss of biodiversity has ramifications that reverberate throughout the food web," he said, likening each species to parts of an airplane, that hold the earth together — until they don't.

"What rivet will we lose that we'll have catastrophic failure? I think the rivet will be losing the bees," he said. "More than one-third of our food supply is dependent on bees."

THANKS TO ALL WHO MADE THE SHOW!

Derek Hevel

Our 55th Annual Wild Mushroom Show opened October 27th at noon in our new location at North Seattle College's cafeteria. This was our first year at NSC, where we had a larger main hall and more activity than usual. A few of our seasoned committee leads were not able to attend the show, but new and budding member helpers stepped up to make the show fantastic.

To all our specimen collectors: you did a great job searching the region for all those great mushrooms. The excellent fungi you brought in made the whole show happen. Thank you to all the members who offered a couple of hours or even their entire weekend to make the show a success. We enjoyed working with you, and we could not have put this show on without your hard work! We hope you enjoyed working with us. Thanks to our speakers—Langdon Cook, Daniel Winkler, Alana McGee, Leon Shernoff, Dr. Erica Cline, and Danny Miller—another set of great lecturers. The talks were well attended and enjoyed by the public. We also appreciate the leads of all the show activities, including Brian Luther and Danny Miller at the ID Table; Jamie Notman at Cooking & Tasting; Sweta Agrawal and Alissa Alan at the Dyeing demonstration; Marilyn Droege at Arts & Crafts; James Ardena at Cultivation; Pacita Roberts at Membership; Denise McDonough baking up mushroom snacks; Kate Turner at the Kids' Table and the Glowing Haunted House; Carlos Cruz covering Security; Brenda Fong leading Hospitality; Paul Hill doing the photo show; Kim Traverse at the Lichen table; Wren Hudgins doing the ASK ME program; Mike Li covering Admissions; Jeremy Collison at the Microscope Table; and Erin and Brady Raymond at Book Sales. Hugs to Luise Asif, who once again ably coordinated our volunteers. Thanks again to Daniel, Josh, Colin, and Wren (among others) for leading those informative tray tours, always a favorite with the public. Kudos to Lisa Page Ramey who once again designed our show poster, post cards, and yard signs; she also redid ALL of the show signage this year! Thanks to Randy Richardson, who rented the truck and drove all our stuff to the show venue and tackled setup and takedown. A big tip of the hat to Donna Naruo, who served as treasurer (very important!), and Derek Hevel, who worked with Kate Turner to upgrade the old UV light box into a new walk-in glowing Haunted House, which was a big hit at the show. So many other people who weren't able to attend helped long beforehand to plan the show, including Milton Tam, Marian Maxwell, Shannon Adams, and John Goldman.

Great work, everyone! Let's do it again next year!

MAGIC MUSHROOM DRUG EVOLVED TO MESS WITH INSECT BRAINS

Jennifer Frazer

Scientific American, Oct. 17, 2018

There's something odd about the many species of magic mushrooms: they're not related to each other.

Normally, you'd expect such a complex and powerful chemical as psilocybin—the magical ingredient—to be produced by a closely related group of organisms whose common ancestor discovered it once.

But not in this case. Scores of mushroom species—one even lichenized—from five different distantly related families make it. A team of American scientists wondered about that, and had a hunch about why it might be.

They tested their hunch by, for the first time, identifying the psilocybin-producing genes (there turned out to be five) and comparing the versions found in the various magic mushrooms. And sure

enough: the genes shared the same origin. The psilocybin gene cluster had somehow found its way into distantly related species through a process called horizontal gene transfer.

In animals, plants, and fungi, horizontal gene transfer probably happens when jumping genes called transposons pick up other genes and take them along for the ride. It's possible the fungi exchange DNA directly when they meet, but insects, viruses, or other third party shuttles may be involved too.

Although mushroom-making fungi, considered sophisticated and complex for the fungal world, have only rarely been caught sharing DNA this way, the fact that they have made an exception for these genes implies psilocybin is a seriously hot item.

But why? A better question might be what, exactly, does a coffee bush get out of making caffeine or a coca plant out of making cocaine? Why do magic mushrooms bother to be magic? They aren't getting magical trips out of the deal.

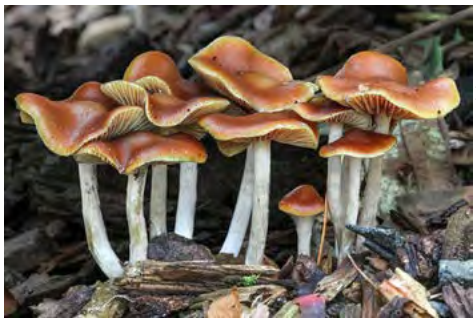
The surprising reality is that the majority of naturally produced recreational drugs—caffeine, nicotine, cocaine, morphine, and psilocybin—evolved to be, if not quite insecticides, then scramblers of insect brains. The fact that our brains are enjoyably scrambled by them too is sheer coincidence, but also speaks to the uncomfortable truth that your brain is not so different from a cockroach's as you might like to think. (Of course, you're not so different from a plant either.)

In humans, psilocybin is converted to psilocin on ingestion, which activates one of the same receptors as feel-good neurotransmitter serotonin and produces the wild effects for which the drug is known. Serotonin, incidentally, is the same molecule on which antidepressant serotonin-reuptake inhibitors like Prozac act. However, serotonin is not the private preserve of humans. All animals with left-right symmetry—including insects—produce serotonin, as well as some plants and fungi.

A plant has an obvious motive for stockpiling a chemical arsenal: salad bar prevention. But what about mushrooms? The majority of psilocybin-producing mushrooms are either wood or dung decayers. In those environments, they are not only being eaten by insects, but also competing with them for food. Termites are major fungal competitors inside decaying logs, but a variety of other wood- and dung-eating insects compete with fungi for food.

Psilocybin may help tilt the playing field in the fungus's favor by causing insects to, I don't know, maybe blank on what they went in that log for again? Another serotonin receptor antagonist called 5HT-2A causes *Drosophila* fruit flies to somehow neglect to eat the fruit they're sitting on. Whatever they're experiencing, though, is unlikely to be fun. Insects lack the dopamine-based reward systems also triggered by the drugs that make them so pleasurable and addictive to humans.

Another chemical that makes mushrooms poisonous—muscarine—is often made in the same mushrooms that make psilocybin in the genus *Inocybe*, which suggests It has a similar purpose. Muscarine is a mimic of the neurotransmitting brain chemical acetylcholine, which helps translate electrical impulses into muscle action, among other roles. Although no one knows its exact effects on insects (if any), when consumed by humans in mushroom form, it causes PSL syndrome: excessive perspiration, salivation, and lacrimation (sweat, spit, and tears). The most famous acetylcholine mimic, however, is nicotine.


Caleb Brown

Psilocybe cyanescens.

Decay mushrooms aren't the only fungi in the insect manipulation business. Fungi that parasitize insects may also use neurotransmitter-mimicking chemicals to zombify their victims. Social insects like termites might be especially vulnerable to attempts to screw with their brains because their success depends on socializing, not typically an insect strong suit and also a skill that requires nuanced brain power (as any human can tell you).

In the process of searching for the psilocybin-producing genes, the scientists made another discovery: there was less variation in the gene content of distantly related wood decay fungi than between decay fungi and their close relatives in other habitats. The common thread between wood- and dung-decaying fungi may be the shared interest in attacking tough plant fibers like lignin and in repelling the insects that compete with them. The fact that their shared environment seems to be a stronger driver of gene content than shared ancestry is quite stunning, I think.

As a result of the chemical warfare going on between fungi and insects in dung and dead logs, these results also suggest decay mushrooms may be a good place to search for new neuro-active drugs. Fungi in such haunts may be veritable factories of neurotransmitter-targeting drugs. Though originally intended to throw insects off their game, there is no telling what unintentional, valuable—and interesting—effects they may have on us.

Reference

Reynolds, Hannah T., Vinod Vijayakumar, Emile Gluck-Thaler, Hailee Brynn Korotkin, Patrick Brandon Matheny, and Jason C. Slot. 2018 "Horizontal gene cluster transfer increased hallucinogenic mushroom diversity." *Evolution Letters* (*2*): 88–101.

HUNGARIAN HONEY TRUFFLES ARRIVE IN HONG KONG

Jacqueline Tsan

South China Morning Post, Oct. 17, 2018

You might be an expert on black Périgord or white Alba truffles, but have you ever heard of honey truffles?

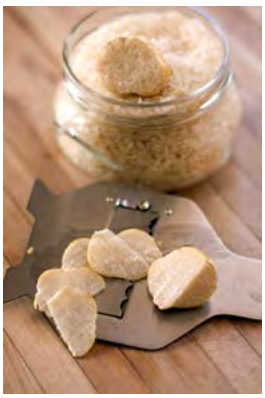
The fungus, known by more scientific minds as *Mattirolomyces terfezioides*, is a kind of white truffle found primarily in Hungary under black locust trees along the Danube river, where the soil is sandy and slightly alkaline. The truffle was first documented in 1588 when a Hungarian magistrate ordered a certain forest protected owing to its supply of these special mushrooms.

As you might guess from its name, this mushroom is known for its sweetness. The good news is, it's available in Hong Kong; the bad news is, there might only be a few precious kilograms left.

cont. on page 6

Hungarian Honey Truffles, *cont. from page 5*

We managed to try it at the Island Shangri-La, which claims to be the only place in Hong Kong to stock honey truffles at the moment and has created a special menu for lucky diners while stocks last. The hotel's chef, Sam Chan, tried the truffle last year and contacted the supplier for delivery this autumn (the mushrooms are harvested between August and November).



http://earthydelightsblog.com/

Hungarian honey truffles, Mattirolomyces terfezioides.

The truffle arrives in a jar, resting on rice kernels to soak up the excess moisture for prolonged preservation—having only ordered 7kg of the mushroom, Chan was taking no chances. The truffle starts off with a gentle, almost nutty flavor profile and, as expected, has a deep, honey-like finish. Just short of being cloying, the sweetness nevertheless lingers on the tongue, and as such, pairs beautifully with a strong, buttery Chardonnay.

The honey truffle is a natural addition to sweet dishes such as the ice cream and panna cotta desserts at the hotel's Lobster Bar & Grill, but it is also used to admirably subtle effect with a scallop tartare and green pea risotto. It lends depth to the bright, fresh notes of the seafood dish, while it melts beautifully into the rice, adding richness of flavor without the heaviness usually associated with its black Périgord counterparts.

Chan estimates his stock won't last long, perhaps not even until November, so time is of the essence. Failing a booking, we'd suggest a flight to Hungary, where, with any luck, the sweet truffles will still be in season for a few more weeks yet.

RESCUED FROM THE BRINK OF EXTINCTION: *LIGNOSUS RHINOCERUS*, THE TIGER MILK MUSHROOM

syfung

https://qswownews.com/, Oct. 12, 2018

Lignosus rhinocerus, Tiger Milk Mushroom.

In the diary of John Evelyn (1664), a special mention was made of the Tiger Milk Mushroom, referred to as Lac Tygridis—a wild solitary mushroom that looked like a mushroom, weighed like a metal, came from a hard coagulation of matter, and was used by natives to treat diseases. Sir Henry Nicholas Ridley, the father of Malaya's rubber industry, attempted to cultivate it as early as 1890 but did not succeed. With forest clearing and over time, this mushroom is almost forgotten owing to its rarity in the wild.

The Temuans of Malaysia utilized the Tiger Milk Mushroom as medicine to treat coughs and asthma and to strengthen a weak constitution by consuming the underground sclerotium (the tuber-like part with medicinal value) in the form of a decoction. The Semai aborigines used *betes kismas* (a common name for the Tiger Milk Mushroom) to treat asthma, cough, fever, cancer, liver-related illnesses, and joint pains. They were also used by men to revitalize their bodies and as medicine for women after childbirth. It was documented that in the state of Kelantan, Malaysia (where the mushroom is often given to mothers after childbirth), the sclerotium was pounded with raw rice, infused, and drunk. The local Malay and Chinese communities utilized the sclerotium of the Tiger Milk Mushroom to treat food poisoning, wounds, stomach cancer, breast cancer, and swellings.

In 2009, the Medicinal Mushroom Research Group from the University of Malaya in Malaysia initiated a safety assessment of cultivated *L. rhinocerus* sclerotia powder after its successful cultivation to ensure that the cultivar was safe for consumption.

The sclerotium is the main source of food storage and medicinal material. It is a compact mass of hardened fungal mycelium and represents one of the stages in the fungal life cycle. This structure is a morphologically variable, nutrient-rich, multi-hyphal aggregate that serves as a food reserve and can remain dormant until favorable growth conditions arise. They are long-lived compared to mycelia owing to their ability to survive environmental extremes.

Anti-proliferative effect was demonstrated by proteins or protein-carbohydrate complex in high-molecular-weight fraction of the sclerotial cold water extract from cultivated *L. rhinocerus* against breast cancer (MCF7) and lung cancer (A549) cell lines, but not in the two corresponding human non-tumorigenic cell lines. Anticancer therapeutic properties from mushrooms have recently been in the limelight, and the Tiger Milk Mushroom shows promising worth for further evaluation as it shows selective cytotoxic mushroom properties which target only cancerous cells and do not harm normal healthy cells. The cold water extract also exhibited anti-acute inflammatory activity and ability to fully relax both the trachea and bronchus.

The scientific findings have so far verified some of the mushroom's traditional applications and revealed interesting data which show its potential to be further developed into a possible nutraceutical.

More scientific investigations are needed to validate the medicinal properties of the Tiger Milk Mushroom across its species and to unveil potential biomolecules that may form a valuable foundation for pharmaceutical and industrial applications.

JAPAN FIRM CLAIMS SUCCESS IN ARTIFICIAL CULTIVATION OF LOW-COST, MATSUTAKE-LIKE MUSHROOM

https://www.japantimes.co.jp/, Oct. 14, 2018

Wikipedia

Tricholoma bakamatsutake.

KOBE – A fertilizer maker in western Japan has claimed success in artificially cultivating Bakamatsutake mushrooms—a species related to the highly prized Matsutake mushroom, with a similar flavor.

Once mass production of Bakamatsutake, whose scientific name is *Tricholoma bakamatsutake*, is ready, consumers will be able to enjoy its Matsutake-like flavor, but at a lower cost, said Taki

Chemical Co., the Kakogawa, Hyogo Prefecture-based company behind the research.

Bakamatsutake mushrooms are found in beech and oak forests, not in red pine woodlands where Matsutake mushrooms grow. The growth season for Bakamatsutake starts about one month ahead of the Matsutake mushrooms, according to the company.

Although another institute has symbiotically cultivated the mushrooms on plants, a researcher at Taki Chemical, who first started work on developing an artificial cultivation method for Bakamatsutake mushrooms about six years ago, has for the first time successfully grown them on artificial mushroom beds, the company said.

It is said the mushroom was named *Baka* (stupid) Matsutake because it failed to grow in the same place and season as Matsutake.

But Taki Chemical said Bakamatsutake is often described as tasting and smelling better than matsutake.

Domestically harvested Matsutake mushrooms sell for ¥40,000 [$350] to ¥50,000 [$450] per kilogram, although their prices vary widely depending on when and where they are picked.

But even Matsutake-specialized sellers said they have no idea about prices for Bakamatsutake mushrooms owing to their rare appearance at retail stores. "We'd like to supply products cheaper than Matsutake mushrooms," a Taki Chemical official said.

Pointing out that artificial cultivation will make it possible to ship Bakamatsutake mushrooms any time of the year, the official hopes that the company will be able to develop a stable production system and launch its Bakamatsutake business in three years.

UNRAVELLING THE GENETICS OF FUNGAL FRATRICIDE

Uppsala University, Oct. 15, 2018

One mainstay of evolutionary theory is survival of the fittest individuals, whose genes can thereby be passed on. However, one type of gene—"selfish" genes—can be passed on without benefiting the individual. Biologists believe that selfish genes may be important drivers of evolution, and it is therefore essential to understand how selfish genes function.

One example of a selfish gene, known as the "spore killer," has been found in certain fungi. If a fungal spore carries this gene, the spore kills all related (sibling) spores that lack the gene. The spore-killing gene will thus be passed on, despite being detrimental to the fungus as a whole. Similar genes for killing siblings have been found in other organisms such as fruit flies and mice, but in those species it is a matter of sperm that destroy sibling sperm. Selfish genes may also serve as pesticides: inserting selfish genes into malaria-bearing mosquitoes can cause individuals of one sex only to be born, thereby reducing their population size. However, knowledge of how selfish genes function genetically, and of how they spread in nature, is still limited.

For the first time, a research group at Uppsala University's Department of Systematic Biology has succeeded in sequencing complete genomes that contain complex selfish genes. The researchers sequenced genomes from two different types of spore killers found in the Ascomycete fungus *Neurospora intermedia*. The results have now been published in *Nature Communications*.

"Sequencing selfish genes of this type is difficult, since they are often located on parts of the chromosome that have accumulated a huge amount of mutations, and pieces of the chromosome have been rearranged," says Hanna Johannesson, who headed the study.

Sequencing of the genome showed that the spore-killing genes exist in chromosome regions where much of the chromosome has changed direction: forming so called "inversions." These chromosome regions have also collected numerous new mutations and areas where repetitive DNA has expanded. The mutations may mean that individuals with spore-killing genes are more poorly adapted, and they may be an explanation of why these spore-killing genes are unusual in *Neurospora intermedia*.

"One result that surprised us was that the two spore killers were not related to each other and use different genes to kill sibling spores. This may suggest that selfish genes in general, and spore-killing genes in particular, are more common than people used to think," says Jesper Svedberg, the main author of the study.

INDIA MAN CLAIMS WIFE DEVELOPED FUNGAL PATHOGEN TO POISON HIM

https://timesofindia.indiatimes.com/, Oct. 17, 20018

BENGALURU - Counselors at the Women's Cell at the police commissionerate were taken aback when Devesh (name changed), a resident of Uttarahalli, recently arrived for counseling and took off his shirt to reveal severe rashes and boils all over his body and face.

He claimed that his 45-year-old wife had created some fungus which she had mixed with his food and given to him, his 81-year-old mother, and her caretaker. "All three developed an allergy and are suffering," said a senior counselor at Sahayavani dealing with the case.

It all began with the woman, Rupa (name changed), a professor with detailed knowledge of chemistry, approaching the helpline in August and accusing her second husband, Devesh, of abuse.

"She…said he physically and mentally tormented her and wanted to divorce him. But she also wanted to make the relationship work…" the counselor added.

When Devesh was summoned for a counseling session, he showed his body condition to the counseling staff and expressed fear of living with his wife. "He claimed she often develops some fungus and bacteria at home and saves it in the refrigerator. He strongly believes she mixed some pathogen she had developed in food and gave it to him, his mother, and her caretaker, resulting in rashes. Rupa refuted this but admitted to have created some fungus at home for education purposes," the counselor said.

"It is possible for a person with adequate knowledge of organic chemistry to create a fungus," said city dermatologist Anil Abraham, "but not a pathogen ... I think in his particular case, the husband is overreacting and imaging things. Most bacteria or fungi, when cooked in food, usually lose their potency."

That is not all. Devesh told counselors that his wife practices black magic, conducts scientific tests at home, and produced paper cuttings of various voodoo procedures, which he claimed to have recovered from her room.

Rupa wants to settle their difference and continue with her married life; the man claims he is petrified and probably dying a slow death.

ORIENTAL TURKEY

Hope Miller
Hope's Mushroom Cookbook

Ingredients:

½ C silvered, blanched almonds
3 TBs butter or margarine
2 tsp salt
1 small garlic clove, minced
2 C cooked turkey, cut in pieces
1 (5-oz.) can water chestnuts
¼ lb mushrooms*, sliced
½ C pineapple chunks
½ C chopped green pepper,
½ C diced fresh tomato
1 C diced celery
6 green onions, thinly sliced
1 TBs sugar
1 TBs cornstarch
4 TBs soy sauce

Procedure:

Brown almonds in 1 TBs of the butter in a large, heavy frying pan. Remove nuts with a slotted spoon and set aside. Add remaining butter to pan along with salt, garlic, mushrooms, and turkey; cook, stirring, until brown. Drain and save liquid from water chestnuts. Add 1/3 of this liquid to pan along with water chestnuts; cover and cook 5 minutes. Add pineapple, peppers, tomato, celery, green onion, and half of the almonds; cook and stir about 5 minutes. Blend sugar, cornstarch, soy sauce, and ¼ C more reserved liquid; stir into hot mixture and cook until thickened. Serve over Chinese noodles; garnish with remaining almonds. *Yield 6 servings*

*Mushrooms: You can use *Hygrophorus subalpinus*; *H. purpurascens*; Shiitake; Matsutake; *Agaricus campestris*; boletes; *Laetiporus sulphureus*; or *Hydnum repandum*.

Hope Miller
June 10, 1933 – September 26, 2018

We are sad to report that Hope Miller, widow of prominent American mycologist Orson K. Miller, passed away on September 26, 2018, at the age of 85. After their marriage in 1953, the two travelled the world together studying mushrooms. She was a co-author of three of his books, including *North American Mushrooms, A Field Guide To Edible and Inedible Fungi.* In addition to contributing and editing several mycological papers, she wrote a cooking column and was the author of two mushroom books of her own: *Wild Edible Mushrooms* and *Hope's Mushroom Cookbook*. She is survived by three daughters, five grandchildren, and four great grandchildren.

Puget Sound Mycological Society
Center for Urban Horticulture
Box 354115, University of Washington
Seattle, Washington 98195

RETURN SERVICE REQUESTED

Non-Profit Org.
U.S. POSTAGE
PAID
SEATTLE, WA
PERMIT NO. 6545