SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
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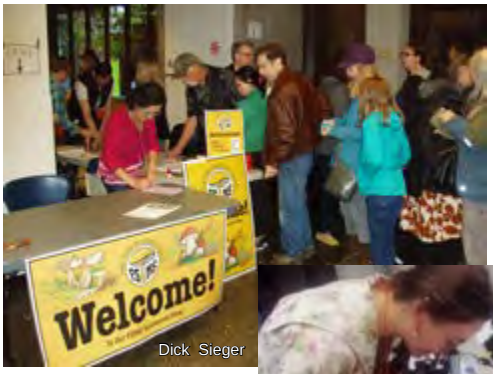

2019 PSMS Wild Mushroom Show

THANKS FOR THE SHOW HELP! Derek Hevel

Our 56th Annual Wild Mushroom Show opened October 26th at noon at North Seattle College's old cafeteria. This was our second year here, where we shifted the locations of a few activities and fixed a few other issues from last year.

To all our specimen collectors: you did a great job searching the region for all those great mushrooms. Our receiving, sorting, and tray arranging operation was a little different this year, but you all pulled it off with no strife and an hour early. The excellent fungi you brought in made the whole show happen. Thanks to Shannon, Sara, Erin O'D, Wren, and Danny for creating the display trays. Thank you Joe Z for delivering the sand for the tray display for the 13th year in a row!

Thank you to all the volunteers 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! Unending thanks to Luise Asif, who once again ably coordinated our volunteers.

Thank you to our speakers—Daniel Winkler, Alison Pouliot, Danny Miller, Tristan Woodsmith, Sami Kempf, and Dr. Erica Cline—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, Danny Miller, Wren Hudgins, and Colin Meyer at the ID Table; Jamie Notman at Cooking & Tasting; Marion Richards at the Dyeing demonstration; Marilyn Droege at Arts & Crafts; Milton Tam at Cultivation; Pacita Roberts at Membership; Kate Turner and Dory Maubach 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; Tea McMillan and Kelsey Hudson at the Bridle Trails State Park Survey table; and Erin and Brady Raymond at Book Sales. Thanks again to Daniel, Josh, Colin, and Wren (among others) for leading those informative tray tours, always a favorite with the public. Gracias to Lisa Page Ramey, who once again designed our show poster, post cards, and yard signs with Stacey Wurster's amazing artwork; Lisa also created some great new information signage. Thanks to Kim Traverse, who rented the truck, 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 Kim Traverse, who upgraded last year's new walk-in haunted house, which was a big hit at the show.

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

Spore Prints

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CALENDAR

Nov. 12	Membership meeting, 7:30 pm, CUH *Spore Prints* deadline (**early**)
Nov. 18	Board meeting, 7:30 pm, CUH board room
Dec. 10	PSMS Holiday Extravaganza, 7:30 pm, CUH

NEW MUSHROOM COIN https://eng.lsm.lv/, Oct. 14, 2019

The Latvian Central bank has just released a €5 coin designed to appeal to both numismatists and mycologists. One side of the new coin shows a slightly elvish-looking mushroom hunter in rapt contemplation of a snail crawling across the top of a mushroom. The other side depicts "mushroom with mycelium" in a stylized form reminiscent of a new mushroom-shaped constellation in the nocturnal sky.

Latvian Bank publicity image

MEMBERSHIP MEETING

Tuesday, November 12, 2019, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

Our speaker for November is Dr. Fred Rhoades, who will present "Mushroom identification up close and personal."

Dr. Fred Rhoades

In this presentation Fred will feature a selection of his macrophotographic and other intriguing views of PNW mushrooms and their friends in mushroom habitats. The best edible mushrooms will be included, focusing on the features that separate them from the not-so-good. Zooming into the world of mushrooms, Fred will share some of their important diagnostic features up close. Furthermore he'll explore some more unusual features of some unusual fungi (and their friends).

Fred studied both mycology and lichenology with Bill Denison at Oregon State University and George Carroll at the University of Oregon. For his Masters and Ph.D. theses he studied the growth rates and population biology of the important, northwest foliose lichen *Lobaria oregana*. From 1977 to 2009 he was an instructor of biology at Western Washington University in Bellingham, where he taught a variety of cryptogamic botany and general biology courses until retiring. Currently Fred lives in Bellingham and continues to give occasional programs and forays and spend much of his field time photographing a variety of lower life forms including mushrooms, lichens, bryophytes, slime molds, and the odd plant or animal.

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

FIELD TRIP REPORT, Sept. 28 Brian S. Luther

We had pretty good weather for our first fall field trip, with only an occasional sprinkle and some welcome sunshine later in the afternoon. Out of the 85 members who signed in, 31 were brand new and experiencing their first field trip. It had been one of the best chanterelle seasons in many years, and I was hoping our members would do well. I wasn't disappointed. I'm pleased to report that everybody found lots of chanterelles.

Brian S. Luther

A tasty threesome—a Yellow Chanterelle (Cantharellus formosus), a Hedgehog (Hydnum repandum), and a White Chanterelle (C. subalbidus).

Our hosts extraordinaire were Dave & Wuqi Weber, who regularly volunteer to do this twice a year—in both the spring and the fall. The spread of appetizing breakfast snacks and coffee they provided were greatly appreciated by all. Thank you, Wuqi & Dave, as always, for your contributions to PSMS!

The field trip guides for the day were Dave & Wuqi, Andrew White, Marcus Sarracino, Jamie Rumbaugh, and Carolina Kohler. Because we had so many new members, Jamie and Carolina pitched in at the last minute to lead a group out. Thanks for doing a great service for our members.

The fungi brought in covered two picnic tables, and I counted 71 species. Most of the chanterelles were Yellow Chanterelles (*Cantharellus formosus*), but some White Chanterelles (*C. subalbidus*) were also found. Most were in good condition, but I spent time throughout the day showing members how to recognize and trim off secondary mold and bacterial decay so that they'd have wholesome specimens.

Only a much smaller group stayed for the potluck. Everybody seemed to have a good day, so the season started out well.

FIELD TRIP REPORT, Oct. 4–6 Brian S. Luther

Brian S. Luther

Potluck on Oct. 5, showing one of two picnic tables covered in mushrooms found.

We had a break in the weather for this outing at an old CCC shelter, and it sprinkled only lightly. Fifty-two members signed in, with quite a few arriving and camping ahead on Friday. I spent some time cutting more firewood and kept the fire going all day.

Our hosts were Chris & Alice Kuntz, who were volunteering for the first time. They were well organized with a great spread for Saturday morning; you would have thought they had experience doing this before. Your efforts were greatly appreciated by all who attended, Alice and Chris. Thank you!

We had 13 new members, and everybody who wanted to was able to go out with a field trip guide. After a day of collecting, most everybody came away with plenty of good edibles. Chanterelles and Matsutake were found right in the campground I counted 115 different species displayed. Some of the many interesting specimens included *Chroogomphus pseudo-vinicolor*, *Albatrellus ellisii*, and the beautiful bright light-purple *Cortinarius salor*.

The potluck was very good with many appetizing dishes, but a few stood out. Mark Langmas made an absolutely fabulous cream of chanterelle soup (loaded with sautéed chanterelles) using a goat's milk base and it disappeared quickly—super delicious!

I made sure that those camping Saturday night had plenty of firewood before I left, and Julia Benson and Jamie Rumbaugh split it all up. We had many happy members who had a good time.

FIELD TRIP REPORT, Oct. 11–13 Brian S. Luther

We had only 18 members sign in for this outing, but all were very enthusiastic and several camped or were in RVs. Our hosts were Anna Conser and husband, Jonathan, who were doing this volunteer job for the first time. Besides hauling all the food and supplies over and getting it all set up for Saturday morning (and then taking it all back to Seattle), they were looking after a toddler and a newborn the whole time! Your exceptional work was appreciated by all members, Jonathan and Anna. Thank you!

It was cold at night and a bit chilly during Saturday, so the campfire was a welcome place to come back to and sit by. Ben Moore and I cut quite a bit of wood for the campfire with chainsaws we'd brought, and Ben split most of it, with just about all of it being consumed.

Wren Hudgins, Julia Benson, Dave & Wuqi Weber, and Halle Magrini served as field trip guides, and this meant that all could join in because there were so few members. Many found beautiful White and/or Yellow Chanterelles, and some very fine *Boletus edulis* were also brought in along with some Matsutake and a few other edibles. I counted 75 different species. Notable or interesting specimens found included *Hydnellum suaveolens*, a hydnoid fungus with a lumpy, cream-colored cap and a bright blue stem having a pungently fragrant odor, as well as *Spongipellis delectans*, a rarely collected polypore on dead Cottonwood.

The potluck was delightful with many tasty foods. Afterwards, two cars followed me back over the Entiat Mts. to get to Leavenworth, taking my shortcut on forest service logging roads.

Brian S. Luther

PSMS members in the morning around the campfire on Oct. 12 before going out in groups.

The catacombs in Paris have been used for many things, but one of the oddest might be the cultivation of mushrooms. There are several stories about how farmers stumbled upon using the underground tunnels for growing mushrooms, but one such story says that deserters from the Napoleonic army hid there and found that it was the perfect environment for growing mushrooms. This discovery didn't stay a secret for long, and soon other mushroom farmers rushed to join them. This practice still exists today.

FIELD TRIP REPORT, Oct. 19 — Brian S. Luther

It poured all day, just as it did at this location in 2016 and 2017, so we couldn't have done it without the excellent shelter. Again, our hosts were mostly new: Cecilia Izzo, Krista Schoening, and Alex Wilson assisted by Al Philipps. What a breakfast spread and hot coffee they put out for us, and we really needed it on this soggy day. Special thanks to all of you for a job well done!

Fifty-seven members signed in, and we had eight field trip guides, including Andrew White, Dan Paull, Randy Richardson, Les Rawlings, Wren Hudgins, Iain McConnell, and Dave & Wuqi Weber. Tons of mushrooms were brought in, and I counted over 150 species. Most everyone found chanterelles (Yellow & White), as well as some Western Matsutake (*Tricholoma murrillianum*), Bear's Head (*Hericium abietis*), Cauliflower mushrooms, Angel Wings, and others.

The warm camp fire in the shelter fireplace, which I kept going all day, was again the focus of attention. The potluck at 3:00 pm was great, with many hot dishes—and for sure nobody went away hungry.

Brian S. Luther

Chapman Strong, Sandra Nokes, and Sacha Maxim show off their "Hippie Blanket" of Yellow Chanterelles they had just found.

DEADLY "DEATH CAP" MUSHROOMS FOUND GROWING ON UW CAMPUS — Lucas Combos

https://patch.com/, Oct. 17, 2019

SEATTLE - Highly toxic mushrooms were found on the University of Washington campus this week, prompting the college to send a warning to students. According to the UW, a university gardener found 40 "Death Cap" [*Amanita phalloides*] mushrooms growing on the east side of Benson Hall and confirmed their identity with a campus mycologist. Although they look dangerously similar to edible mushrooms, Death Caps contain extremely poisonous amanitin toxins. Eating one can lead to kidney and liver failure or even death.

Symptoms can take anywhere from six to 24 hours to arrive. School staff urges anyone who recently ate a foraged mushroom and feels ill to contact a doctor immediately. Those who see mushrooms they suspect are toxic should report the location to UW Facilities. UW says Death Caps are invasive, and they can often be found this time of year growing near edible species.

The Washington Poison Center warns against eating any mushroom without being 100 percent certain of what it is. While many varieties of mushrooms are not harmful, every year brings several cases of mushroom poisoning in Washington.

The poison center can answer questions about foraging via their helpline at 1-800-222-1222.

Amanita phalloides.

MAN GOT DRUNK OFF "BEER" BREWED BY HIS OWN BODY AFTER YEAST TOOK OVER HIS GUT

Kashmira Gander

Newsweek, Oct. 21, 2019

A rare condition caused a man in the U.S. to produce a beer-like substance in his gut after eating carbohydrates, which made him drunk.

The ordeal saw the man pulled over by police for driving under the influence and convinced his family he was hiding a drinking habit, according to a case study published in the journal *BMJ Open Gastroenterology* earlier this year. The research on what is known as "auto-brewery syndrome" is due to be presented at the annual meeting of the American College of Gastroenterology this month, according to *New Scientist.*

It all started around January 2011, when the otherwise healthy 46-year-old was hit with symptoms including dizziness, brain fog, and uncharacteristic aggression.

Doctors couldn't work out what was wrong, and he was referred to a psychiatrist who prescribed him antidepressants in 2014.

But his symptoms persisted, and one morning he was pulled over by police for drunk driving. The man insisted he hadn't had any alcohol. But a blood alcohol test told a different story, suggesting he had consumed 20 standard alcoholic drinks, and he was arrested.

His aunt, who had heard of similar cases where people acted inebriated despite claiming not to have consumed alcohol, urged him to have more tests.

Doctors found the fungus *Saccharomyces cerevisiae*, or brewer's yeast, in the man's stool sample. The fungus is commonly used in brewing to turn carbohydrates into alcohol, and was kicking off this process in the man's digestive system, causing his alcohol blood levels to spike without him drinking.

In a test for auto-brewery syndrome, the man was asked to eat a meal heavy in carbohydrates. His blood alcohol levels rose after the meal. Doctors prescribed him with anti-fungal medication, and told to stop eating carbohydrates.

However, his symptoms of inebriation returned, causing him to hit his head and suffer bleeding in his skull. Large amounts of alcohol were once again found in his system. He insisted he hadn't been drinking, but again doctors didn't believe him.

The man found new hope after he visited the gastroenterology department at Richmond University Medical Center in New York. Physicians confirmed fungal yeast had formed in his upper small

bowel and a pouch linking the junction of his small and large intestines. They learned the patient had worked for a construction company and helped to repair houses contaminated with mold, which they believe explained his condition.

The man took a different course of anti-fungal medication, and was ordered by doctors to stop eating carbohydrates for six weeks. Around a year and a half after he first visited Richmond University, he no longer experiences symptoms and can once again eat normally.

The condition was likely triggered by a prolonged course of antibiotics for a thumb injury, which changed the make-up of his gut bacteria, doctors believe.

Dr. Fahad Malik, who treated the man when he was a physician at Richmond University Medical Center, told *New Scientist* the patient "was extremely happy when he started to recover, because for years, no one believed him.

"The police, doctors, nurses and even his family told him he wasn't telling the truth, that he must be a closet drinker," he said.

"Now he is off antidepressants, he's back at work, and he's finally getting on with his life," Malik said.

A COMMON FUNGUS MAY DRIVE PANCREATIC CANCER

The New York Times, Oct. 12, 2019

NEW YORK - By now, you've probably heard that your body is teeming with bacteria. Some 100 trillion of them live on your skin, in your mouth, and in the coils of your intestines. Some protect against infections and help you digest food, while others can make you seriously ill.

Fungi, viruses, and protozoa call your body their home, too. Your fungal residents are less numerous than your bacteria by orders of magnitude, but as researchers are learning, these overlooked organisms play an important physiological role—and when their numbers get out of whack, they can modify your immune system and even influence the development of cancer.

A new study, published in the journal *Nature*, found that fungi can make their way deep into the pancreas, which sits behind your stomach and secretes digestive enzymes into your small intestine. In mice and human patients with pancreatic cancer, the fungi proliferate 3,000-fold compared with healthy tissue—and one fungus in particular may make pancreatic tumors grow bigger.

"The pancreas was considered a sterile organ until a couple years ago," said Dr. George Miller, a surgical oncologist at the New York University School of Medicine who led the study.

But recent research from Miller's lab and others had indicated that some microorganisms, such as bacteria, could sneak past a muscle called the sphincter of Oddi, which separates the pancreas from the rest of the gut. Perhaps fungi could also colonize the pancreas the same way.

The New York Times.

The abundance in the pancreas of the yeast Malassezia, more commonly found on the skin of humans and animals, surprised the scientists.

To find out, Miller and his team fed mice a species of brewer's yeast labeled with a green fluorescent protein. The fluorescent marker revealed that the yeast had indeed moved from the digestive tract to the pancreas in a matter of minutes.

In mice, the types of fungi that ended up in the pancreas were usually very different from those that remained in the gut. Ascomycota and Basidiomycota were the only Phyla of fungi that colonized pancreatic tissue.

One particular fungus was the most abundant in the pancreas: a genus of Basidiomycota called *Malassezia*, which is typically found on the skin and scalp of animals and humans and can cause skin irritation and dandruff. A few studies have also linked the yeast to inflammatory bowel diseases, but the new finding is the first to link it to cancer.

The results show that *Malassezia* not only was abundant in mice that got pancreatic tumors, but was also present in extremely high numbers in samples from pancreatic cancer patients, said Dr. Berk Aykut, a postdoctoral researcher in Miller's lab.

Administering an antifungal drug got rid of the fungi in mice and kept tumors from developing. And when the treated mice again received the yeast, their tumors started growing once more—an indication, Dr. Aykut said, that the fungal cells were driving the tumors' growth. Infecting a control group of mice with different fungi did not accelerate their cancer.

There is increasing scientific consensus that the factors in a tumor's "microenvironment" are just as important as the genetic factors driving its growth.

"We have to move from thinking about tumor cells alone to thinking of the whole neighborhood that the tumor lives in," said Dr. Brian Wolpin, a gastrointestinal cancer researcher at the Dana-Farber Cancer Institute in Boston.

The surrounding healthy tissue, immune cells, collagen, and other fibers holding the tumor, as well as the blood vessels feeding it all help support or prevent the growth of the cancer.

Microbes are one more factor to consider in the alphabet soup of factors affecting cancer proliferation. The fungal population in the pancreas may be a good biomarker for who's at risk for developing cancer, as well as a potential target for future treatments.

"This is an enormous opportunity for intervention and prevention, which is something we don't really have for pancreatic cancer," said Dr. Christine Iacobuzio-Donahue, a pancreatic cancer researcher at Memorial Sloan Kettering in New York.

Nearly 57,000 people will be diagnosed with pancreatic cancer in the United States this year, but their prognosis will be poor. Three-fourths die within a year of diagnosis, and only about one in 10 live longer than five years.

"That's because we don't have any screening or methods of early detection for pancreatic cancer," said Dr. Lynne Elmore, director of the translational cancer research program at the American Cancer Society. By the time the cancer is diagnosed, surgery alone isn't enough. Standard chemotherapies are very limited, and there aren't any great targeted therapies.

The new study also sheds light on how fungi in the pancreas may drive the growth of tumors. The fungi activate an immune

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Pancreatic Cancer, *cont. from page 5*

system protein called mannose-binding lectin, which then triggers a cascade of signals known to cause inflammation. When the researchers compromised the ability of the lectin protein to do its job, the cancer stopped progressing and the mice survived for longer.

But the interaction between microbes and their hosts is extremely complex, Miller said, and further experiments will be needed before the new findings can be applied in treating cancer patients. Microbial populations can change in response to a person's age, diet, use of antibiotics or antifungal drugs, and other factors.

"This is intriguing and exciting research," said Dr. Ami Bhatt, who studies microbes at Stanford University. "But it's probably too soon to add broad spectrum antifungals, many of which have lots of side effects, to cancer treatment regimens, even in experimental settings."

THE "BLOB" DEBUTS IN PARIS

various sources, Oct. 2019

After years of stupefying researchers, the yellow slime mold *Physarum polycephalum* (the "many-headed slime") is now a star of the Paris Zoological Park. Dubbed simply "the blob" after a 1958 Steve McQueen movie about a creature from space that consumes two Pennsylvania towns, it debuted Saturday, October 19.

taringa.net

Physarum polycephalum.

"The blob is really one of the most extraordinary things on Earth today, but it's been here for millions of years, and we still don't really know what it is," Bruno David, director of the French National Museum of Natural History in Paris, told Reuters.

Slime molds are protists—mostly single-cell organisms grouped into their own kingdom on the evolutionary family tree because scientists aren't sure where else to put them.

"We don't really know if it's an animal, if it's a fungus, if it's in between," David said. "Sometimes it behaves like an animal. It is capable of memory. It is capable of having an adapted behavior. It is capable of solving problems, of moving around a labyrinth."

When researchers sliced up pieces of the organism and sprinkled them in a maze, the blob consolidated back into its original form.

When they put nutrients at the end of a maze, the blob searched for a way to the food, retreating from dead ends to find the shortest possible way to the prize. That's because it leaves a slime trail that tells itself where it has been, the *Washington Post*'s Sarah Kaplan previously reported. Its search is so efficient that it has replicated human design. One blob re-created the Tokyo rail system after scientists scattered oat flakes in a pattern that resembled Japanese cities around the capital region.

Blobs can even pass on what they know to others. In one study, French scientists created a bridge and put unpleasant nutrients in the way to make the blob find an alternate path to food on the other side. When the experiment was introduced to a new blob and it was allowed to merge with another, the new super blob showed incredible wisdom. "Somehow during the merging process, the naive cells learned a behavior for a situation that they themselves had never experienced," Harvard University wrote in a summary of the findings.

All this from a gigantic single biological cell—albeit one with countless cell nuclei that can reach 30 cm or more in diameter and 3 to 5 cm thick and can slowly move (its top speed is about 1 mm per hour).

So all hail *P. polycephalum*, "The Blob." Glimpsed in the wild in its mobile, plasmodial stage, it resembles slime. Up close, however, it can be strangely beautiful, as the accompanying photos attest.

Lawrence Durell Wade / Wikimedia

gramha.net

natureid.blogspot.com

FUNGUS CHEMISTRY MAY MIMIC OPIOIDS WITH FEWER SIDE EFFECTS

https://www.technologynetworks.com/, Oct. 15, 2019

The worldwide search for an opioid alternative has made a leap forward—with a scientific discovery in an Australian fungus indicating effective pain relief and the potential for a safer, less addictive drug, helping address the opioid epidemic of deaths by overdose.

The fungus, a previously unknown *Penicillium* sp., was sampled from an estuary in Tasmania's pristine Huon Valley. Analysis revealed a set of uniquely shaped tetrapeptides mimicking endomophins; drug companies have invested several hundred million dollars in the hope of such a find.

An international team, led by the University of Sydney and Queensland, then developed this into a new opioid type considered a gold standard but with fewer side effects and created an effective analgesic for pain relief in the laboratory.

A patent application has been filed in Australia, and further research to confirm whether a new drug is in the making is expected to be finalized in a couple of months.

The findings are published today in the leading journal, *PNAS*.

The senior author, from the University of Sydney's Faculty of Medicine and Health Professor Macdonald Christie, said their findings were on the back of a decades-long search for such a holy grail of potential pain relief.

"The structure we found has never been seen before," said Professor Christie, a pharmacologist with the School of Medical Sciences and Associate Dean Research.

From the fungus, the researchers discovered three versions of tetrapeptides, a chain of four amino acids (the molecular building blocks of life) joined by peptide bonds. But it was their curious molecular structure that caught the researchers' attention.

In some molecules, geometric orientation is referred to as chirality or "handedness." Molecules can be "left handed" or "right handed," mirror images of each other, but the way they are orientated makes a huge difference. In nature, almost all amino acids are "left-handed" in shape.

There are exceptions in nature, with molecules twisted in the right hand orientation, but this is extremely rare in mammals. The ones that were found in the fungus were twisted in this unusual way.

Professor Christie explained: "No one had ever pulled anything out of nature, anything more ancient than a vertebrate that seemed to act on opiate receptors—and we found it."

The sample that prompted the research had been taken from the Tasmanian estuary as part of a program involving Professor Rob Capon, a natural products chemist from UQ's Institute for Molecular Bioscience.

Professor Capon had been part of a program that screened dirt and mud for microbes with biological activity, and 16 years ago found the molecule from a *Penicillium* fungus isolated from mud next to a boat ramp.

Under the microscope it looked like the molecules in our body that interact with the opioid receptor.

Professor Christie said if their follow-up testing is successful, as with any drug discovery, it could be a decade before this would result in a new medication available for purchase by the public.

Such a development, however, could have a major impact globally.

"If this proves successful and leads to a new medication, it will significantly reduce the risk of death by overdose from opioid medications such as codeine," Professor Christie concluded.

KILLER JAPANESE FUNGUS FOUND IN AUSTRALIA

AFP, Oct., 2019, via *The Spore Print*, L.A. Myco. Soc., Oct. 2019

SYDNEY, AUS - One of the world's deadliest fungi has been discovered in Australia's far north for the first time, thousands of kilometers from its native habitat in the mountains of Japan and the Korean Peninsula.

Ray Palmer

Poison fire coral fungus, Podostroma cornu-damae.

The Poison Fire Coral fungus [*Podostroma cornu-damae*] was discovered in a suburb of Cairns by a local photographer and subsequently identified by scientists, James Cook University has announced.

Several people have died in Japan and South Korea after mistaking the bright red fungus for edible mushrooms that are used in traditional medicine and brewing it into a tea.

James Cook University mycologist Matt Barrett, who confirmed the identity of the toxic mushroom found in Australia, said the discovery extends its known distribution "considerably." The fungus most likely grows naturally in Cairns, Barrett said. Instances have also been reported from Indonesia and Papua New Guinea.

Poison Fire Coral is the only known mushroom with toxins that can be absorbed through the skin. If eaten, it causes a horrifying array of symptoms: stomach pain, vomiting, diarrhea, fever, and numbness, which are followed over hours or days by the skin peeling off the hands and feet and the shrinking of the brain, Barrett said.

If left untreated, it can cause multiple organ failure or brain damage leading to death.

"The fact that we can find such a distinctive and medically important fungus like poison fire coral right in our backyard shows we have much to learn about fungi in northern Australia," Barrett said.

Ray Palmer, a self-described "fungi fanatic" who found the specimen, said he had spent the past decade photographing various fungi in the rainforest surrounding his home city of Cairns.

"It didn't surprise me because I have been finding quite a few things over the years," he said.

"No one traipses around the rainforest up here photographing fungi. There are quite a few (more) things to be found—and they probably will be in the coming years."

BREAKING THE MOLD: GOOD NEWS IF YOU LIKE CHEESE

Emma Goldberg

The New York Times, Oct. 23, 2019

The legend of Camembert is one of daring escape and dairy espionage.

Tony Cenicola/The New York Times

A sumptuous Camembert.

The cheese was invented in 1791 when a priest from Brie (yes, like the cheese), took shelter with a dairymaid, Marie Harel, as he fled France's anticlerical government. He taught her to make cheese with an edible rind, as local lore tells it. But the lesser known character in Harel's story is a mysterious mold that resided in Normandy.

Penicillium appears in the wild as a toxic blue fungus, but in Camembert, Brie, and other French regional cheeses, it is white and edible. For centuries, cheesemakers didn't know how it evolved from its untamed to its domesticated forms. In a study published Tuesday in *mBio* that could be good news for American cheese lovers, researchers offer the first detailed view of how a toxic fungus transforms into a mold safe for food production in as few as four weeks.

"We saw in real time how the fungi could change their metabolism in a way that would be advantageous for cheesemakers," said Dr. Benjamin Wolfe, an assistant professor of microbiology at Tufts University and the study's principal investigator. He said the research could ultimately lead to "a diverse new approach to making cheese in the United States."

cont. on page 8

Breaking the Mold, *cont. from page 7*

In contrast to Champagne, which comes from only one region of France, the name Camembert isn't restricted to cheese produced in Normandy but is a special designation reserved for cheeses produced with unpasteurized milk from French cows. And the specialness of that cheese is derived in part from the fungus that naturally evolves into mold in cheese caves across northern France.

Wolfe wanted to see if he could mimic that evolutionary process. Over the course of a summer, his team planted wild blue penicillium on the surface of freshly rendered cow's milk cheese curd while simulating the conditions of French cheese caves.

After a week, the researchers mixed the fungi together with the cheese and transferred the blend to a new cheese surface. This process was repeated eight times. Each week, they observed changes in the mold's color, spore count, and toxin levels. By week four, the fungus had evolved to its domesticated form.

The mold displayed a number of telltale signs of transformation. It turned from greenish-blue to white. Its aroma changed from musty and basement-like to buttery. The rate at which it produced the toxins that made the original fungus inedible was substantially reduced.

Wolfe recalled the excitement in the lab when they first observed its color change. "It was like, 'Here come the mutants,'" Wolfe said. The undergraduates in his lab "fell in love with these fungi, watching them change right before our eyes," he said.

The team's findings could lead to the development of new kinds of cheese in the United States. Wolfe has been approached by American cheesemakers who want to know if his team could collect wild blue fungi in their local cheese caves and transform them into edible molds, creating new regional varieties of cheese.

Benjamin Wolfe

Colonies of penicillium mold isolated from a blue cheese. The white colony is a domesticated version of the wild green mold.

"You could imagine going down different flavor paths," said Antonis Rokas, a professor of evolutionary biology at Vanderbilt University and a co-author of the study. "You could start enhancing or diminishing the mold flavor of the cheese by directing the evolutionary process."

The researchers did not find any specific mutations that caused the fungus to transform, so they hope to learn more about the genetic mechanisms controlling the mold's evolution.

John Gibbons, an assistant professor of food science at the University of Massachusetts, Amherst, said the study shows how a favorite food item historically evolved and how a fungus used in food production can be manipulated without genetic engineering.

"We've been producing cheese for thousands of years and alcohol for tens of thousands," Gibbons said. "Now we have a window into history in terms of what early humans wanted out of microbes."

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