SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 433 June 2007

MOREL REPORT BY DAVE PILZ AVAILABLE

Dave Pilz

via *MushRumors*, Oregon Myco. Soc., May/June 2007

Years in the making, *Ecology and Management of Morels Harvested from the Forests of Western North America* by Dave Pilz et al. is now available online at http://www.fs.fed.us/pnw/ publications/gtr710/.

The report (Gen. Tech. Rep. PNW-GTR-710) is so large it is divided into four segments and might take a while to download from the Forest Service website. The report is also available as a single file (11.7 MB) at http://www.peak.org/~pilzwald/TemporaryDownload/MorelGTR/.

Print copies are free (including mailing). Simply contact the Research Station at the contact information on the following webpage: http://www.fs.fed.us/pnw/publications/order.shtml. Be sure to stipulate the title and General Technical Report number, GTR-710.

FUNGUS FOUND THAT NEEDS BACTERIA IN CYTOPLASM TO REPRODUCE

Science Daily, 6 April 2007

Endosymbiotic relationships—in which one organism lives within another—are striking examples of mutualism, and can often significantly shape the biology of the participant species.

In new findings that highlight the extent to which a host organism can become dependent on its internal symbiont, researchers have identified a case in which the reproduction of a fungus has become dependent on bacteria that live within its cytoplasm. The findings, which appeared online in the journal *Current Biology* on April 5th, are reported by Laila Partida and Christian Hertweck from the Leibniz Institute for Natural Product Research and Infection Biology in Jena, Germany.

The particular partnership under study is the symbiosis of the fungus *Rhizopus microsporus* and *Burkholderia* bacteria that live within its cells. The two species effectively team up to break down young rice plants for their nutrients, causing a plant disease known as rice seedling blight. Past work from the research group had revealed that the *Burkholderia* bacteria play a critical role in the virulence of the fungus against rice seedlings: The bacteria produce a plant poison known as rhizoxin, which has been shown to be the causative agent in rice seedling blight.

The researchers now report a second, striking benefit conferred on the fungus by its intracellular symbiont. When the bacteria are eliminated from the fungus with antibiotic treatment, the fungal cells are no longer able to form spores, suggesting that the bacterial symbiont is in fact required for this mode of fungal reproduction. Spore formation in fungi is a universal process that allows the rapid distribution of fungal cells. The new findings appear to represent the first known case in which spore formation—also known as vegetative reproduction—depends on the presence of another organism.

The researchers found that when both organisms were brought together to re-establish the symbiosis, sporulation was restored in the fungus.

In collaboration with researchers at the Leibniz Institute for Age Research, Jena, the team also made progress in understanding how the endosymbiotic bacteria influence reproduction by their host. Using a laser gun to introduce *Burkholderia* that had been specially labeled with a marker known as green fluorescent protein, the researchers were able to detect the bacteria within both mycelium—the vegetative portion of the fungus—and fungal spores.

On the basis of their findings, the authors conclude that the symbiont-dependent spore formation they observe is a means to maintain the symbiosis between the two species. Although the fungus has lost control over its reproduction, the endofungal bacteria in return provide a highly potent toxin for defending the habitat and accessing nutrients from decaying plants.

Partida-Martinez et al.: "Endosymbiont-Dependent Host Reproduction Maintains Bacterial-Fungal Mutualism," *Current Biology 17*, 1–5, May 1, 2007.

LEARNING CUT-AND-PASTE RULES TO FIGHT A DEADLY FUNGUS

Rachel Tompa

uscitoday, 14 May '07

Like many other normally harmless microbes, the yeast *Candida albicans* is always with us—on the skin and in the gut, for instance.

But when conditions favor it, *Candida* may grow conspicuous. For normally healthy people, the result may be vaginal infection, some form of diaper rash, or oral thrush. These infections are uncomfortable, but rarely present serious risks.

For those with weak immune systems, however, *Candida* infection is a different story. For example, patients undergoing treatment for organ transplants or cancer cannot easily fight *Candida* growth, and *Candida* infection leading to meningitis among newborn premature infants is a growing concern.

When the single-celled fungus gains the upper hand, it changes its itinerary. A multitude of cells invade the bloodstream. They travel throughout the body and can infect many organs. This scenario is known as systemic, or invasive, candidiasis. It can be fatal if not treated early.

Quinn Mitrovich, PhD, a UCSF postdoctoral scientist, is investigating the molecular nuts and bolts of this pathogenic adaptation. He wants to know what allows *Candida* to enter the bloodstream and bodily environs where it normally does not roam. Through his work in the labs of developmental biologist Christine Guthrie,

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PUGET SOUND MYCOLOGICAL SOCIETY
Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 http://www.psms.org
User name: Password:

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ALTERNATE:

SCI. ADVISOR: Dr. Joseph F. Ammirati

EDITOR: Agnes A. Sieger, 271 Harmony Lane, Port Angeles, WA 98362
sieger@att.net

Annual dues $25; full-time students $15

CALENDAR

June 9	Field Trip, Swauk Creek Campground
June 12	Membership Meeting, 7:30 PM, CUH
June 18	Board Meeting, 7:30 PM, CUH
Aug. 20	Board Meeting, 7:30 PM, CUH,
Aug. 21	*Spore Prints* deadline
Sept. 11	Membership Meeting, 7:30 PM, CUH

BOARD NEWS

Dennis Oliver

As I write this we've had two nice days of rain, which hopefully will turn into gallons of morels and a more than significant number of boletes. In drier times the board met to discuss a number of topics of mycological and organizational interest. The master gardeners have invited PSMS to join them to identify mushrooms at their plant clinic on Monday's at CUH from 4–7 PM. This is an excellent opportunity to educate the public and advertise the club. So bring your unknown mushrooms to be identified or a bag or two of morels to brag about. At the June meeting, Kathy Casey will be our guest speaker and the roster, long in production, will be available. At the annual show we plan to have a juried art contest; after much discussion the board formed an art committee of Marilyn Droege, Cynthia Nuzzi, and Molly Bernstein to work on the details.

We just learned that Robert W. Ramsey, 86, Lakewood, WA, died October 12, 2006.
Bob was president of PSMS from 1970–72.

MEMBERSHIP MEETING

Tuesday, June 12, 2007, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.

We are honored to have Chef Kathy Casey as our featured speaker this month. She is a frontrunner, helping to pave the way for the emergence of women chefs and Northwest cuisine on the national level. Her culinary innovations have been recognized since *Food & Wine* named her as one of the "hot new American chefs" earlier in her career. She owns Kathy Casey Food Studios®, a consulting and special events venue, and co-owns Dish D'Lish™ in Ballard and the Sea-Tac Airport with husband John Casey.

She is a taste-maker and a savvy spotter of what's hot in food and beverage trends. In demand as a speaker and writer, Kathy and her cuisine have been featured in many newspapers, magazines, and trade publications. She is a frequent guest on local and national TV shows and is an accomplished food writer, having authored *Pacific Northwest: The Beautiful Cookbook* (a Julia Child Cookbook Awards nominee), *Dishing with Kathy Casey*, *Kathy Casey Cooks Favorites*, and *Kathy Casey's Northwest Table*. She also writes the column, "Dishing," for the *Seattle Times*. Kathy also serves as an ambassador for the American Heart Association's Go Red for Women campaign, is a member of Les Dames d'Escoffier International, a culinary women's organization, and is a member of Women Chefs and Restaurateurs.

Would persons with last names beginning with the letters L to Z please bring refreshments for the social hour?

Mushroom Orientation

The next session of the beginner mushroom orientation will be at 7:00 PM sharp prior to the PSMS membership meeting at CUH on June 12. Basic physical characteristics of the various types of mushrooms will be covered by Hildegard Hendrickson. If you ever wondered how a bolete differs from an *Agaricus* or a morel or what a coral mushroom looks like, this will be the place and time to find out.

SPRING FIELD TRIP

Our last field trip this spring is on June 9 at Swauk Creek Campground, which, if luck holds, could yield both morels and boletes. Keep your fingers crossed.

June 9 **Swauk Creek Campground**
(2500 ft elev, 110 mi. east of Seattle)

Swauk Creek campground is 4 miles south of Swauk Pass between east–west routes I-90 and Hwy. 2.

Driving directions: Take I-5 over Snoqualmie Pass to exit #85. Follow Hwy. 10 east of Cle Elum for 2½ miles. Turn left onto Hwy. 970. After 7 miles bear left onto US Hwy. 97 (north) and continue another 16 miles. The campground is on the right.

29 PINES FIELD TRIP, MAY 12 — Brian Luther

Being almost 110 miles from Seattle and having no shelter, this location wouldn't normally be expected to attract a large gathering of anxious mushroom enthusiasts. However, the people just kept coming, and by the end of the day a surprising 62 people had signed in. The weather was mostly fair, and half way along the 13 mile drive up the Teanaway River Road we were rewarded with a stunning and nearly complete view of Mt. Stewart (at 9,415 ft, it's the second highest nonvolcanic peak in Washington State), so I knew it was going to be a good day.

Twenty-Nine Pines was quite dry, and hardly any morels were found within the campground area itself. What were found, here and there, were rather small and dried up. Most people searched without much luck in surrounding locations, but a few fortunate members did return with rather nice collections of prime *Morchella elata*.

Ron Post was our host, and he had pretty much set out anything an early morning mushroomer would want when arriving at a field trip site: hot coffee, goodies, etc., except a promise that you'd find morels. Thanks for holding down the fort, Ron.

It was great to see Don Lennebacker doing so well with his new pacemaker. Don spent quite a while teaching all of us the finer points of making smoke from a fire pit (cough, cough). He had planned to roast some sausages, but they got nicely smoked instead (and so did we). Stay tuned, because on the next field trip he might be willing to teach us native American smoke signals.

Lynne Elwell gave a very cute demonstration of how she has trained her pooches (miniature Aussies) to search for, and find, truffles, as well as doing a few tricks like spinning around and rolling over on command. Larry Baxter brought his fiancée, Christy Jobe, for the day, and Joanne Young came with her brother and some nieces.

Thirty-six species of fungi were displayed. The real surprise of the day was the appearance of two slightly aborted fruiting bodies of either *Cantharellus cibarius* or *C. formosus* which were found somewhere in the area. How's that for strange? This was only the second time that I've seen spring chanterelles in 37 years of mycology. I saved the specimens and was very curious about this collection, so I spent some time doing microscopy. I measured a number of spores, for comparison, since there is a difference between the spores of *Cantharellus cibarius* var. roseocanus and *C. formosus* (Redhead et al., 1997; Pilz et al., 2003). The basidiospores that I measured were 8.5–10 × 5 µm, and the average L/W ratio was 1.76 µm. This was a small sample, and the specimens were not fully developed, but the mature spore measurements I made clearly put this collection in the range for *Cantharellus cibarius* var. roseocanus.

Two nice *Boletus edulis* were found by somebody, but other good edibles were in short supply. Some interesting species included *Hygrophorus marzuolus* which was actually rather abundant. Several clumps of the very distinctive *Mycena overholtzii* were found, all from exposed logs surrounded by snow, and a couple of small collections of *Gyromitra* (*Discina*) *leucoxantha* were also brought in. For your information, all species formerly in the genus *Discina*, have been transferred to the genus *Gyromitra* (Abbott and Currah, 1997).

Several of the roads leading to collecting possibilities were snowed in, preventing most people from taking the Forest Service logging roads higher up. That, however, didn't stop me. I parked at the first gauntlet of impassable snow on the Red Top Mountain road and hiked up another three miles, searching for morels. I got some really good exercise, but no morels. I did come back with huge specimens of *Hygrophorus subalpinus*, which was common in the conifer woods higher up. Larry Baxter decided to take a large one home for a taste test after I told him it was a good edible mushroom. He reported back to me that it was delicious (he sautéed it with fresh asparagus—yum!). So, don't overlook this large, white, meaty spring "snowbank" mushroom. Special thanks to Josh Birkebak, Hildegard Hendrickson, and Larry Baxter for helping with identification during the day.

Ron organized a late brunch potluck, around 1:00 PM, giving those who wanted to leave early a chance to have a meal together and share their day's experiences (unfortunately, mostly morel-less) with others. No regrets for a great day in the mountains with friends, and I think there was a nice diversity of fungi, giving people the chance to learn some new species.

References

Abbott, Sean P. and R.S. Currah. 1997. The Helvellaceae: Systematic Revision and Occurrence in Northern and Northwestern North America. *Mycotaxon 62*: 1–125.

Pilz, David, Lorelei Norvell, Eric Danell, and Randy Molina. 2003. Ecology and Management of Commercially Harvested Chanterelle Mushrooms. USDA General Technical Report PNW-GTR-576, 83 pp.

Redhead, Scott A., Lorelei L. Norvell, and Eric Danell. 1997. *Cantharellus Formosus* and the Pacific Golden Chanterelle Harvest in Western North America. *Mycotaxon 65*: 285–322.

WHAT'S BECOME OF *MACROLEPIOTA RACHODES*? — Dick Sieger

We have a group of big coarse brown mushrooms in the Pacific Northwest that we called *Macrolepiota rachodes* (= *Lepiota rachodes*). They have rough scaly caps 4 to 8 inches across, substantial fibrous stalks with prominent rings, and flesh that changes from white to reddish or saffron when it is cut. The group is widespread, common, and frequently eaten.

We were comfortable with the name we used. The few books and mycologists available to hobbyists decades ago assured us that we were correct. Then dozens of European and American mushroom books were published and they offer confusing concepts of what they call *M. rachodes*. Some describe a stately mushroom, some describe a robust mushroom, and some wed the two forms into a mushroom with features borrowed from both. A third form is scarcely mentioned. Even the name is spelled in two ways, "rhacodes" and "rachodes." So what, exactly, do we call them?

Elsa Vellinga to the rescue. She is a Dutch mycologist at UC Berkeley. She decided that the three varieties of *M. rachodes* are quite different from one another and should become three species. Research convinced her that they are morphologically and genetically more closely related to the genus *Chlorophyllum* than they are to *Macrolepiota.* So she published them as three species of *Chlorophyllum*: *C. rachodes, C. brunneum*, and *C. olivieri.*

These three species are common and they aren't hard to find. *Chlorophyllum rachodes* and *C. brunneum* start appearing in early summer. Look for them in gardens. Gardens tend to be moist so

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they can appear in dry weather. Expect them to continue appearing in one place until hard frost and look in the same place next year. *C. olivieri* shows up in the fall. It's found under trees in leaves and woody debris. Patches can be prolific! Thin one, and a week later there seem to be just as many as before.

One or more of these three species poisons some people. We are not sure which because of the ambiguous identification in the past. If you want to try them—and they are excellent—make sure they are cooked thoroughly, eat a small portion the first time around, and be wary of serving them to guests.

If you or someone you know does get in trouble eating one of these mushrooms, please confirm the *Chlorophyllum* species involved and let me know. My e-mail address is sieger@att.net.

Folks mostly eat *C. olivieri* on the Olympic Peninsula where I live. *C. rachodes* is the one commonly eaten in Seattle. Edibility is subjective. Here is my opinion. *C. rachodes* and *C. brunneum* are best, but *C. olivieri* is almost as good if the stalks are discarded. Brown all three over high heat before continuing with their preparation. They tend to produce lots of liquid which can be poured off, boiled down, and returned to the mushrooms. They have an assertive flavor and meaty texture. All are good when dried and, because of its light texture, dry *C. olivieri* makes good mushroom powder for coating fish and seasoning onion soup.

You may have heard of *Chlorophyllum molybdites* which is notorious for poisoning casual foragers in the places where it grows. I'm not aware of any collections of this mushroom from the Pacific Northwest. (See notes under description of *C. rachodes.*)

Key to Gilled *Chlorophyllum* Species of the Northwest

1a. Stalk length is noticeably greater than the cap diameter; scales on the cap are fibrous (like hemp rope); scales are grayish olive brown on a dingy background..... ..... *Chlorophyllum olivieri*

1b. Stalk length approximately equals the cap diameter; scales on the cap are smooth; scales are cinnamon brown on a white background.....2

2a. Stalk has a ring with one edge; bottom of stalk has an abrupt bulb with a flattened top that may have a ridged perimeter ..... *Chlorophyllum brunneum*

2b. Stalk has a ring with two edges—one turned up and one turned down; stalk base is swollen or is a bulb with a sloping top and no ridge .....*C. rachodes*

Confirm your ID by reading the mushroom's description!

Taxonomic Descriptions

Chlorophyllum olivieri (Barla) Vellinga

CAP: 5–12 cm wide; convex becoming flat with a knob in age; **disc** grayish olive brown, smooth; **margin** like the disc at first, soon breaking up concentrically into coarsely fibrous scales on a dingy background. **GILLS:** free, white, becoming red or brown when bruised, darkening in age, close, edges finely fringed, in two or three tiers. **SPORE PRINT:** white. **STALK:** 7–15 cm long—about 1½ times as long as the diameter of the cap, top 7–15 mm thick, equal with an abrupt rounded bulb at the base, stuffed, smooth, white, surface darkening when bruised, cut flesh staining reddish or saffron. **RING:** thick, persistent, membranous, double, the edge fibrous and frayed, white with the lower surface darkening in age; movable like a ring on a finger. **ODOR:** not remarkable. **TASTE:** not remarkable. **HABIT:** scattered to gregarious. **HABITAT:** litter under conifer or deciduous trees. **EDIBILITY:** edible and choice but may sicken some people—see notes. **SPORES:** 8.7–11 × 5.8–8 μm, oval, with a small germ pore, dark reddish brown in Melzer's. **CHEILOCYSTIDIA:** globose to oval. **PLEUROCYSTIDIA:** absent. **CAP CUTICLE:** compact hymeniform layer of clavate to bulbous cells that may have irregular projections.

NOTES: Of the gilled *Chlorophyllum* species in the Northwest, one or more sicken some people; it is uncertain which because in the past all three were called "*Macrolepiota rachodes*."

Chlorophyllum brunneum (Farlow & Burt) Vellinga

CAP: 10–20 cm wide, convex becoming flat in age; **disc** cinnamon brown, smooth; **margin** colored like the disc, smooth at first, soon breaking up concentrically into smooth upturned scales with white, fibrous flesh showing between the scales. **GILLS:** free, white, becoming red or brown when bruised, darkening in age, close, edges finely fringed, in two or three tiers. **SPORE PRINT:** white. **STALK:** 10–20 cm long—about equal to the diameter of the cap, top 10–25 mm thick, club shaped, base with an abrupt bulb having a flattened top and often a ridged perimeter, stuffed, smooth, white, surface darkening when bruised, cut flesh staining reddish or saffron. **RING:** thick, persistent, membranous, single edge, edge fibrous and frayed, movable like a ring on a finger, white above with a tough brown patch below. **ODOR:** not remarkable. **TASTE:** not remarkable. **HABIT:** scattered to gregarious. **HABITAT:** compost, rich soil, gardens. **EDIBILITY:** edible and choice but may sicken some people—see notes. **SPORES:** 10.0–13.2 × 6.9–8.6 μm, broadly oval, with a germ pore, dark reddish brown in Melzer's. **CHEILOCYSTIDIA:** clavate, narrowing toward the base. **PLEUROCYSTIDIA:** absent. **CAP CUTICLE:** compact cemented hymeniform layer of clavate to bulbous cells.

NOTES:

Salient features that distinguish *C. brunneum* from *C. rachodes*: *C. brunneum* has a ring with a single edge and its stalk base is an abrupt bulb with a flattened top that often has a ridged perimeter; *C. rachodes* has a double-edged ring and a stalk base that is either gradually swollen or is a bulb with a sloping top that never has a ridge.

Edibility: Of the gilled *Chlorophyllum* species in the Northwest, one or more sicken some people; it is uncertain which because in the past all three were called "*Macrolepiota rachodes*."

Chlorophyllum rachodes (Vittadini) Vellinga

CAP: 10–20 cm wide, convex becoming flat in age; **disc** cinnamon brown, smooth; **margin** like the disc at first, soon breaking up concentrically into smooth upturned cinnamon brown scales with white fibrous flesh showing between the scales. **GILLS:** free, white, rarely tinged pale green, becoming red or brown when bruised, darkening in age, close, edges finely fringed, in two or three tiers. **SPORE PRINT:** white or cream. **STALK:** 10–20 cm long—about equal to the diameter of the cap, top 10–20 mm thick, club shaped, gradually swollen at the base or with a rounded bulb having a sloping top and no ridge, stuffed, smooth, white, surface darkening when bruised, cut flesh staining reddish or saffron. **RING:** thick, persistent, membranous, movable like a ring on a finger, with two edges—one turned up and one turned down, edges fibrous and tattered, above white, below with brown cuticle that darkens in age. **ODOR:** not remarkable. **TASTE:** not remarkable. **HABIT:** scattered to gregarious. **HABITAT:** compost, rich soil, gardens. **EDIBILITY:** edible and choice but may sicken some people—see notes. **SPORES:** 8.8–12.7 × 5.4–7.9 µm, globose to pyriform, with a small germ pore, dark reddish brown in Melzer's, contents become red when mounted in 3–5% KOH or NH_4OH and

stained with Congo red. **CHEILOCYSTIDIA:** globose to pyriform. **PLEUROCYSTIDIA:** absent. **CAP CUTICLE:** compact interwoven hymeniform layer, cells irregularly constricted.

NOTES:

Salient features that distinguish *C. rachodes* from *C. brunneum*: *C. rachodes* has a double-edged ring and a stalk base that is either gradually swollen or is a bulb with a sloping top that never has a ridge; *C. brunneum* has a ring with a single edge and its stalk base is an abrupt bulb with a flattened top that often has a ridged perimeter.

Cultures of *C. rachodes* rarely produce mushrooms.

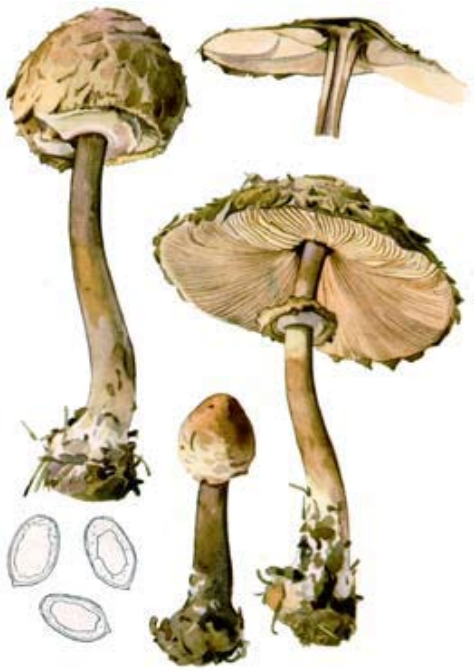
Edibility: Of the gilled *Chlorophyllum* species in the Northwest, one or more sicken some people; it is uncertain which because in the past all three were called "*Macrolepiota rachodes*." Occasional clusters have fused gills; examination of these sterile gills has not revealed a parasite, but consumption is discouraged.

Look-alike: The poisonous *Chlorophyllum molybdites* (Meyer ex Fries) Massee looks like *C. rachodes* but is not known to grow in the Pacific Northwest. *C. molybdites* produces a green spore print and has white gills that become green with age. *C. rachodes* sometimes has gills with a green cast but its spore print is always white. *C. molybdites* frequents lawns; its spore contents become gray when mounted in 3–5% KOH or NH_4OH and stained with Congo red; its cap cuticle has some pear shaped cells and, at the disc, tightly interwoven cells that may be upright but are not organized.

Comparison of the Gilled *Chlorophyllum* Species of the Pacific Northwest

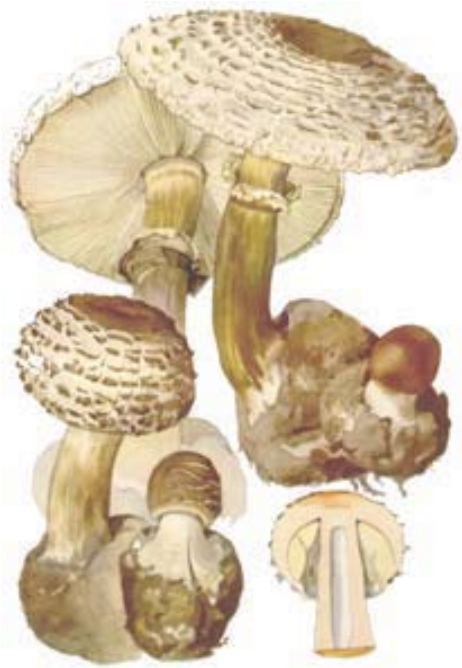
Characteristic	*C. rachodes*	*C. brunneum*	*C. olivieri*
Ratio of stalk length to cap diameter	Stalk length equals cap diameter	Stalk length equals cap diameter	Stalk length 1½ times cap diameter
Cap colors	Cinnamon brown on a white background	Cinnamon brown on a white background	Grayish olive brown on a dingy background
Cap scales	Smooth	Smooth	Coarsely fibrous
Stalk diameter	10–25 mm	10–25 mm	7–15 mm
Ring	Double edge	Single edge	Single edge
Base of stalk	Gradual swelling or a bulb with a sloped top	Abrupt bulb with a flattened top	Abrupt rounded bulb
Habitat	Compost, rich soil	Compost, rich soil	Litter under trees
Cheilocystidia	Broadly oval	Club shaped	Rounded
Cultures	Mushrooms rarely result	Not observed	Mushrooms often result

Chlorophyllum olivieri



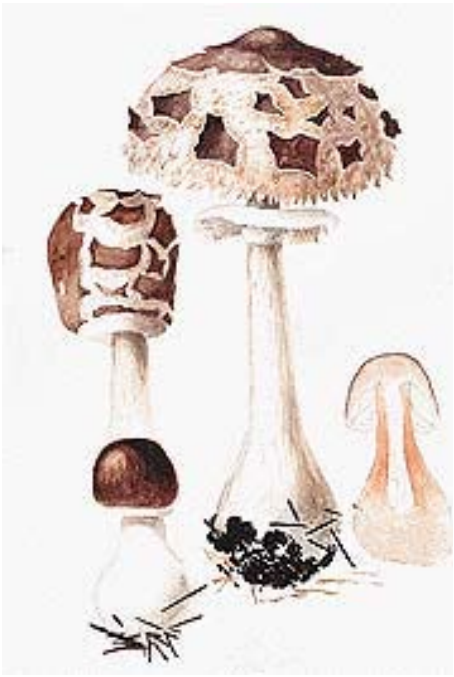
Mushrooms; Pilát & Ušák, Spring Books, London, 1938

Chlorophyllum brunneum



Mushrooms; Pilát & Ušák, Spring Books, London, 1938

Chlorophyllum rachodes



Mycology at Kew, http://www.rbgkew.org.uk

SANTA PARK CLOSING DOWN OVER FUNGUS

Helsingin Sanomat, International Edition, May 2, 2007

The Santa Park grotto in Rovaniemi, Finland, is to close its doors for the summer because of an extensive problem with fungus and mildew growing in the structures.

"It is really upsetting. Just when the product and our finances have been squeezed into shape," says CEO Wille Rajala.

A fungus study was conducted at the park recently after employees began suffering symptoms. The maximum permissible levels were exceeded considerably.

Fungus and small particles were found in the air of the subterranean theme park, built in the late 1990s. Now much of the interior structures will have to be torn out and replaced. Extensive repairs are also in store for the ventilation system.

The repairs are expected to cost hundreds of thousands of euros, and will be paid for by the theme park's owner, the City of Rovaniemi.

About 20 seasonal employees work in the summer at Santa Park on the Arctic Circle. In the winter there are 35. The park has only three year-round employees.

Santa Park has had to cancel its foreign bookings for the summer.

"Orders are high for Christmas, and we are putting great effort into preparations," Rajala says.

During the fiscal period that is ending, the park has actually turned a profit. Growth in turnover is expected to be about 12 per cent.

During the repairs, Santa himself, the most important resident of the establishment, will move into temporary exile at the Santa Claus Office two kilometers away. The grotto will re-open on November 23.

FUNGI USED TO FILTER POLLUTANTS AT BOAT LAUNCH

Keith Kinnaird

The Bonner County Daily Bee, April 8, 2007
via *The Spore Print*, L.A. Myco. Soc., May 2007

SANDPOINT, ID - Mushrooms are being used to capture hydrocarbons and other pollutants that would normally wind up in Lake Pend Oreille at the Memorial Field boat launch.

The demonstration project, which showcases a best management practice for keeping pollution out of the lake, replaces the hard-pack gravel shoulder next to the launch ramp with a series of descending basins designed to filter out pollutants before they enter the water.

"It basically was a gravel patch that had very little usefulness," said Gary Parker, program coordinator for Lake*A*Syst, which arms landowners with practical information on how they can take an active role in protecting local water quality.

Before the project was installed, stormwater swept over the gravel shoulder and into the lake. Stormwater would also hit the asphalt parking lot and wash into the water, leaving the distinctive rainbow sheen of hydrocarbons.

The demonstration project aims to route stormwater runoff through the basins. The top six basins are filled layers of wood chips inoculated with phoenix fir oyster mushrooms [*Pleurotus pulmonarius*] and the bottom three basins contain layers of pearl oyster mushrooms [*Pleurotus ostreatus*]. The fungi have been shown to break down pollutants, according to Scott Daily, a certified permaculturist with Full Circle Design, which designed the project.

A grate will be installed perpendicularly on the launch ramp to catch stormwater and feed it to the basins.

The project has serendipitous origins.

"We were looking for a high-profile site," said Parker. "We wanted to show landowners what they could do on their property."

The same day Parker was looking for a site, Daily called Parker looking for a project.

The city of Sandpoint's Public Works and Parks & Recreation departments provided the site, while the Bonner Soil & Water Conservation District, Natural Resource Conservation Service, Tri-State Water Quality Council collaborated to implement the project.

INDOOR FUNGUS MOLECULES MAY PROTECT INFANTS AGAINST FUTURE ALLERGIES

Science Daily, 1 May 2007,
via *The Spore Print*, L.A. Myco. Soc., May 2007

Maybe being a fussy housekeeper isn't such a good thing after all.

Environmental health scientists at the University of Cincinnati (UC) say they have confirmed what other scientists have only suspected: early-life exposure to certain indoor fungal components (molecules) can help build stronger immune systems, and may protect against future allergies.

The UC team found that infants who were exposed to high levels of indoor fungal components—known as fungal glucans—were nearly three times less likely to wheeze compared with infants exposed to low levels.

Fungal glucans are tiny molecules that scientists believe cause respiratory symptoms in adults. Crawling infants are often exposed to these molecules when they disturb dust on carpet or floors in their homes.

Study lead author and environmental health scientist Yulia Iossifova says exposure to high levels of these molecules may also protect against allergy development in high-risk infants.

"The immune system's protective effects only appear to occur when there are high levels of microbial exposure," she explains. "Cleaner environments do not have enough microbial components to trigger the immune system response."

The UC team reports their findings in the May 2007 edition of the scientific journal *Allergy*. This epidemiological study is the first to suggest that early-life exposure to high levels of indoor fungal glucans can have a positive impact on the human immune system.

"Fungi are a diverse group of microorganisms, so species differ in their glucan content and allergenic proteins. Some fungi also contain mycotoxins that can contribute to disease," adds Tiina Reponen, PhD, professor of environmental health and corresponding author of the study. "Exposure to indoor molds during infancy may be associated with respiratory symptoms, such as persistent coughing and wheezing."

The UC-led team analyzed the effects of microbial exposures to both fungal glucans and endotoxins (natural compounds secreted from disease-causing agents like bacteria) in 574 infants, enrolled in the Cincinnati Childhood Allergy and Air Pollution Study (CCAAPS), who were identified as being at greater risk for future allergies because at least one parent had known allergies.

The CCAAPS, funded by the National Institute of Environmental Health Sciences, is a five-year study at UC examining the effects of environmental particulates on childhood respiratory health and allergy development.

UC researchers collected dust samples from each infant's primary activity room and analyzed them for indoor allergens, fungal glucans, and bacterial endotoxins. They also gathered information about the home, including the presence of any visible mold and water damage. Environmental and food allergy development was monitored through annual skin prick tests.

Scientists say early-life exposure to common microbial components—like bacterial endotoxins and fungal glucans—can stimulate the body's immune system to produce infection- and allergy-fighting substances. Because of this, Iossifova says, people should avoid overusing antibacterial sprays and soaps to clean their bodies and homes.

"Certain microbes can have helpful affects in the body," she explains, "but antibacterial disinfectants can't discriminate between helpful and harmful microbes—they destroy them all.

"This eliminates the natural competition among bacteria and fungi, so the surviving microbes are often the infectious ones that can develop resistance to drugs designed to eliminate them."

Iossifova says further research is needed to determine how early microbial exposures affect the development of certain allergic conditions—including asthma, dermatitis, and hay fever—later in life.

Cut and Paste Rules, *cont. from page 1*

PhD, and microbiologist Alexander Johnson, PhD, Mitrovich hopes to find ways to block these molecular events and halt raging *Candida* infections.

The vagina, the bloodstream, and the brain are quite different environments. It is unusual for a single pathogenic microbe to adapt so quickly to such different surroundings, Mitrovich explains. Yet *Candida* is able to invade virtually every part of the body once systemic candidiasis sets in—leaving researchers mystified.

Rapid Splicing When Time is of the Essence

Some scientists have begun looking at changes in *Candida* gene expression during different stages of infection. An expressed gene is one that is switched on. During gene expression, the genetic code is transcribed into an RNA messenger molecule. The RNA encodes a complementary message that is translated into protein within factories inside each living cell.

A trademark of any pathogen is the ability to change its gene expression in response to the host environment in order to elude the host immune response. But the fact that *Candida* is able to invade every human organ "means that it is very adaptive," says Mitrovich. "We speculate that this involves multiple changes in gene expression."

There's a good chance the quick-change artistry of *Candida* is due to a biological phenomenon known as RNA splicing, Mitrovich says. Similar to the way an audio or video engineer cuts and pastes interview footage to obtain the desired presentation, *Candida* manipulates its own genetic blueprint. It cuts and pastes RNA to quickly change the proteins it makes.

The impetus for Mitrovich's work came from observations made in another yeast species, *Saccharomyces cerevisiae*—brewer's yeast. It does not cause disease. But of interest to those who study its sometimes fearsome fungal brethren, scientists working in Guthrie's lab found that RNA splicing in *S. cerevisiae* is highly controlled, and that it occurs very quickly in response to different environmental conditions.

"The production of new RNA can be slow, whereas the splicing responses we see in *S. cerevisiae* happen very rapidly—within a few minutes of exposure to a new environment," Mitrovich says.

Guthrie, Johnson and Mitrovich wondered whether something similar happens when the pathogenic yeast *Candida* is exposed to different environments in the human body. "Splicing is a way for an organism to be poised to adapt—to move into a new environment quickly," Mitrovich says.

Secrets of Shape Shifting

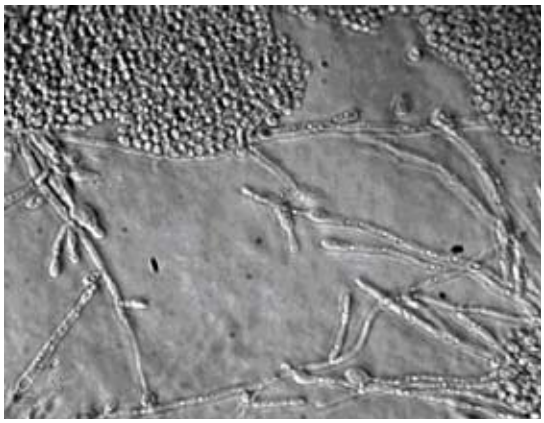
While scientists do not yet understand the tricks *Candida* uses to invade its host, they do know that this yeast takes on many different physical forms.

For example, it can exist in a "yeast" form, in which each cell is round and separate from other cells. It can also exist in a "hyphal" form, in which cells are elongated and attached to each other. There also are different physical forms associated with stages of mating.

The ability of *Candida* to sample all these different forms is thought to be important in its success as an infectious pathogen.

Mitrovich is surveying the entire complement of *Candida* genes —its genome—to find out how RNA splicing is involved as *Candida* changes from one form to another. He has already seen intriguing changes in the splicing of a few specific genes when *Candida* switches from one mating form to another.

Mitrovich hopes eventually to identify master regulators of splicing responses in *Candida*. If *Candida* is indeed using splicing regulation as a means to survive in the human body, then targeting the key proteins involved could be a new avenue for better drug therapies to fight infection.



Quinn Mitrovich

An image of the yeast Candida albicans*, as grown in a laboratory dish, obtained with a light microscope. Some cells have assumed a small, round form, while others are long, filamentous hyphal cells. The ability to shift forms is thought to be crucial for invasion of—and survival within—the different tissues that* Candida *infects.*

SOUTHWEST SALMON FRITTATA **Kathy Casey**

http://www.alaskaseafood.org/recipes/

Ingredients:

1 can (14.75-oz.) of traditional-pack Alaska salmon (or two 7.5-oz. cans) or 12–14 oz. skinless, boneless salmon
8 large eggs
2 tsp minced fresh garlic
1 TBs taco seasoning, divided
1 TBs vegetable oil
½ cup thinly sliced onions
1 cup sliced mushrooms
½ cup diced roasted peppers, divided
1 cup sliced cooked red potatoes (about 3 potatoes)
¾ cup shredded pepper jack cheese
Garnishes: salsa, fat-free sour cream, sliced green onions

Directions:

Preheat oven to 425°F. Drain salmon and discard skin and bones (if any).

In a large bowl, whisk the eggs, garlic, and 1½ teaspoons taco seasoning until frothy.

Heat a large (10-inch) nonstick oven-proof skillet over high heat, then add and heat the oil. Sauté the onions and mushrooms for about 4 to 6 minutes, or until just getting soft. Add half of the roasted peppers and the potatoes. Sprinkle with the remaining 1½ teaspoons taco seasoning, and stir around gently. Pour in the egg mixture. Reduce the heat and, as the eggs cook, quickly and gently push the outer edges towards the center with a spatula, letting the uncooked egg mixture run down underneath the cooked eggs. Continue until eggs are about half set. Do not stir.

Scatter the drained salmon evenly over the frittata then sprinkle with the remaining roasted peppers and the cheese. Place pan in oven and bake until eggs are set and just puffy, about 6 minutes. Slice into wedges and serve directly from the pan. Serve topped with dollops of salsa and sour cream and garnish with a sprinkle of green onions. *Serves: 6 to 8. Prep Time: 15 minutes.*

Nutrients per serving:

324 calories, 19g total fat, 7g saturated fat, 54% calories from fat, 302mg cholesterol, 26g protein, 11g carbohydrate, .8g fiber, 668mg sodium, 333mg calcium and 1.3g omega-3 fatty acids.

CURRY-FLAVORED MUSHROOMS TEMPT TASTE BUDS

The New Zealand Herald , Sept. 30, 2006
via *Mycofile*, Vancouver Myco. Soc., March 2007

A mushroom that tastes like curry—it's not the creation of genetic engineering, but an entirely natural food that grows wild in Scotland. Now, the small, brown but potent-tasting curry-scented milkcap, or *Lactarius camphoratus*, previously regarded as little more than a curiosity by mushroom foragers, is to be collected and sold commercially.

Liz Walsh, director of Glasgow-based Wildfoods, said: "We believe we are the first company to sell the curry-scented milkcap commercially. It is a fascinating natural food that really does smell and taste of curry...we strongly believe there could be an excellent market for it out there among food lovers."

The company believes the curry mushroom has many potential culinary uses for imaginative cooks, such as an addition to Indian-style dishes, particularly vegetable curries. It could also be used as spicy condiment or to add a touch of heat to more conventional mushroom side dishes such as risotto or pasta sauces.

It will sell at £10 ($28.65) for 250 g.

[Ed. note: *Lactarius camphoratus* is also found in the Pacific Northwest.]

This will be the last newsletter until September.
Have a great summer!

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

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