Q&A: A Fungiphobe's Reckoning

I gasped, tensed and slammed my eyes shut. I giggled nervously as I tried to regain my pride in front of my co-worker, hoping my fear wasn't that obvious.

After returning to the office from a long winter break, my colleague discovered a forgotten, unfinished cup of coffee. Over two weeks, her once warm coffee and cream had transformed into a fuzzy tapestry of terror.

"Look at this!" she said as she thrust the mug in my direction.

Apparently, my fear **was** that obvious.

That day, I decided to tackle my fear of mold head-on. I jumped online and searched for a University of Arizona mold researcher. I found Barry Pryor, plant sciences professor and **BIO5 Institute** member.

Pryor describes himself as a plant doctor and ambassador to the fifth kingdom, a taxonomic category of the second-highest rank, which encompasses all fungi, including molds. (Science recognizes seven kingdoms now. The other six are plants, animals, chromists, protists, eubacteria and archaebacteria.)

Pryor's training is in plant pathology and plant health management. Fungi happen to be the principal pathogens for plants, so Pryor became steeped in the fungal world. His research focuses on Alternaria, a genus of fungi that is a ubiquitous plant pathogen. Alternaria species can also cause allergies and are linked to the onset of childhood asthma.

"I'm always looking for new areas of research with Alternaria because they seem to be present in every environment, where they are critical for breaking apart materials and recycling nutrients," he said.

Pryor's research also focuses on a second group of fungi: those that are grown commercially for food and pharmaceuticals.

He is the founding director of the Arizona Mushroom Growers Association and a member of the University's **Controlled Environment Agriculture Center** [2], where he finds new ways to grow mushrooms with high yields and with varying nutritional profiles. He also teaches a popular general education course called Mushrooms, Mold and Man and was the faculty adviser for the **Mycocats** [3] student club, which diverted landscape and post-consumer waste such as mesquite pods and pizza boxes as feed for growing gourmet mushrooms which they later sold to the Student Union Memorial Center.

Pryor agreed to meet and see if he couldn't turn this fungiphobe into a fungiphile.
What follows are excerpts from our conversation.

What is mold?

Mold is the colloquial term for filamentous fungi, and it's what we think of when we picture those fuzzy microbes that crawl around in the soil, plant debris, your carpet or on your skin. Molds reproduce by making ubiquitous, microscopic spores that are released into the air. If the spores land in a spot with a little moisture and food, they can germinate, grow more mold and continue to reproduce. Some molds can produce mushrooms, which are large specialized fruiting bodies that can also make spores for reproduction.

Are fungi dangerous?

There are many benefits from fungi, but there are also some fungi that produce toxins. Some mushrooms also produce toxins, and some can even kill you, but this is very rare. For example, there are an estimated 2 (million) to 10 million species of fungi worldwide. Of those, about 20,000 are known to make mushrooms. About 1,000 of those mushrooms are known to be edible. That does not mean that other 19,000 are poisonous; it simply means you can't digest them. Of those 1,000, we can only grow about 60 in artificial cultivation for human consumption, while the other 900 or so must be wild harvested. Of the remaining, there may be 100 or so species of poisonous mushrooms, but only a handful are deadly poisonous.

Nearly all deaths come from just two species, Amanita phalloides (known as the death cap) and Amanita virosa (known as the destroying angel). These are found principally in the Northern Hemisphere but are spreading worldwide, and the main reason people get poisoned is because they both look similar to the delicious meadow mushroom called Agaricus campestris. Agaricus campestris grows in meadows, and the deadly Amanita grow in forests that may be surrounding the meadows. So, people might be harvesting mushrooms in the meadow and get too close to the forest without realizing it and see another white mushroom, put it into their basket, then end up poisoning their family.

But there are far more poisonous plants than poisonous mushrooms. I tell people, "if you went to Mount Lemmon and started eating plants that you didn't recognize, you probably wouldn't come out of the mountains." Just don't eat things you don't recognize as safe.

Some fungi produce toxins when growing on food, especially rotting food? which you shouldn't eat in the first place? and ingestion of these toxins can cause acute or chronic illness or interfere with your immune system.

Some toxin-producing fungi can also grow in our homes, such as black molds, and cause "sick building syndrome" because of the illness people get when they are exposed to these environments. Some of these risks associated with exposure to black molds have been questioned, but there is much we don't know about indoor mold exposure. All areas of indoor fungal growth should be avoided or remediated. Exposure to fungal spores can also cause serious allergies in some people. They are not the most prominent allergens in our environment? plant pollen generally is? but unlike plants that will just cause you to stuff up, some fungi can infect your sinuses as well, and that can be very serious.

Can fungi be good for you?

Mushrooms are very nutritious, and consumers are starting to appreciate this more.
Mushrooms are high in protein, fiber and vitamins. They are low-calorie, low-fat and are full of antioxidants and nutraceuticals. The market for mushrooms is growing rapidly worldwide.

Fungi are also the workhorses of industry, working behind the scenes to produce foods such as cheese, drinks such as beer, antibiotics and other medicine, vaccines, flavorings and much more. Fungi are also critical components for the stability and sustainability of every ecosystem, which of course contributes to everyone's general health.

So, what was in that cup?

Whatever grew in this coffee cup was likely whatever mold spores were in the air. They settled and grew using the carbohydrates like sugar, fats or whatever other carbon source was in the cream.

A newly minted fungiphile

While these fuzzy critters still make me squirm, after speaking with Pryor, I now find fungi fascinating.

If you're interested in learning more, Pryor and his students will host a "fungus/mushroom petting zoo" at the Tucson Festival of Books, happening on campus March 14-15.

Mikayla Mace is a science writer in the Office of University Communications and a regular contributor to Lo Que Pasa. She earned a bachelor's degree in neuroscience and cognitive science with a minor in astronomy and a master's in journalism from the University of Arizona. Mace worked as a science, health and higher education reporter before returning to the University last year.

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