

Report to the Boards of Health
Jennifer Morse, MD, MPH, FAAFP, Medical Director

Mid-Michigan District Health Department, Wednesday, December 20, 2023
Central Michigan District Health Department, Wednesday, December 20, 2023
District Health Department 10, Friday, December 15, 2023



Fungal Infections

Fungus (plural, fungi) includes yeast, mold, and mushrooms. They may be too small to see or [cover an area over 3 miles wide](#). There are millions of different types of fungi. Fortunately, only a few hundred types can infect people. Many can also infect animals and pets. Public awareness of fungal infections has been found to be very low.

When fungus in the environment is disturbed, spores in the air can be inhaled. Other times, the fungus can enter the body through a break in the skin. The spores turn to yeast in the body and may cause illness or may stay dormant in the body. Fungal infections can affect anyone but are more common in people who have weakened immune systems. They can cause infections of the skin and nails, lungs, bloodstream, bladder, vagina, eye, mouth, throat, esophagus, and meningitis. Fungi can also contaminate the environment in healthcare facilities, causing healthcare-acquired infections (HAI) and contaminate medical products and devices.

While many fungi can be found almost anywhere, some fungi are endemic, meaning then are only in certain areas of the world. In many areas in the world, fungal infections are not reportable, and testing may not be available, so it is hard to be certain where fungi are endemic.

Aspergillosis

Aspergillosis is caused by a fungus called *Aspergillus*. This is a very common mold both indoors and outdoors. Most breathe in this mold spore without ever getting sick while others will get ill. It can cause allergy-like symptoms, fungus balls in the lung or sinus cavity, or more serious infections.

Blastomycosis

Blastomycosis is caused by a fungus called *Blastomyces*. It is endemic to the areas as shown in the map to the right. This fungus prefers to live in decomposing material, like dead wood and leaves, as well as moist soil. People that take part in outdoor activities, like hunting and camping, or work in forestry, digging, or excavation may be at higher risk of infection. It typically causes lung infections, which may spread throughout the body. It may also infect the skin causing bumps, blisters, or ulcers. Recently there was a [large outbreak at the](#)



The game and show “The Last of Us” is about a mutated *Cordyceps* fungus that causes zombie-like infections in people. This is based on a **real** *Cordyceps* fungus called *Ophiocordyceps unilateralis* that parasitizes insect brains, controlling them and causing odd behavior. It makes the insects seek higher areas where there is more sun and warmth, allowing the fungus to grow. The insect dies, the fungus bursts out from the insect, and spores are released so it can spread to other insects. The risk of it mutating to infect humans is thought to be **very low**.

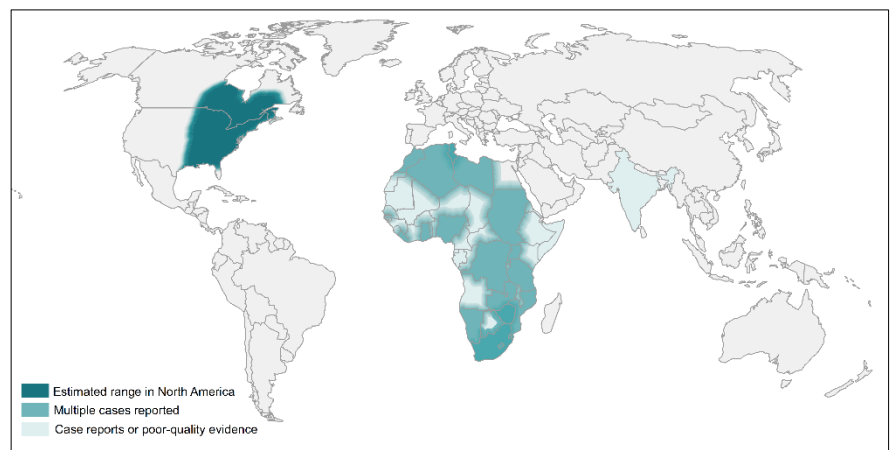


Fig. 3 World map estimating regions most likely to have blastomycosis based on literature review

[Escanaba Billerud Paper Mill](#) causing at least 121 cases of blastomycosis and one death.

Histoplasmosis

Histoplasmosis is caused by a fungus called *Histoplasma*. It is endemic to the areas as shown in the map to the right. This fungus is typically found in soil with a lot of bird or bat droppings. It typically causes lung infections, which may spread throughout the body. It is best to avoid or hire professionals if you need to clean large areas of bird or bat droppings. If you have a weak immune system, avoid exploring caves, cleaning chicken coops, or disturbing areas that may have bird or bat droppings.

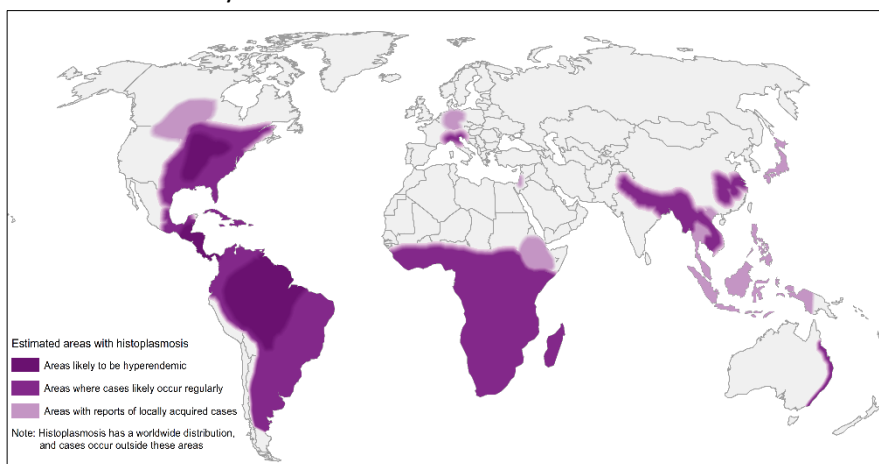


Fig. 1 World map estimating regions most likely to have histoplasmosis based on literature review

Coccidioidomycosis

Coccidioidomycosis, or Valley fever, is caused by a fungus called *Coccidioides*. It is endemic to the areas as shown in the map to the right. Though the risk is very low, anyone who lives in or travels to the southwestern United States (Arizona, California, Nevada, New Mexico, Texas, or Utah), or parts of Mexico or Central or South America can get Valley fever. The risk for infection is higher in dusty areas. It typically causes lung infections, which may spread throughout the body. It rarely can cause skin infections if the spores enter the skin through a cut or wound.



Fig. 2 World map estimating regions with coccidioidomycosis based on literature review

Candidiasis

Candidiasis is a fungal infection caused by a yeast called *Candida*. *Candida* lives in on and in our body normally, usually without causing problems. If conditions with our body change, it can overgrow and cause infections in the vagina, mouth, throat, or gut. There are different species of *Candida* that cause infections in people, the most common is *Candida albicans*. *Candida auris*, *Candida glabrata*, and *Candida parapsilosis* are species that are more likely to be resistant to many drugs and is starting to cause more infections.

Pneumocystis pneumonia

Pneumocystis pneumonia (PCP) is a serious infection caused by the fungus *Pneumocystis jirovecii*. Many of us are exposed to *Pneumocystis* as children and up to 20% of people are infected. Fortunately, illness caused by *Pneumocystis* illness is very rare in healthy people. It usually only develops in people with weak immune systems, such as cancer, HIV/AIDS, or organ transplants.

Mucormycosis

Mucormycosis is a rare fungal infection caused by a group of molds called mucormycetes. These molds are common in the environment especially in soil with decaying organic material like leaves, compost, and animal waste. The infection usually affects the sinuses or lungs after the fungal spores have been inhaled. Sometimes the spores infect the skin through cuts, burns, or other injuries. These infections are most common in people with a weakened immune system.

Dermatophytosis, also called tinea and “ringworm”

Dermatophytosis is a fungal infection of the skin or nails due to one of nearly 40 different fungi. These infections are common. The fungi that cause these infections live in the environment, especially damp areas like showers and can pass from person to person, and animals to people. Infection of the skin is called “ringworm” as it is usually a red, circular rash.

Sporotrichosis

Sporotrichosis is an infection caused by a fungus called *Sporothrix*. It is found throughout the world in soil and on plants. It is also called “rose gardener’s disease”. People usually get sporotrichosis in the skin through cuts or scrapes from plants, particularly when working with sphagnum peat moss. It can also be caused by scratches or bites from animals, mainly cats. It starts as a small, painless bump where the fungus enters through a break in the skin. The bump eventually gets larger and may look like an open sore or ulcer that is very slow to heal. More bumps or sores may appear later near the original one. It rarely causes lung infections when the spores are inhaled.

Symptoms of Fungal Infections

Most fungal infections never cause illness. When they do, many will cause lung infections like pneumonia. They symptom can start suddenly and be severe, but often are gradual and last several weeks or months, and can include:

- Wheezing
- Shortness of breath
- Cough
- Fever
- Night sweats
- Weight loss
- Coughing up blood
- Fatigue (extreme tiredness)
- Chest, rib, or back pain
- Headache

Some may have infections in the sinuses with symptoms such as:

- Stuffiness
- Runny nose
- Headache
- Reduced ability to smell
- One-sided facial swelling
- Headache
- Nasal or sinus congestion
- Fever

Skin infections may be just a rash or may be blisters or ulcers. There may be pain or it may be painless growths or other types of lesions. Nail infections usually cause the nail to become discolored, thick, fragile, or cracked. The nail may lift from the nail bed.

Fungi and yeast can cause infections of the mouth, throat, or esophagus which will typically cause pain and difficulty swallowing. Infection of the bladder may not cause any problems or cause symptoms of a bladder infection. Vaginal infections usually cause discharge, itching, and irritation.

In some people, particularly those who have weakened immune systems, fungal infections can spread from the lungs to other parts of the body, such as the blood, skin, bones and joints, and the central nervous system (the brain and spinal cord). They can cause death.

COVID-19 and Fungal Infections

COVID-19 has caused increased risks for fungal infections because having COVID weakened the immune system and treatments for COVID-19, like steroids and other drugs, also weaken the body’s defenses against fungi. The most reported fungal infections in patients with COVID-19 have been aspergillosis, invasive candidiasis, and mucormycosis. *Candida auris* has also been increasing and there have been outbreaks in COVID-19 units.

Antimicrobial-Resistant Fungi

There are not many drugs available to treat fungal infections. Some fungi, like *Candida auris*, can easily become resistant to the antifungal drugs normally used to treat infections. The use of fungicides in agriculture can also add to drug resistance problems. Some fungicides are like medical antifungal drugs. This causes the fungus in the environment to get resistant, and people breathe in those resistant spores from the environment and get sick.

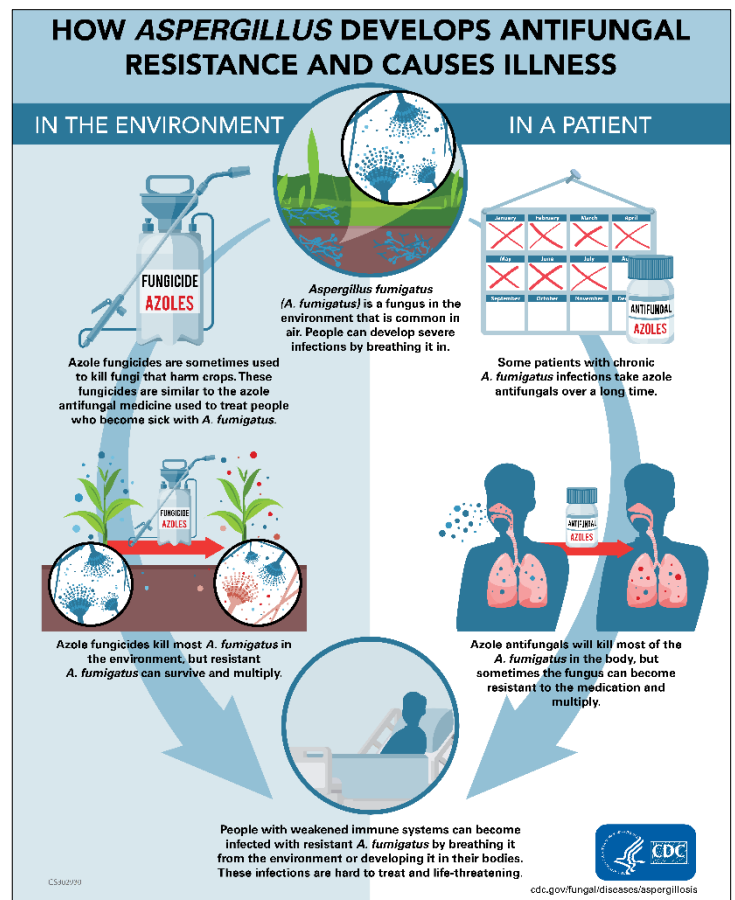
Preventing

It can be difficult to avoid breathing in fungal spores because they are so common in the environment. Most people that do get infected with fungi will never get sick. For those with a weak immune system or with certain medical problems, it may be worthwhile to try to lower the risk of infection, though there isn't proof that these recommendations work:

- Try to avoid areas with a lot of dust like construction or excavation sites, or where rotting vegetation is being disturbed. This may include things like gardening, yard work, raking leaves, farm work, and so on.
- Avoid areas that may be heavily contaminated with bird or bat droppings.
 - If you can't avoid these areas, wear an N95 respirator while in these types of environments. Avoid reusing the respirator, especially if it gets wet or dirty.
- Wear shoes, long pants, and a long-sleeved shirt when doing outdoor activities such as gardening, yard work, or visiting wooded areas.
- Wear gloves when handling materials such as soil, moss, or manure.
- Clean skin injuries well with soap and water, especially if they have been exposed to soil or dust.
- Avoid water-damaged buildings or other areas that may be or are affected by mold.
 - For more information about indoor mold, including cleanup and remediation recommendations see <https://www.cdc.gov/disasters/mold/index.html>
- To prevent ringworm
 - Keep your skin clean and dry. Don't walk barefoot in areas like locker rooms or public showers.
 - If you're an athlete in a close contact sport, shower immediately after your practice session or match, and keep all of your sports gear and uniform clean. Don't share sports gear with other players.
 - Wash your hands with soap and running water after playing with pets. If you suspect that your pet has ringworm, take it to see a veterinarian.

Recommendations:

1. Some fungal infections seem like pneumonia and be misdiagnosed. If you have symptoms that aren't getting better with treatment, talk to your doctor about possible fungal infections.
2. If you are at increased risk for fungal infections, consider steps to prevent infection.
3. Take charge of your own and your family's risk of infection while using healthcare. See <https://www.cdc.gov/HAI/patientSafety/patient-safety.html> and <https://www.jointcommission.org/resources/for-consumers/take-charge/prevent-infections-and-ask-caregivers-to-wash-their-hands/>.



Sources

- Benedict, Kaitlin, Noelle Angelique M. Molinari, and Brendan R. Jackson. "Public awareness of invasive fungal diseases—United States, 2019." *Morbidity and Mortality Weekly Report* 69.38 (2020): 1343.
- Ashraf, N., Kubat, R.C., Poplin, V. et al. Re-drawing the Maps for Endemic Mycoses. *Mycopathologia* 185, 843–865 (2020). <https://doi.org/10.1007/s11046-020-00431-2>
- CDC. Fungal Diseases. <https://www.cdc.gov/fungal/index.html>