

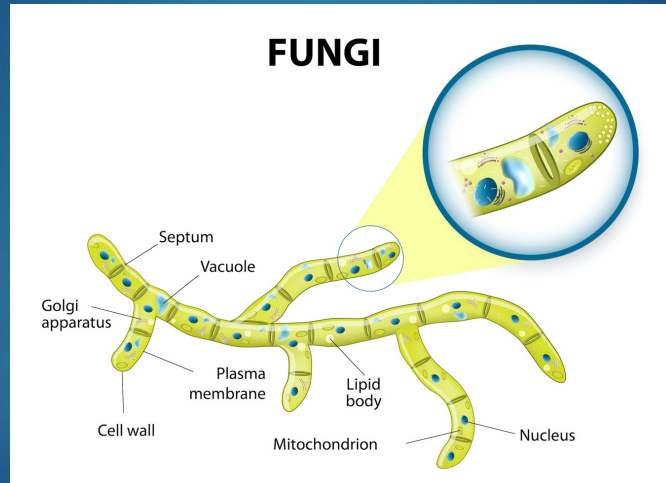
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Main points other than spores

- ▶ There is a lot of hyphae or mycelia when mold & some filamentous bacteria such Actinobacteria grow.
- ▶ Mold & Streptomyces spp. have very similar characteristics.
- ▶ Mold & Streptomyces may grow together
- ▶ There is more than conidia or spores to consider in the water damaged buildings

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Hypha vs hyphae

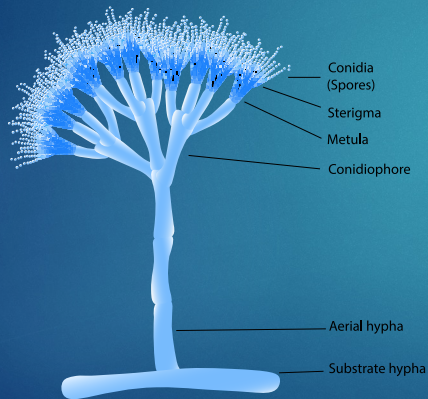


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Hyphae vs mycelia

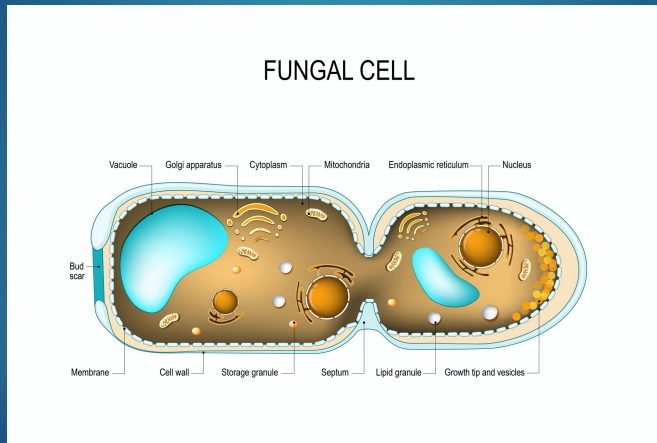
Aerial hyphae are not roots

Mycelia is a mass of hyphae



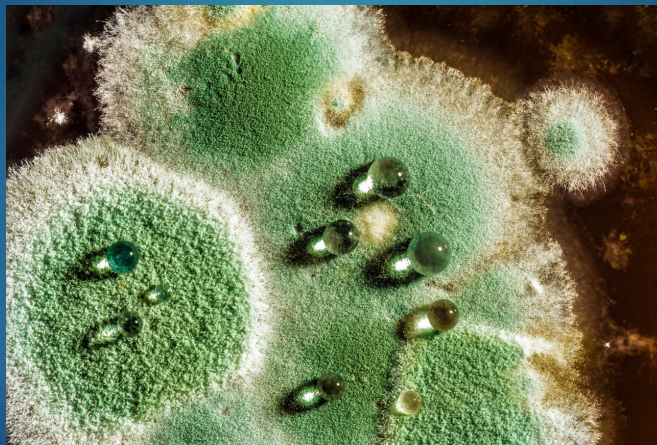
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Hyphal tips



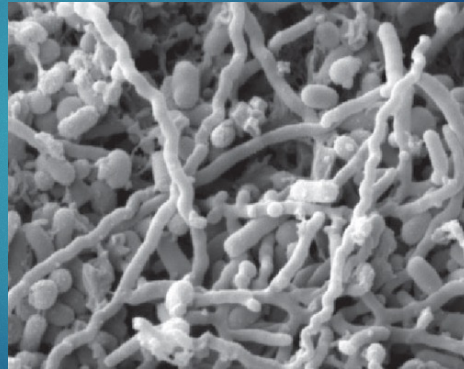
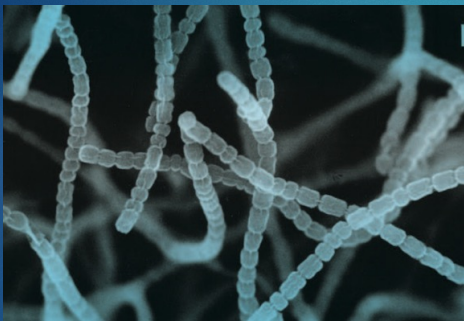
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What do many hyphal growth tips look like with mycelia?



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Does this look like mold or bacteria?



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Fungal race for water sources

- ▶ Filamentous fungi can navigate & branch, making them well-adapted to spread in the environment, including their spreading on and within plant & animal tissues.
- ▶ Individual hyphae possess an ability to sense the physical & chemical properties of interfaces, and thus can respond to growth in different environments. *Spectrum*. 2017;5(2). doi: [10.1128/microbiolspec.FUNK-0040-2016](https://doi.org/10.1128/microbiolspec.FUNK-0040-2016)
- ▶ *Rhizopus stolonifer* hyphae finds its way through different mazes quickly compared to other species tested in the 1st Fungus Olympics. *PLoS One*. 2021; 16(9): e0257823. doi: [10.1371/journal.pone.0257823](https://doi.org/10.1371/journal.pone.0257823)

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Survival with fluctuating water activity and humidity

- ▶ *Aspergillus niger*, *Cladosporium halotolerans* & *Penicillium rubens*.
- ▶ Only *C. halotolerans* renewed hyphal tips growth after lowering to 75% RH.
- ▶ *A. niger* & *P. rubens* were not able to regrow with hyphae at 75% RH
- ▶ Conidia appear to benefit with starting growth with humidity rather than wetting.
- ▶ *Appl Environ Microbiol.* 2016 Aug 15;82(17):5089-98.
- ▶ doi: [10.1128/AEM.00510-16](https://doi.org/10.1128/AEM.00510-16).Print 2016 Sep 1.

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Fungal CATs Conidial Anastomosis Tubes

- ▶ "Under appropriate conditions, a conidium germinates to form a tip-growing tube that extends and successively branches to establish the fungal colony."
- ▶ "A colony can arise from a single spore, but it has been long appreciated that conidia and conidial germlings in close vicinity to each other commonly undergo fusion to produce an interconnected network of germlings."
- ▶ "21 genera and 73 species"
- ▶ *FEMS Microbiol Lett.* 2005 Aug 15;249(2):191-8.
- ▶ doi: [10.1016/j.femsle.2005.06.048](https://doi.org/10.1016/j.femsle.2005.06.048).

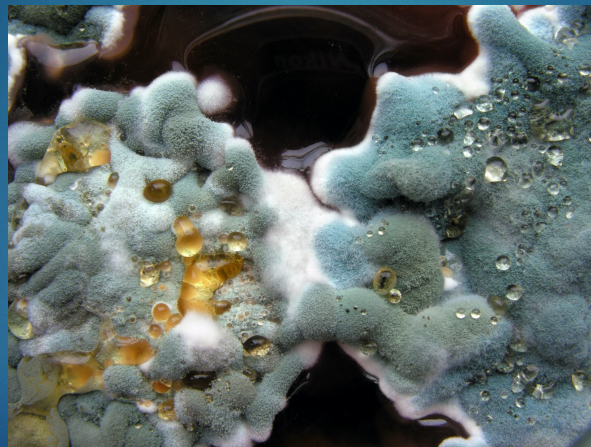
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Hydrophobins

- ▶ Small amphiphilic substances that self-assimilate into monolayers on hydrophilic and hydrophobic surfaces and their properties. Fungi secrete these substances to reduce surface tension and support hyphae growth or to increase the hydrophobicity of conidia, aerial hyphae and fruiting bodies (paraphrased)
[Sci Rep. 2018 Aug 13;8\(1\):12033.](#) doi: [10.1038/s41598-018-29749-0.](#)
- ▶ Species of *Streptomyces* have a lifestyle similar to filamentous fungi. These bacteria form aerial hyphae that may branch into chains of spores. (paraphrased)
(1) [Curr Biol. 1999 Jan 28;9\(2\):85-8.](#)
doi: [10.1016/s0960-9822\(99\)80019-0.](#)
(2) [Mol Microbiol. 2012 Jun;84\(6\):1033-49.](#)
doi: [10.1111/j.1365-2958.2012.08070.x.](#)

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Guttation: Mold



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Guttation: Mold

- ▶ Guttation droplets of *Penicillium nordicum* & *Penicillium verrucosum* contain high concentrations of the mycotoxins ochratoxin A & B
Mycopathologia. 2007 Apr;163(4):207-14. doi: 10.1007/s11046-007-9003-1.
- ▶ *Stachybotrys* spp. & the guttation phenomenon
Mycotoxin Res. 2014 Aug;30(3):151-9. doi: 10.1007/s12550-014-0193-3.

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Guttation: Bacteria

- ▶ Actinobacteria such as *Streptomyces* also produces exudate like some mold such as *Penicillium*

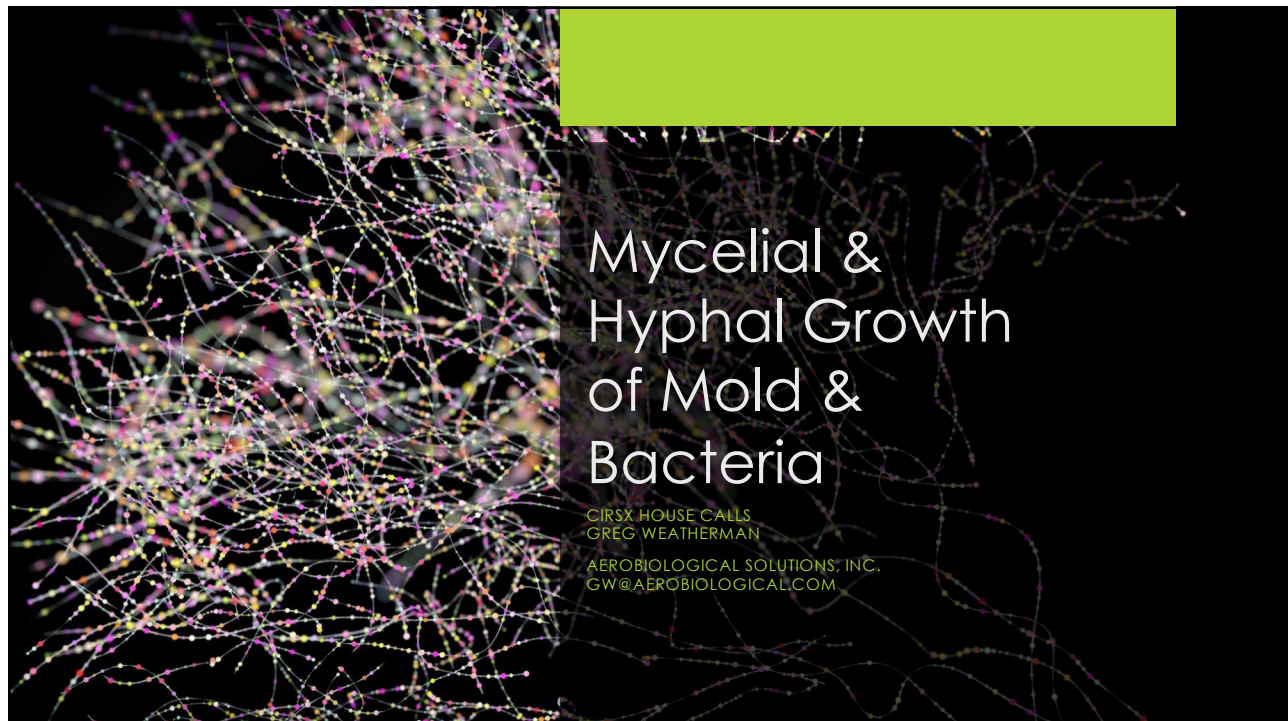


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Guttation: Bacteria

- ▶ "Colorless droplets of water" *Streptomyces bikiniensis* 1947
- ▶ "Exuded droplets" *Streptomyces griseus* 1953
- ▶ "Yellow guttation drops" *Streptomyces scabies* 1968
- ▶ "Blue Droplets" *Streptomyces coelicolor* 1979
- ▶ [Microb Biotechnol. 2011 Mar; 4\(2\): 286–299.](#)
- ▶ doi: [10.1111/j.1751-7915.2011.00251.x](https://doi.org/10.1111/j.1751-7915.2011.00251.x)

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