Healthcare-associated fungal infections

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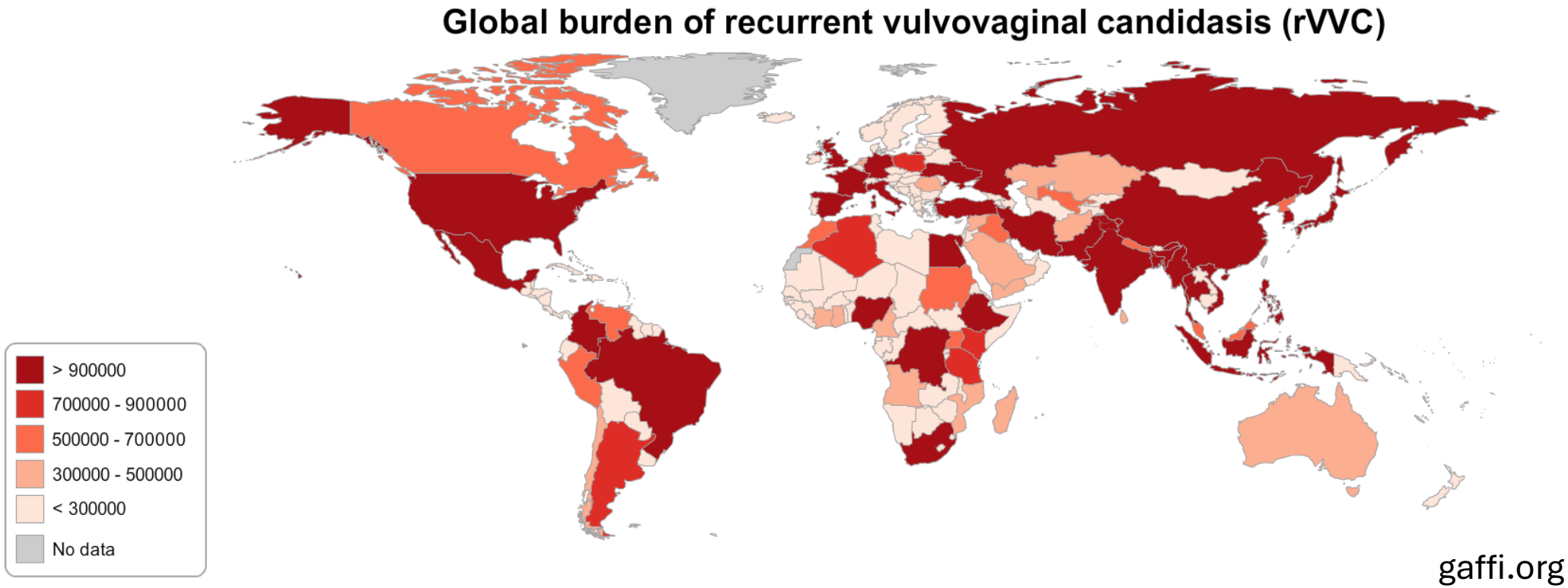
Why study fungal diseases?

- Fungi are persistent
  ~25% world's population have a mucosal/skin fungal infection



gaffi.org

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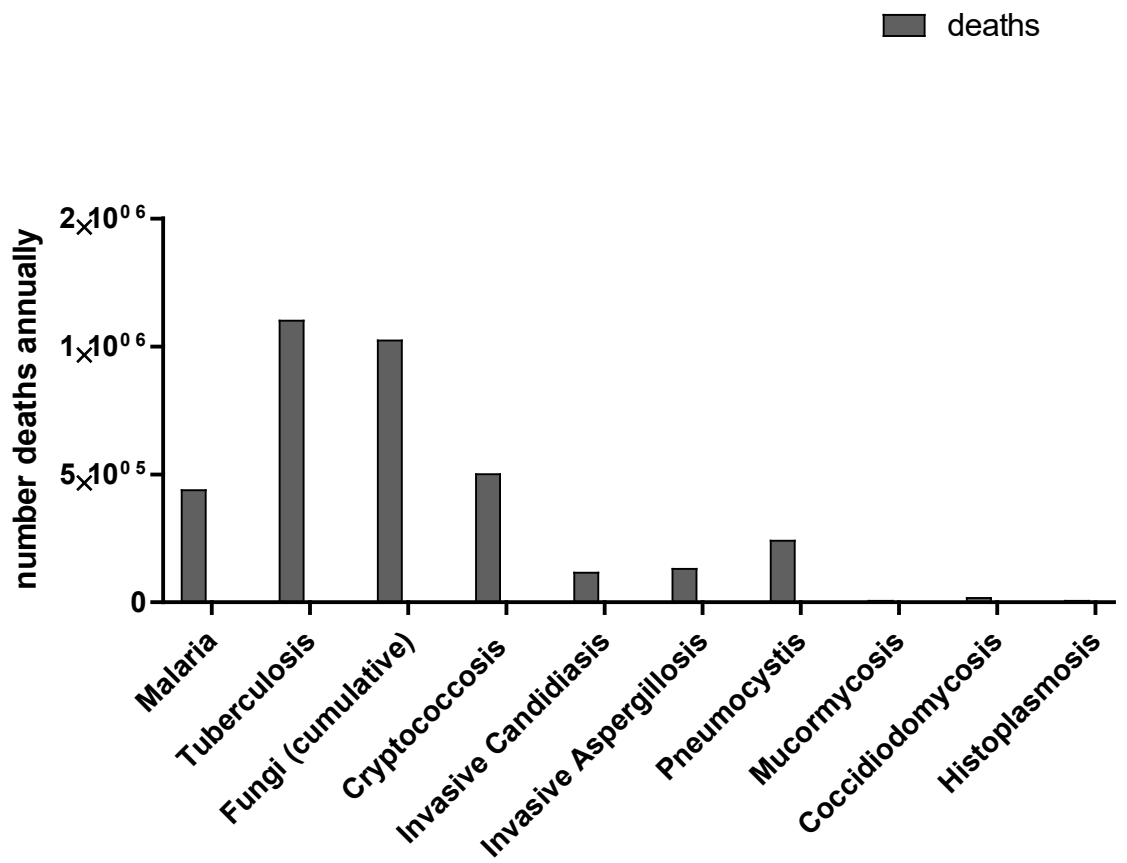

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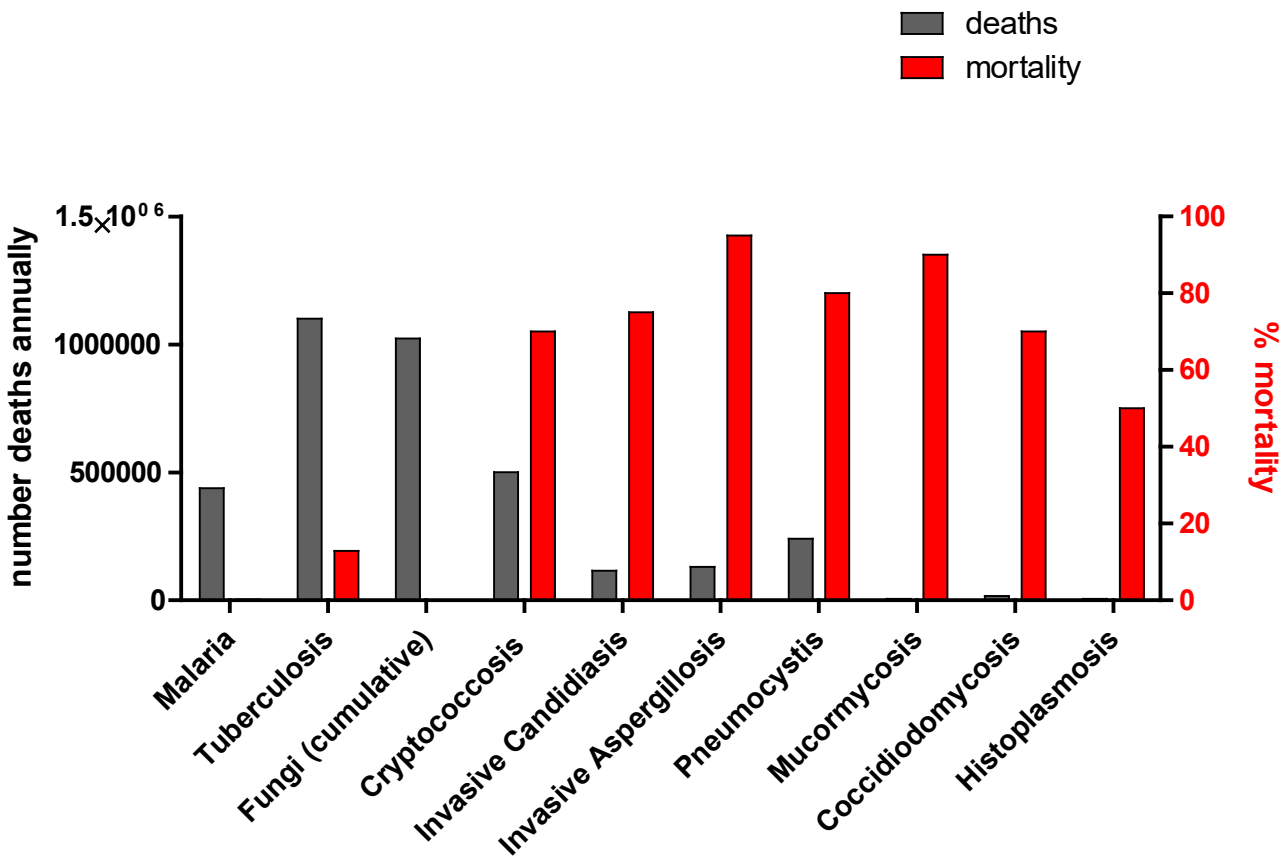


Why study fungal diseases?

- Fungi are persistent
  ~25% world's population have a mucosal/skin fungal infection
- They're lethal
- Diagnosis and treatment is limited

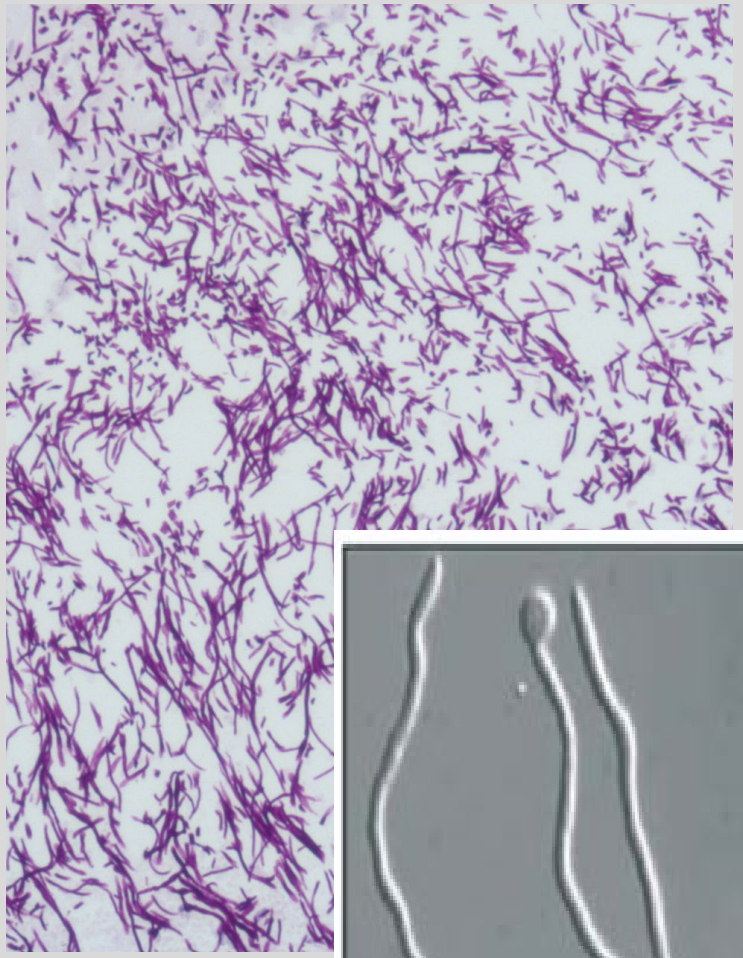
NO AVAILABLE VACCINES

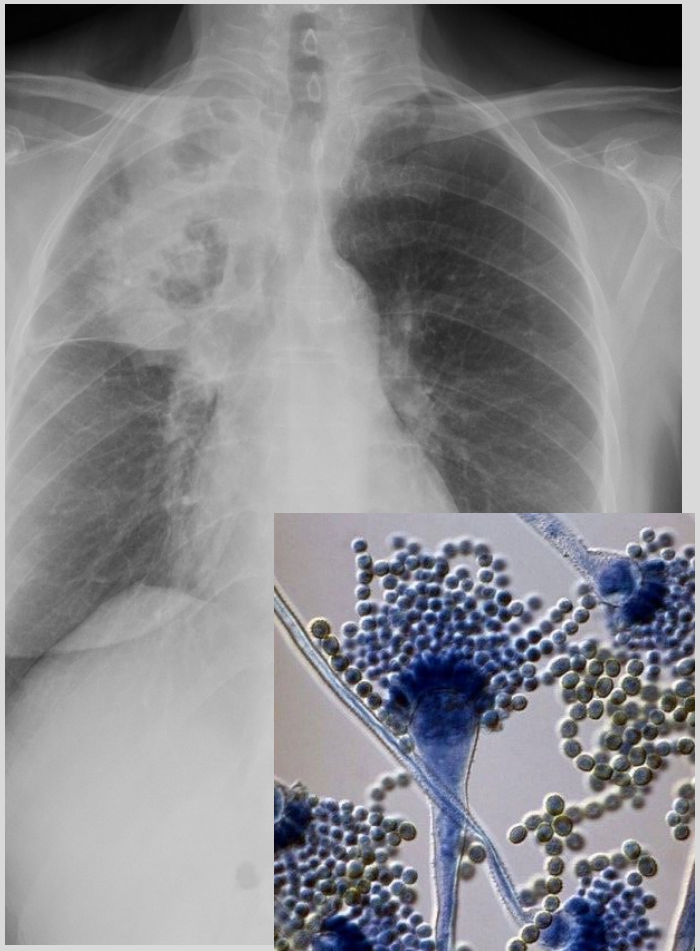
LIMITED ANTIFUNGAL DRUGS AVAILABLE

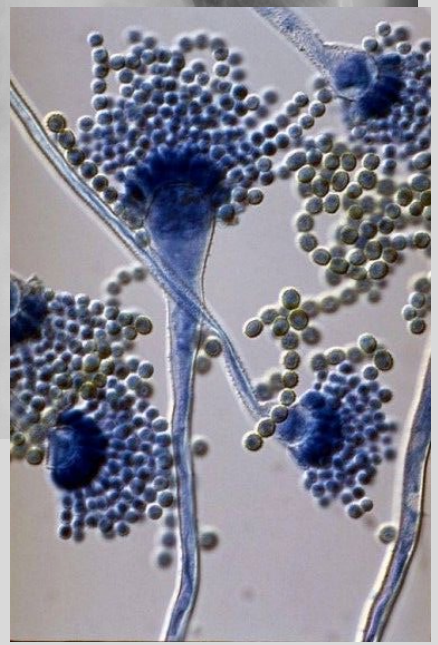
INCREASING RESISTANCE

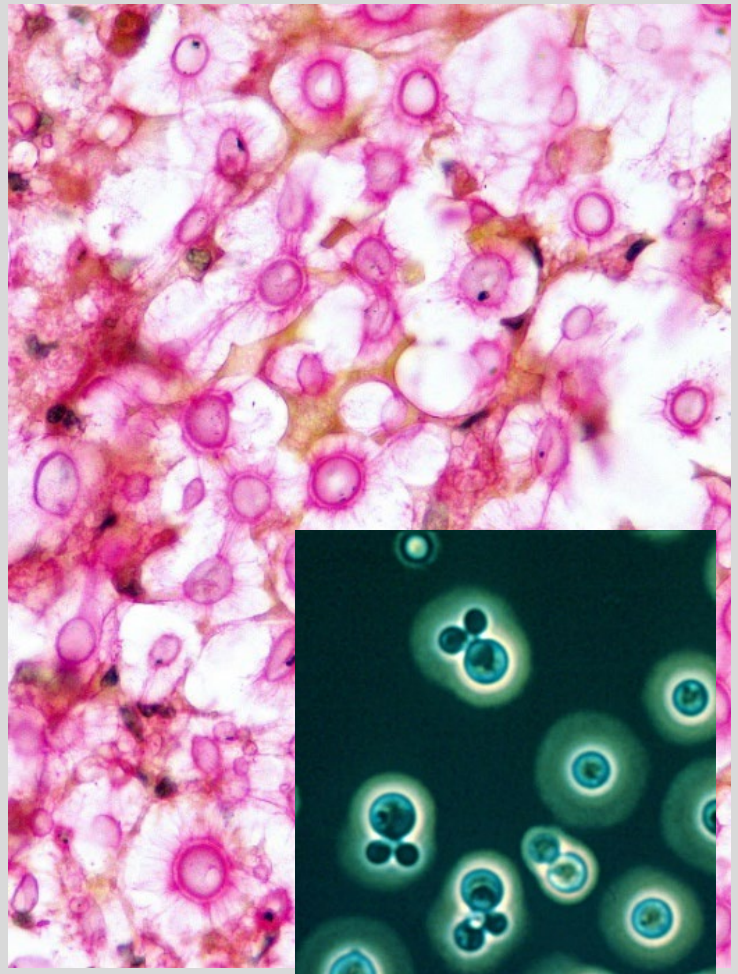
Many fungal infections are healthcare associated

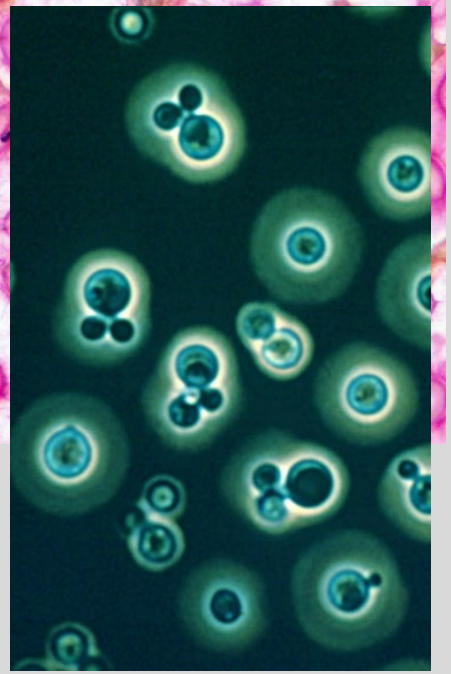
- Most fungal infections occur in people who are vulnerable
- Risk factors include anything that causes immune system dysfunction or disturbance
- These risk factors can be either primary (congenital) or acquired



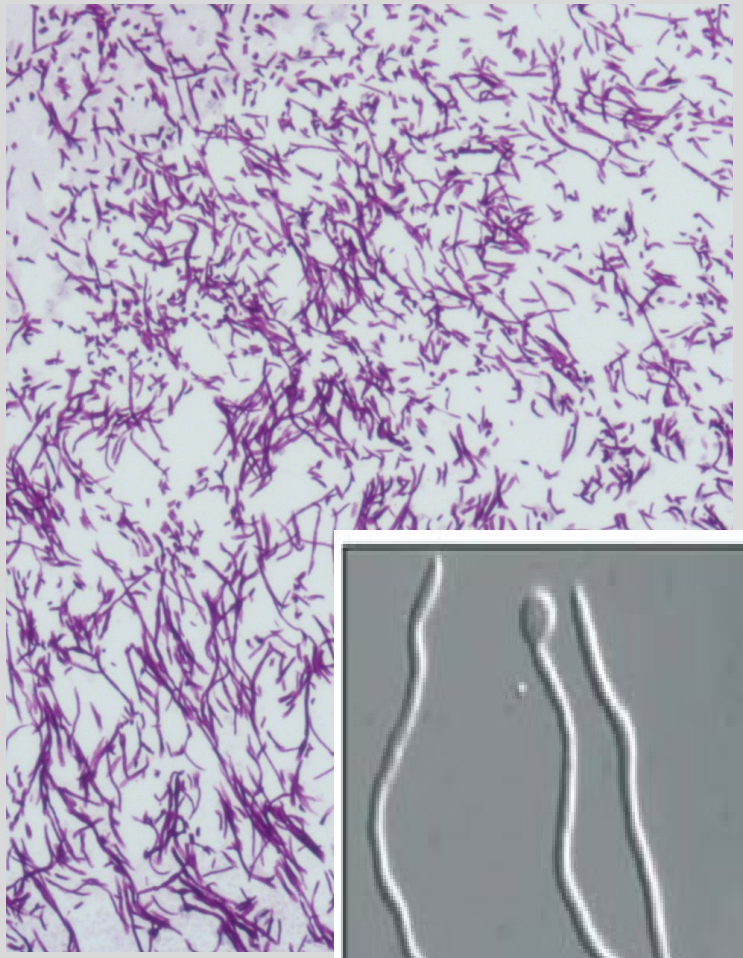


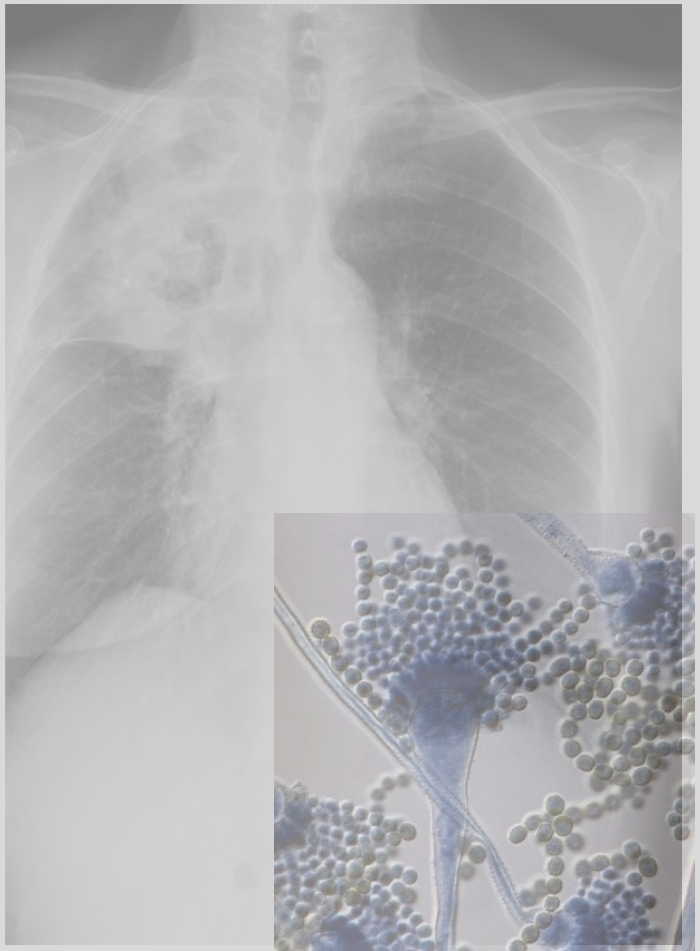


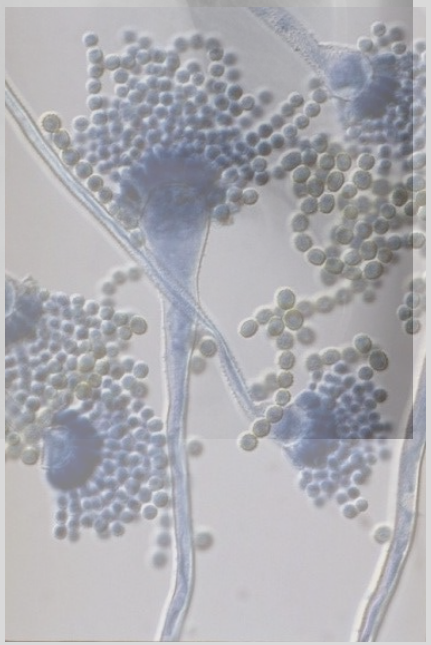


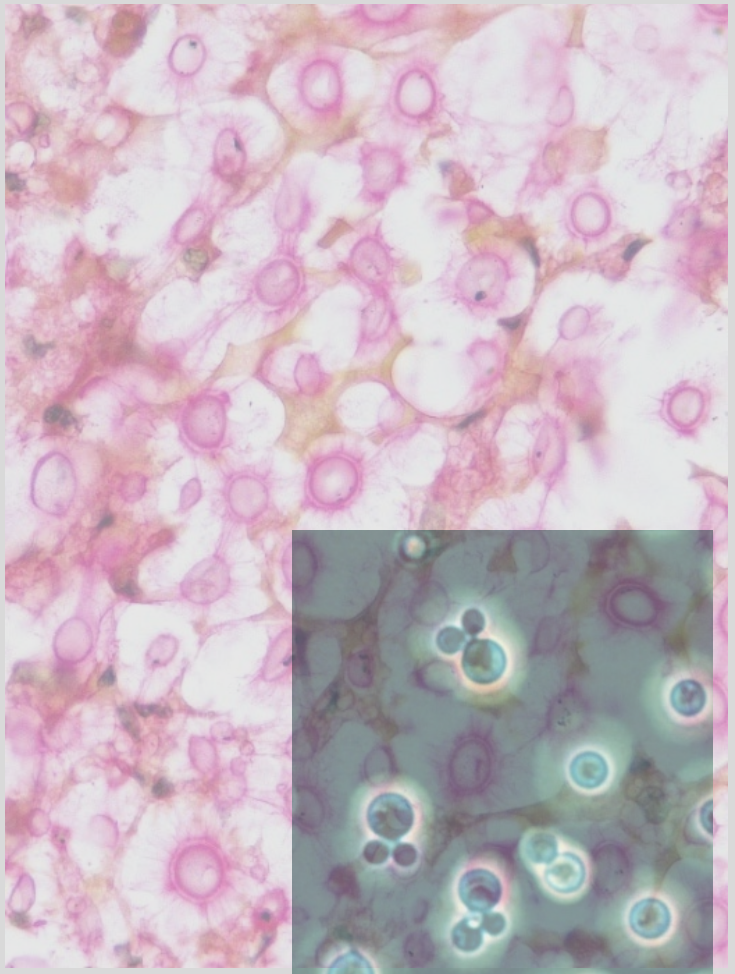


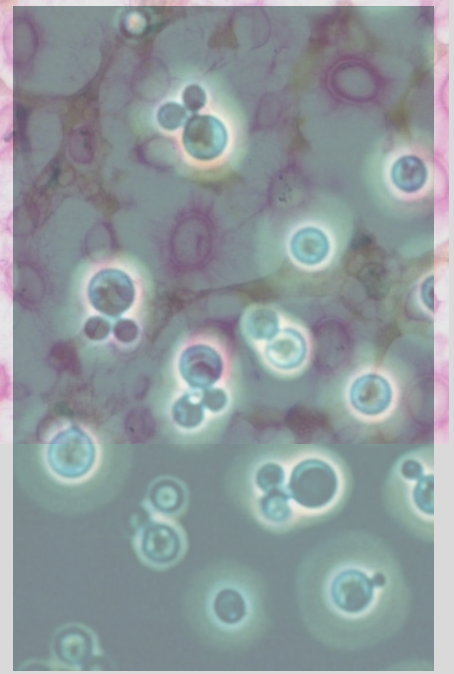
Candidiasis











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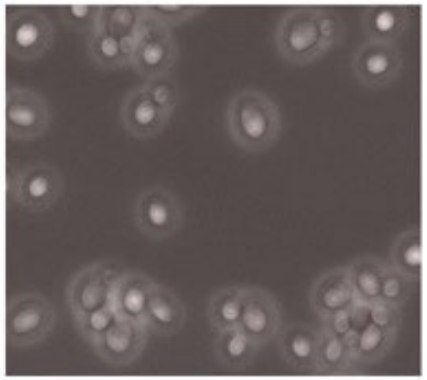
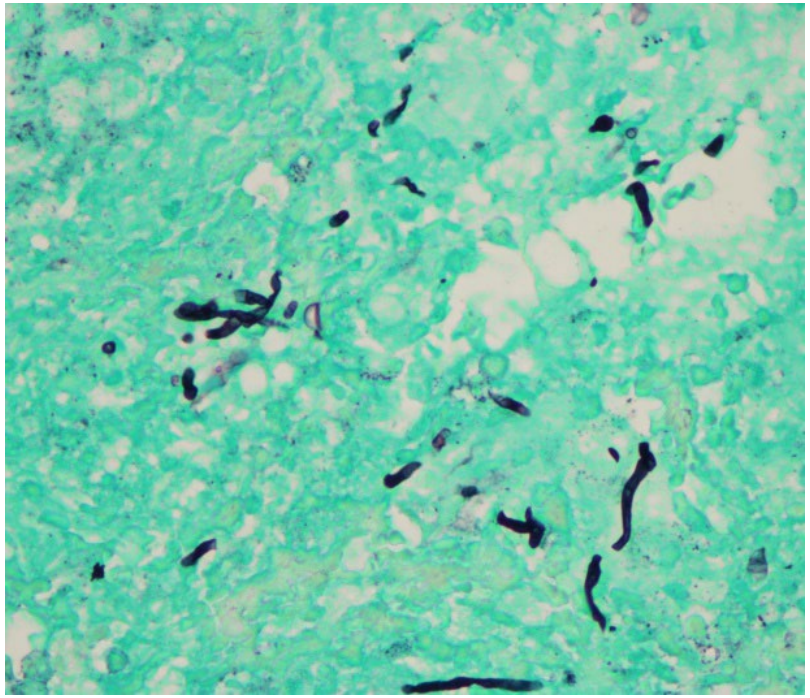
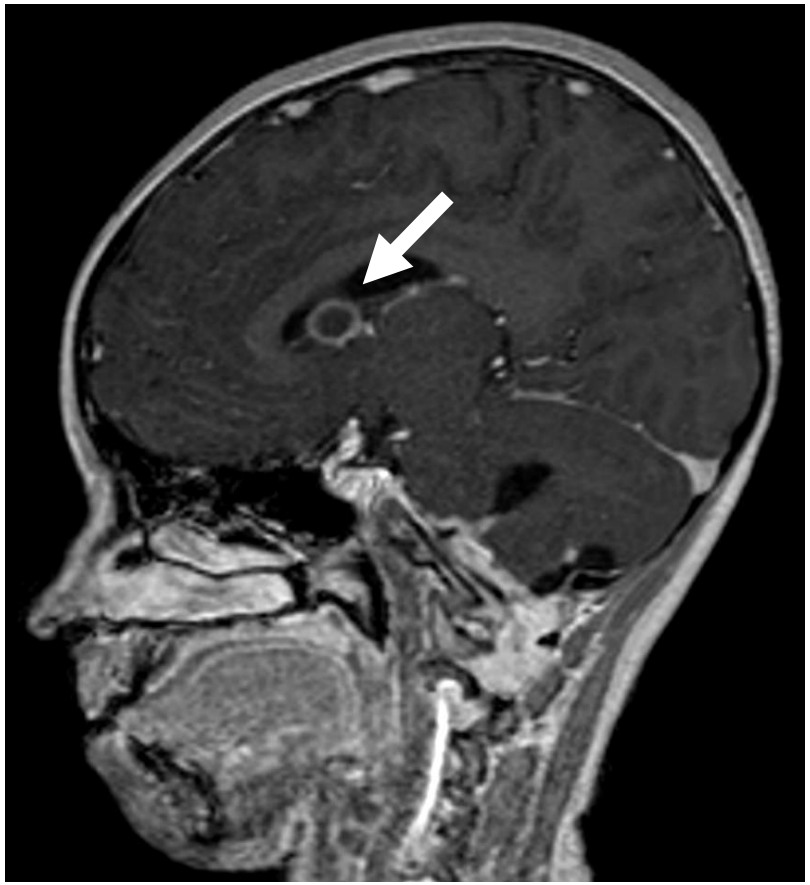
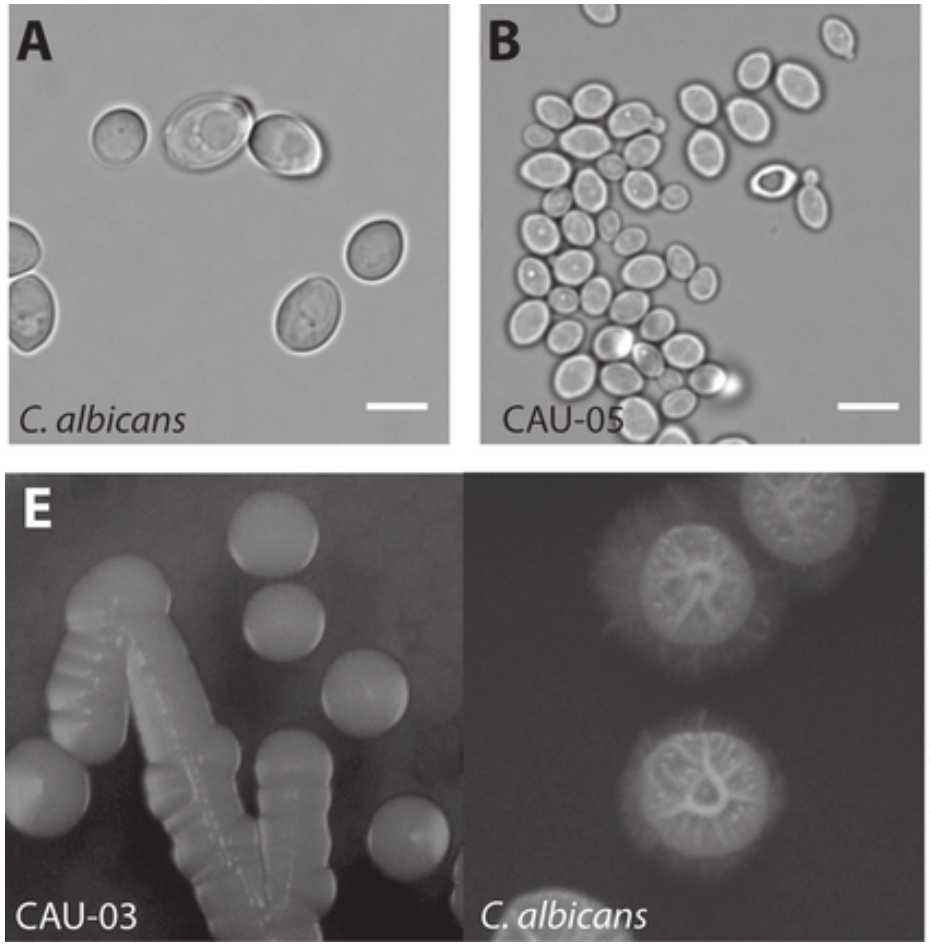




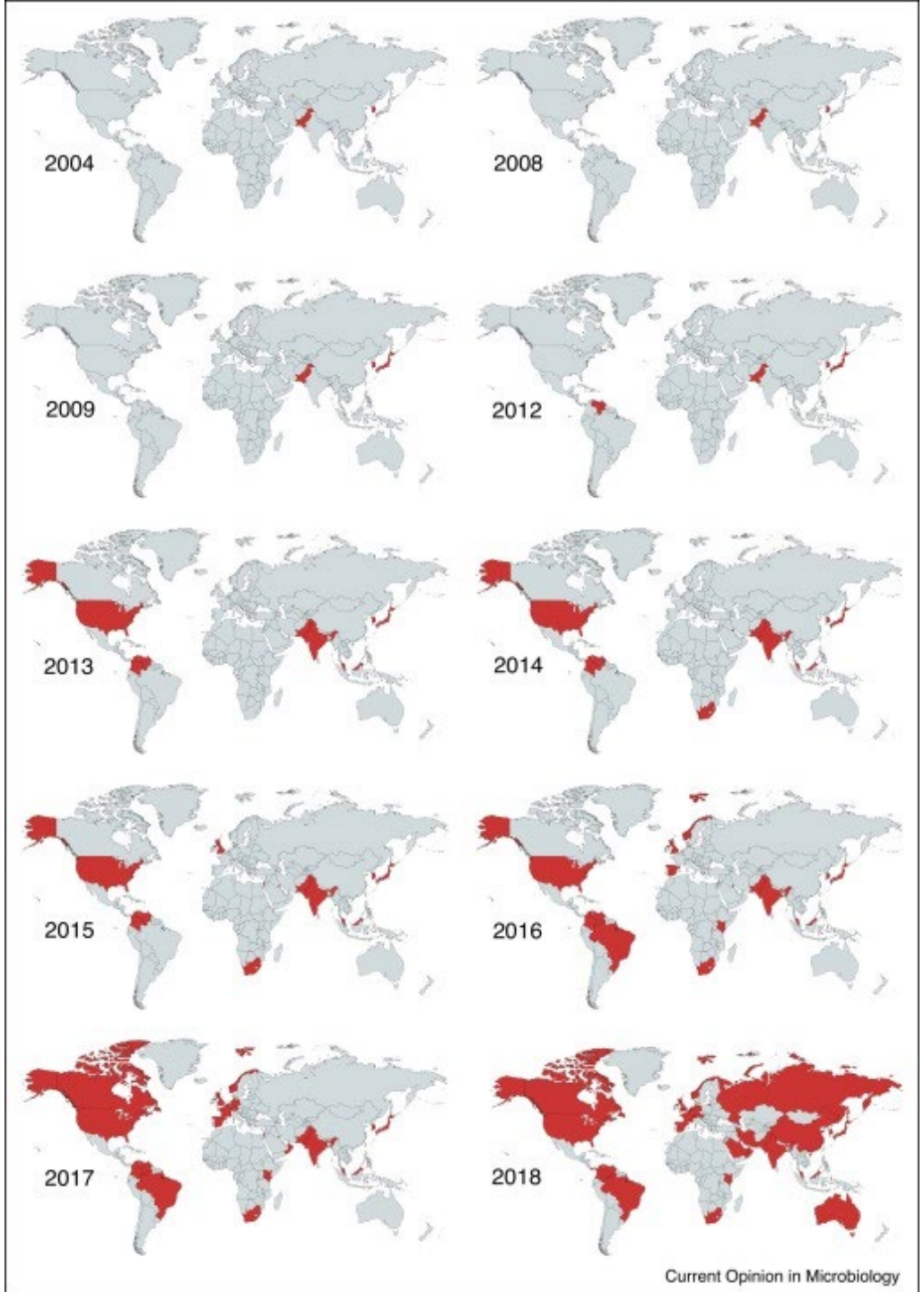


- *Candida albicans*, rise of non-*albicans* species
- ~350,000 patients per year
- Mortality rate: ~40%
- Chemotherapy, **neutropenia**, antibiotics, intravenous catheters

Candida auris: rise of the first fungal superbug

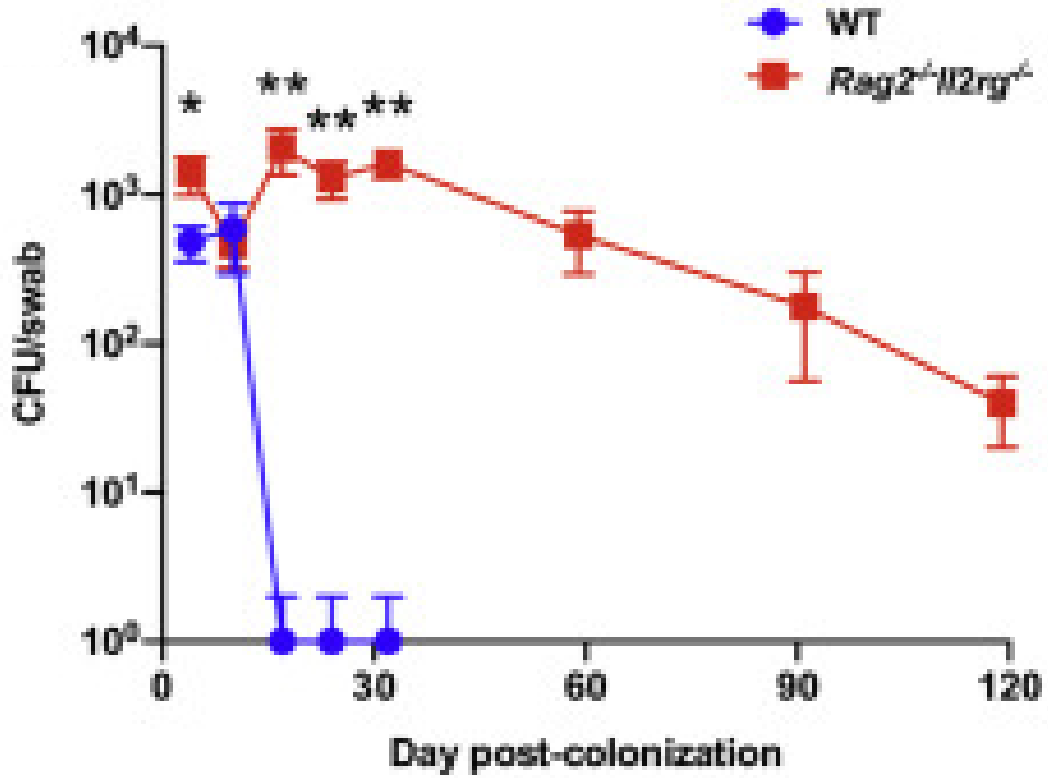


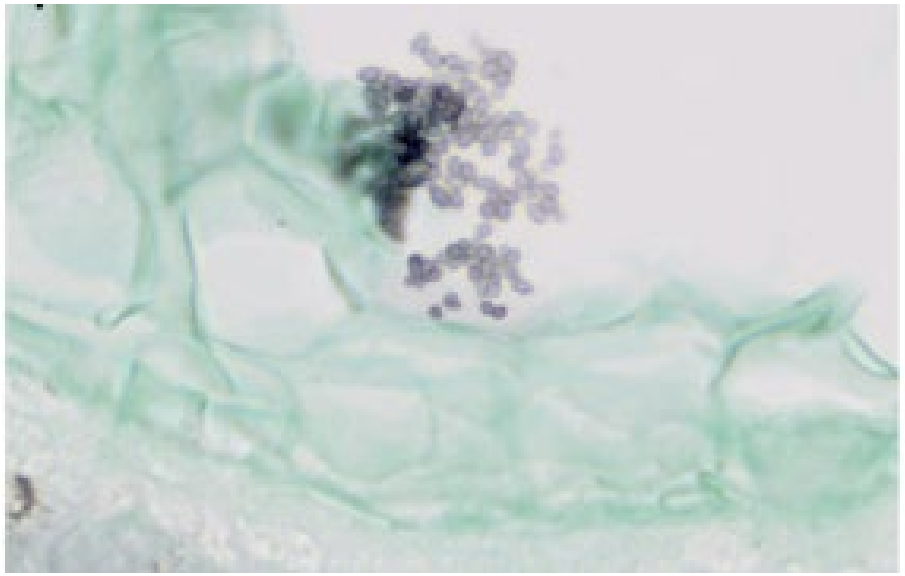
- *C. auris* grows up to 42C; this is unusual for fungus
- *C. auris* is naturally resistant to up to 3 classes of antifungal drugs
- This fungus colonises human skin
- Unlike other types of fungal infections, we see outbreaks and clusters of *C. auris* cases in care homes and hospitals

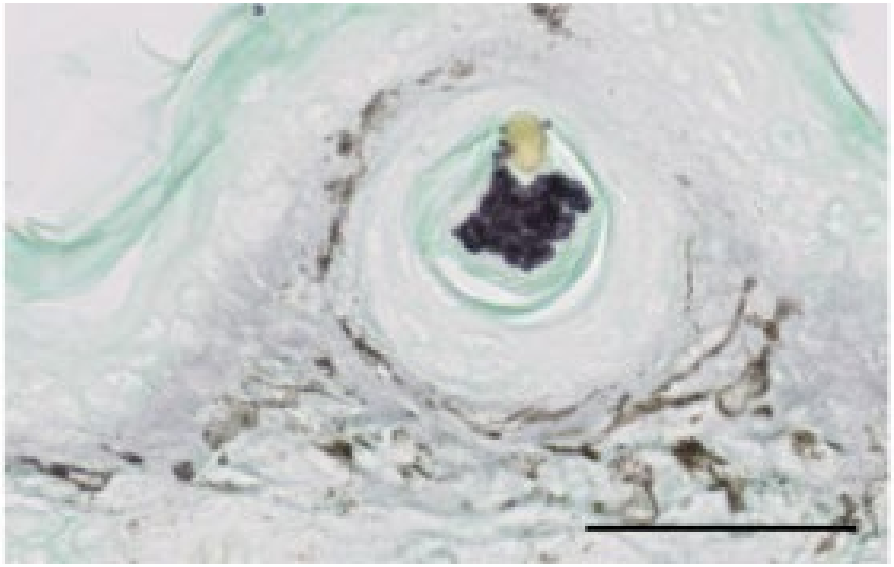


Countries in red = reports of *C. auris* cases

Candida auris resides on skin for long periods of time

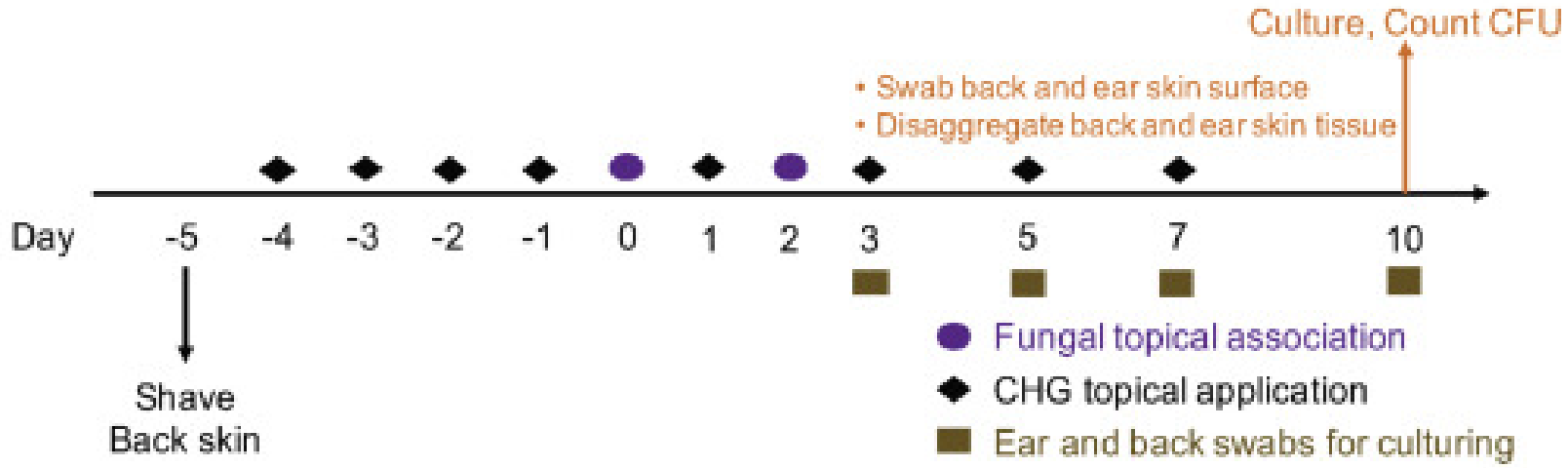


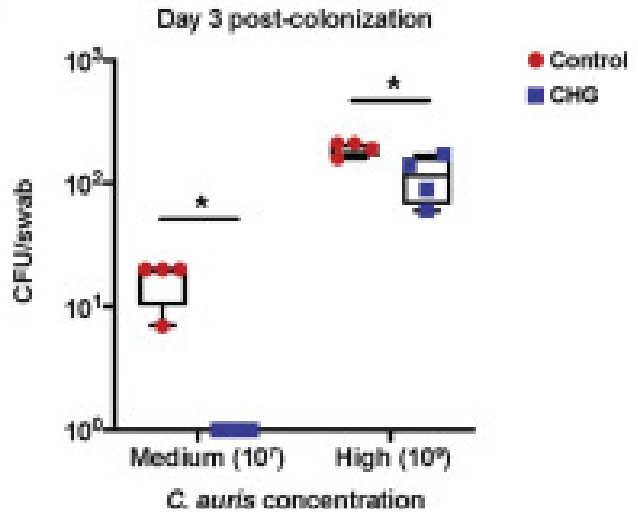


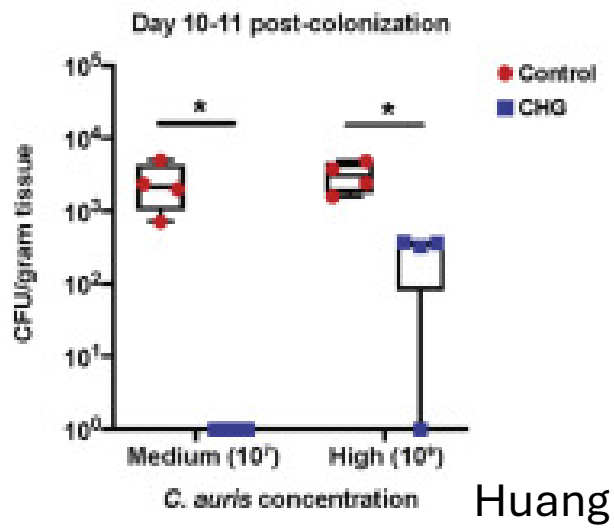


Huang et al 2021 Cell Host Microbe

Chlorhexidine wipes can help control *C. auris* spread







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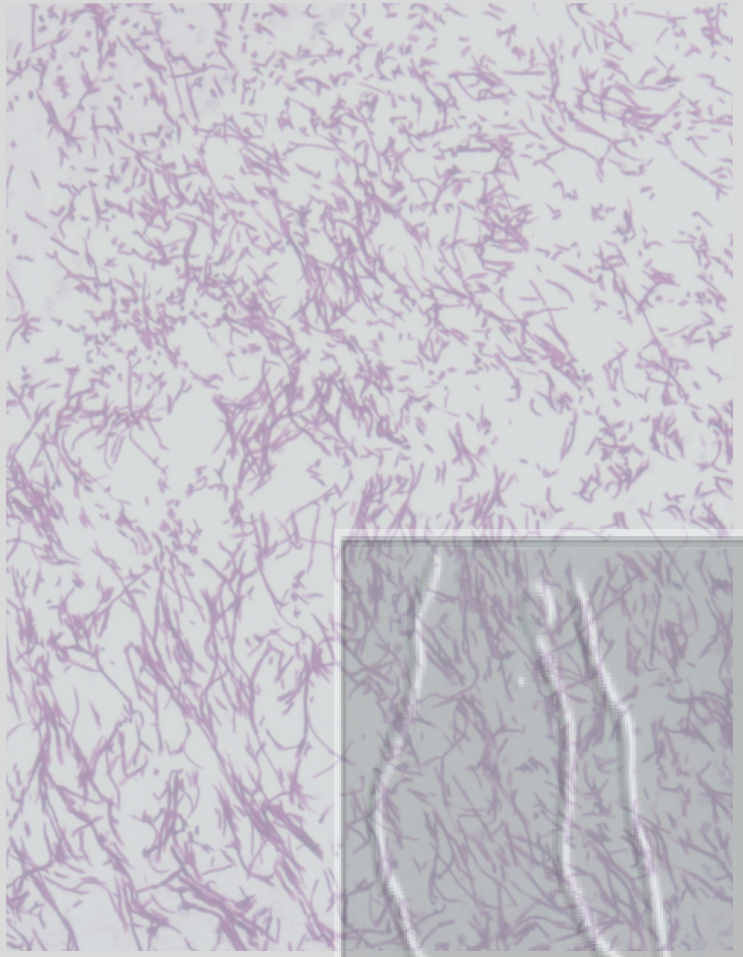
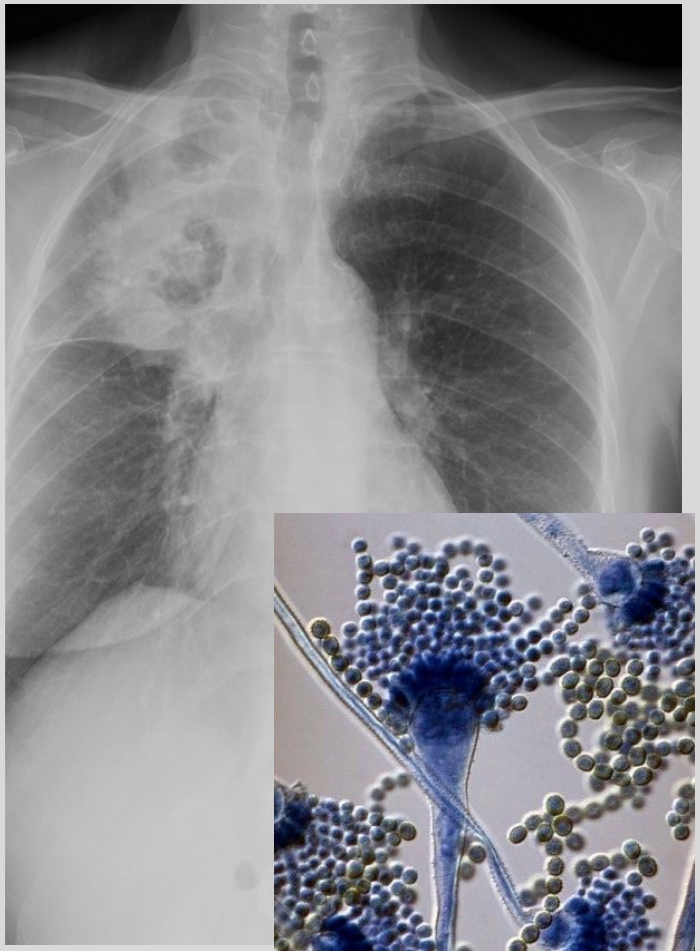
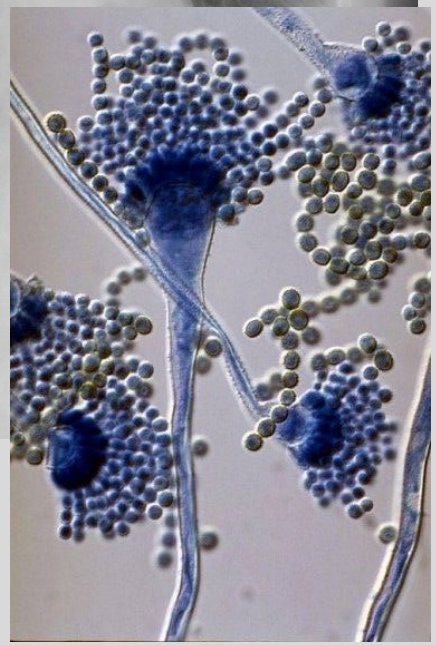
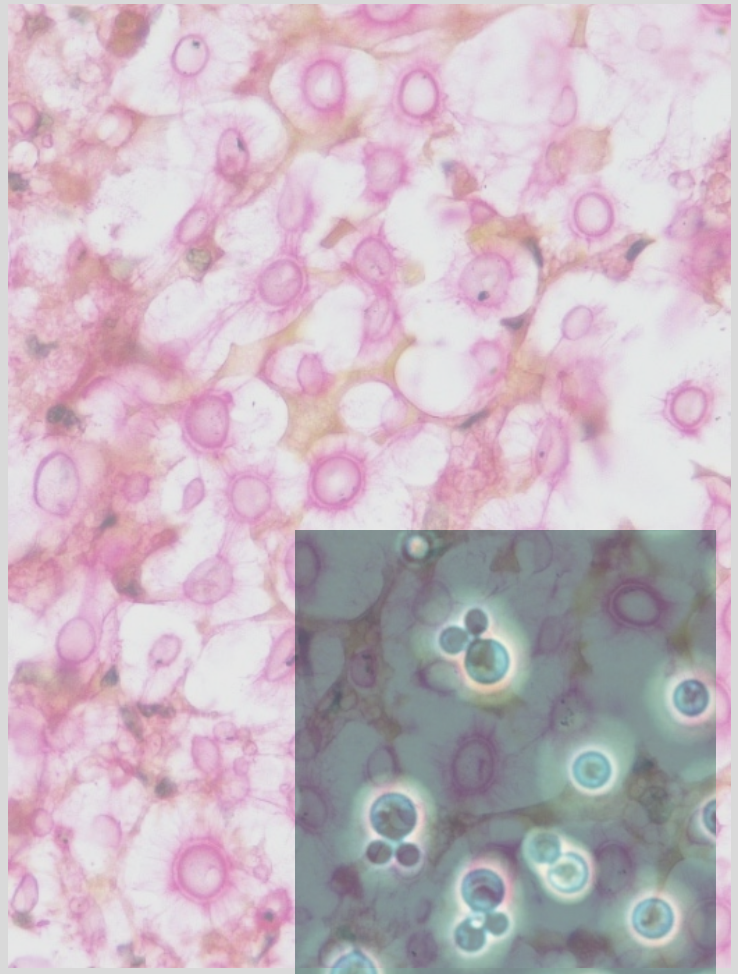
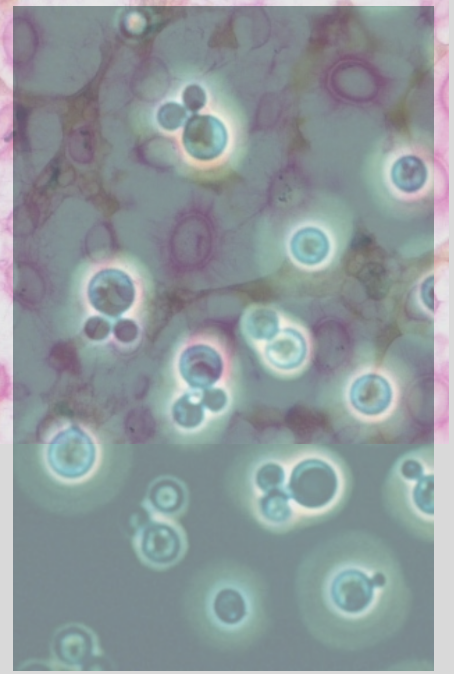
Aspergillosis & Pneumocystis











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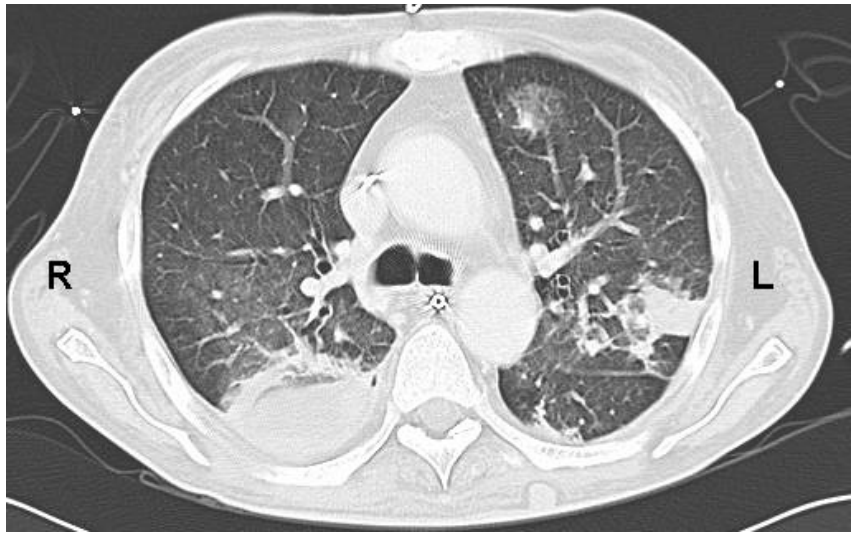
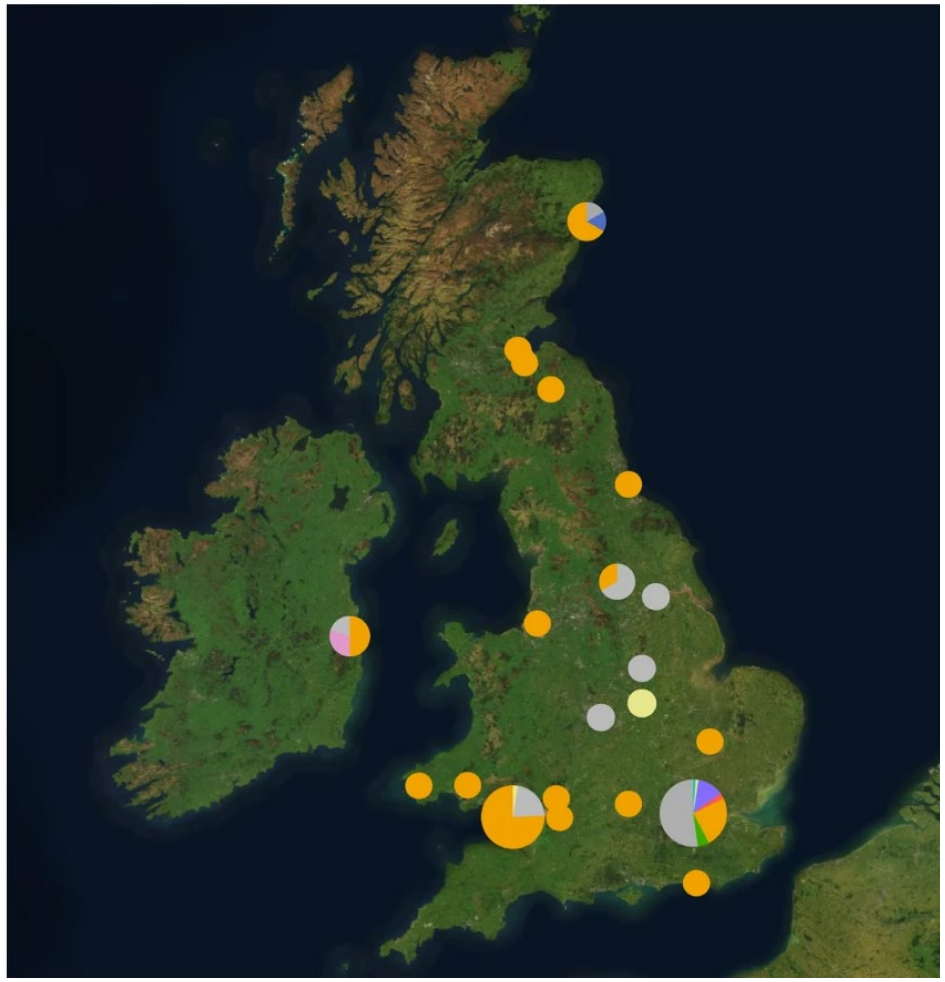


- *Aspergillus fumigatus, Pneumocystis jirovecii*
- 300,000 patients per year
- Mortality rate: 30-90%
- Risk factors: acute leukaemia, stem cell transplants, lung transplants, cystic fibrosis, prior lung pathology/problems

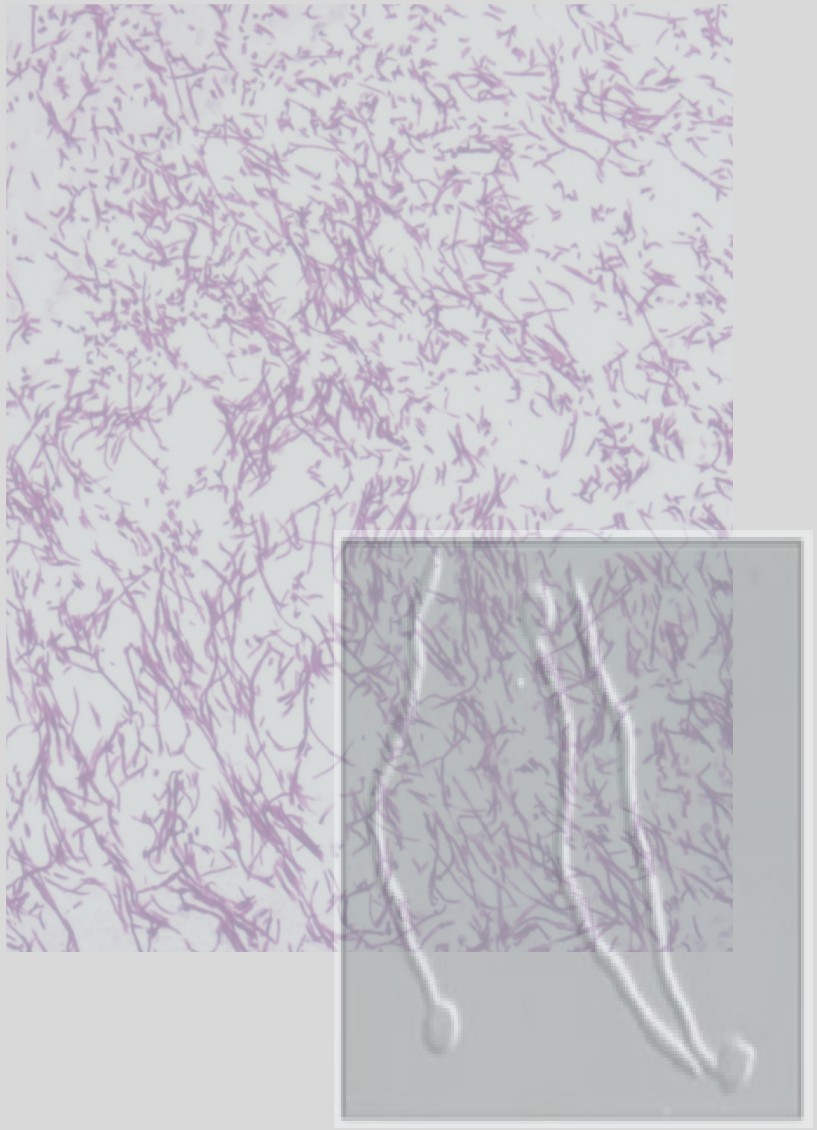
Drug resistance can be acquired in the environment

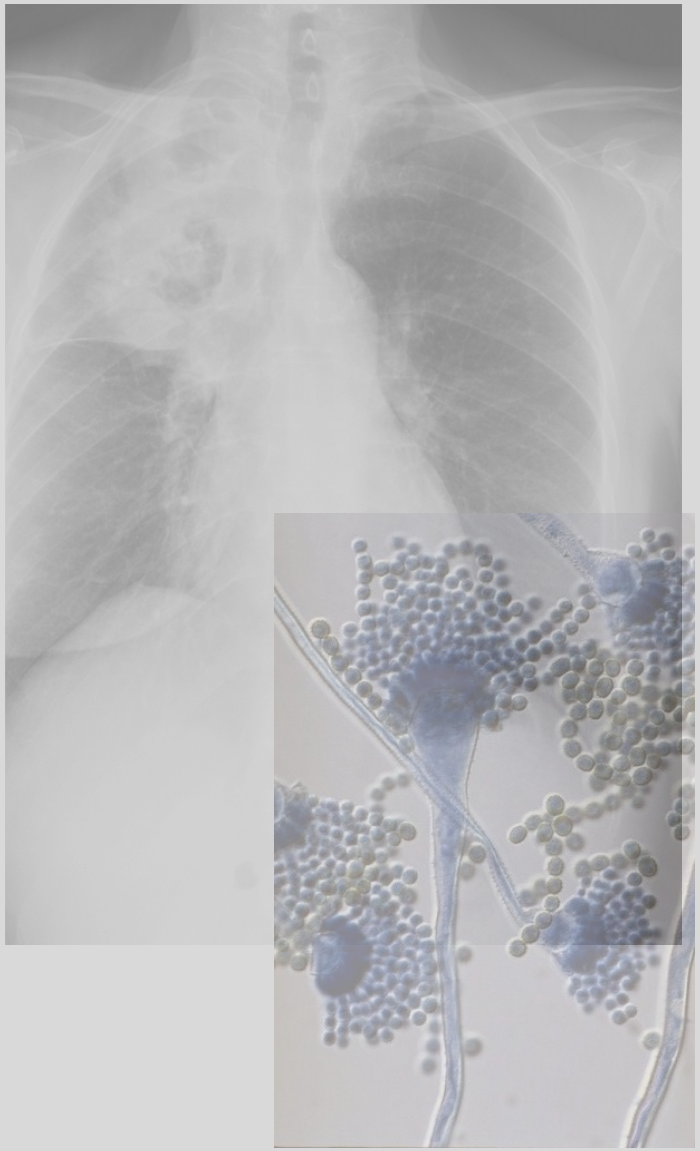


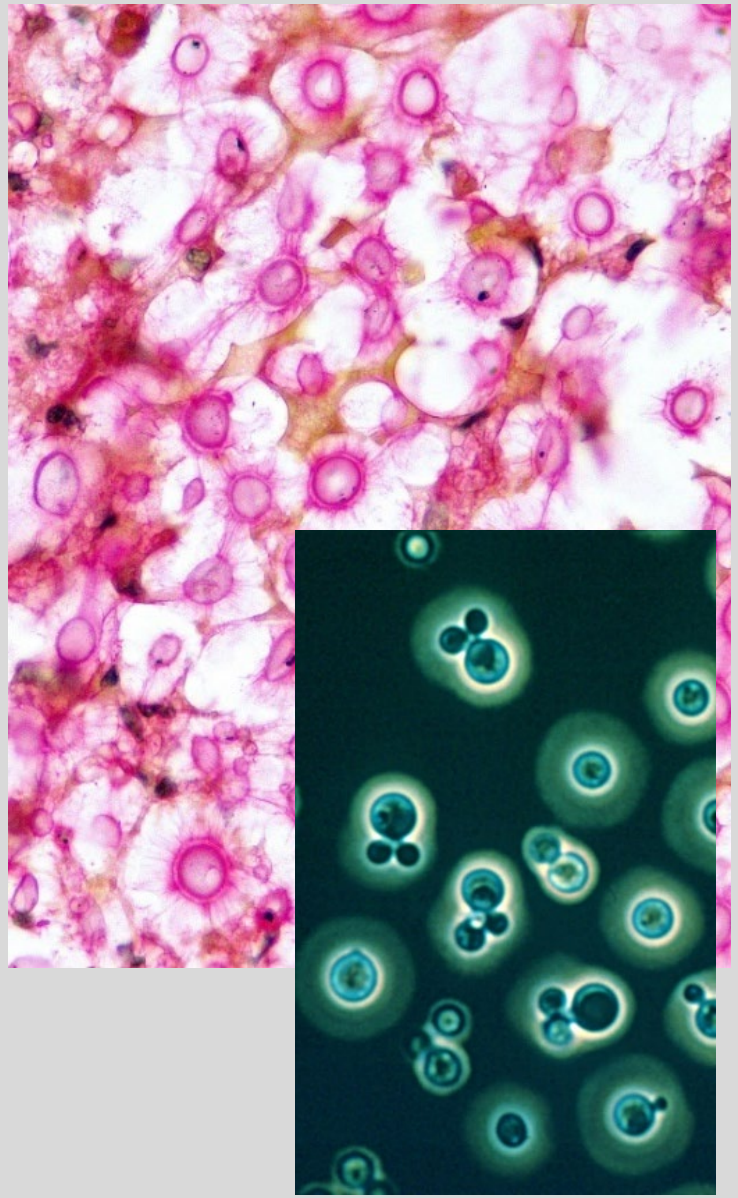
Rhodes et al 2022 Nature Microbiology

- Fungi can acquire mutations that make them resistant against antifungal drugs
- Environmental isolates of the fungus can carry the same mutations as we see in patients
- Wide-spread use of antifungals in agriculture is a contributing factor

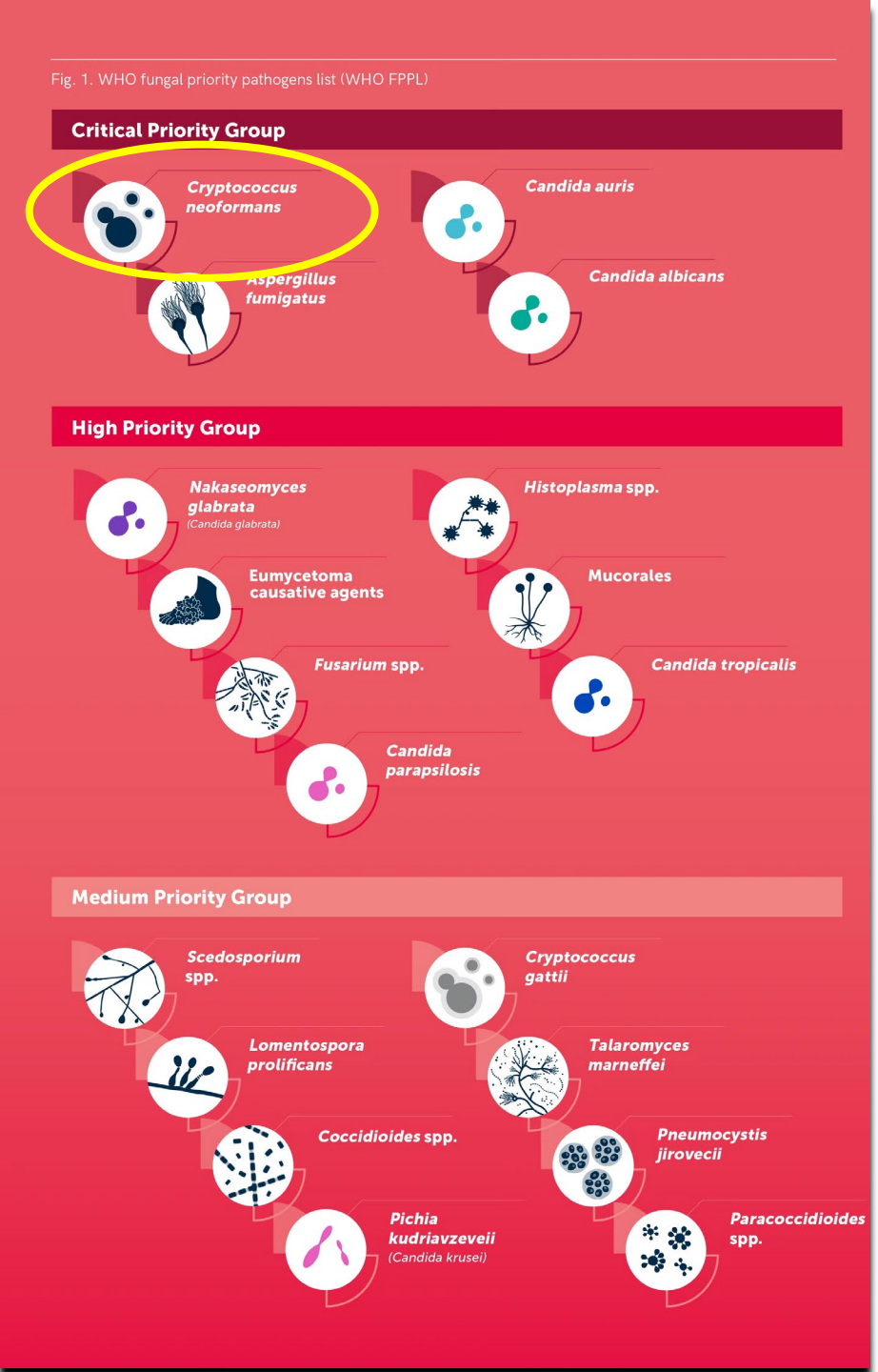
Cryptococcosis

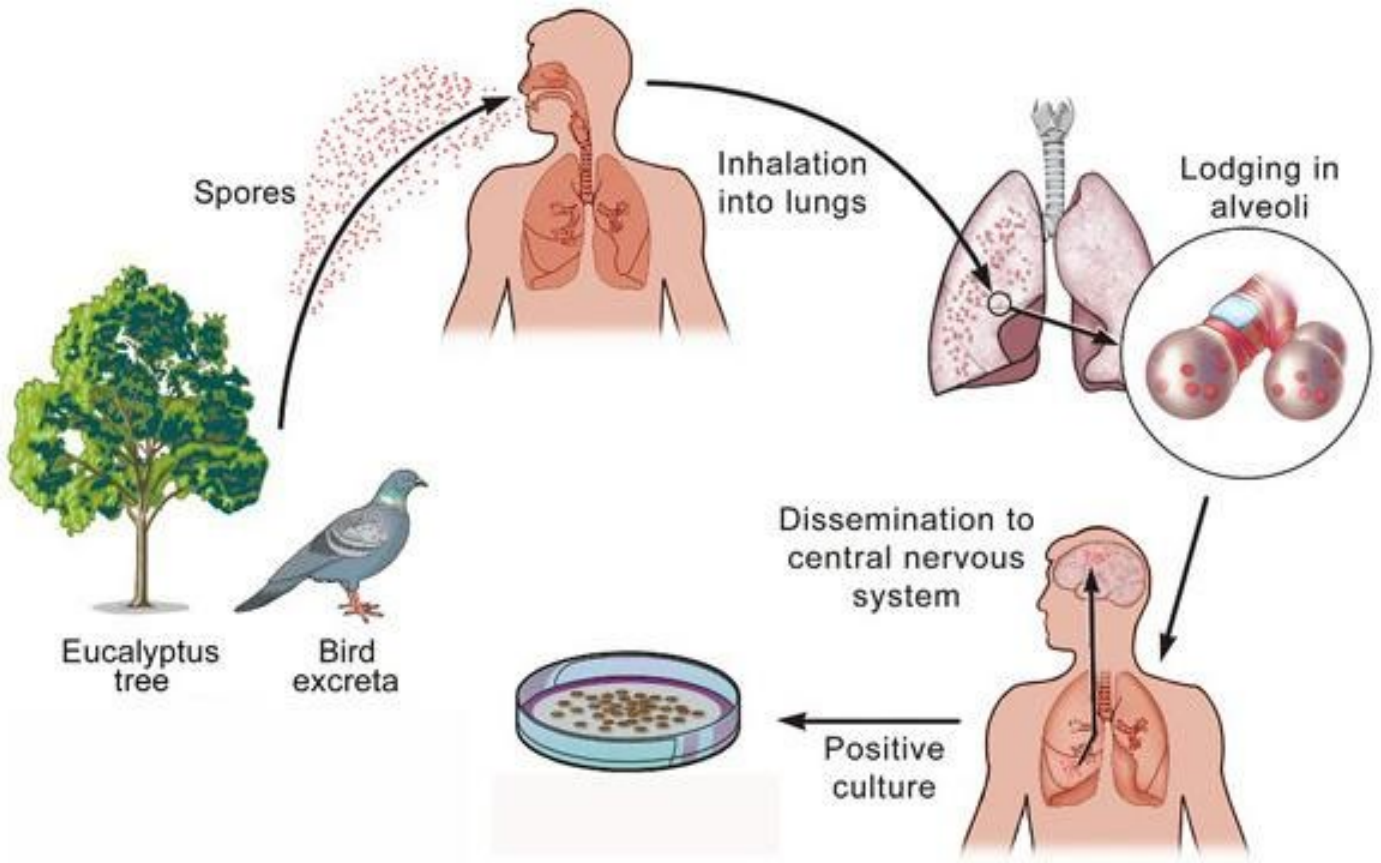




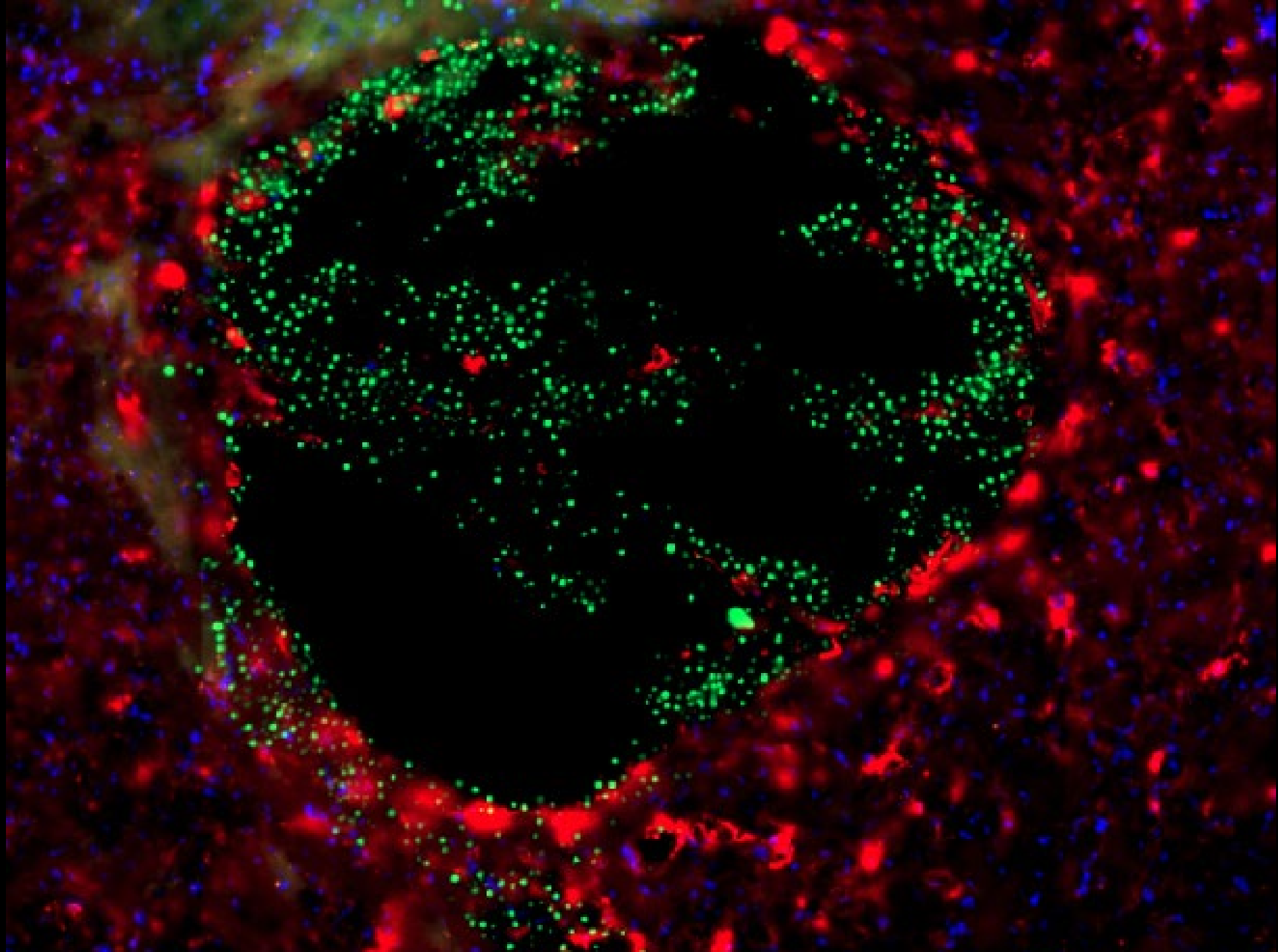


Cryptococcal Meningitis





- Kills 10-15% of HIV-infected patients
- 1 million cases every year
- Mostly in sub-Saharan Africa
- Increasing frequency in patients with cancer and transplants


Fungus
Immune cells
Nucelei (cells)

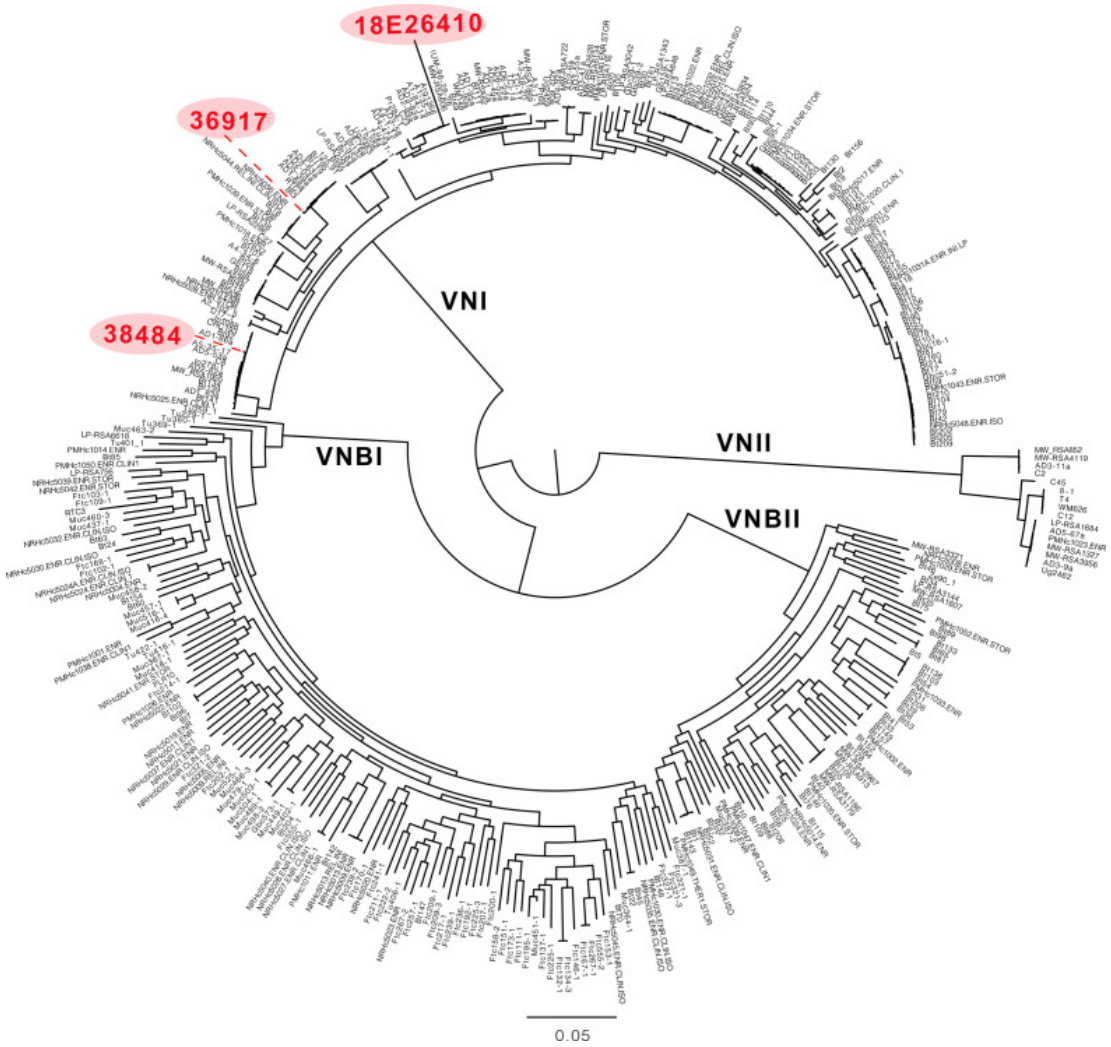
UK cases of cryptococcal meningitis – link with roosting pigeons?

Two dead after pigeon dropping infection at hospital

19 January 2019

BBC 2019

UK cases of cryptococcal meningitis – link with roosting pigeons?



Farrer 2021 Microb Genomics

Looking ahead

WIDER RANGE OF ANTIFUNGAL DRUGS

MORE RESEARCH AND INVESTMENT

INCREASED AWARENESS AND EDUCATION

Acknowledgements

Alanoud Alselami

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Sarah Fu

David Lecky

Lorna George

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Graham Anderson

Adam Cunningham

Robin May

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Wei Lu

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Rachael Dangarembizi (Uni of Cape Town)

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