

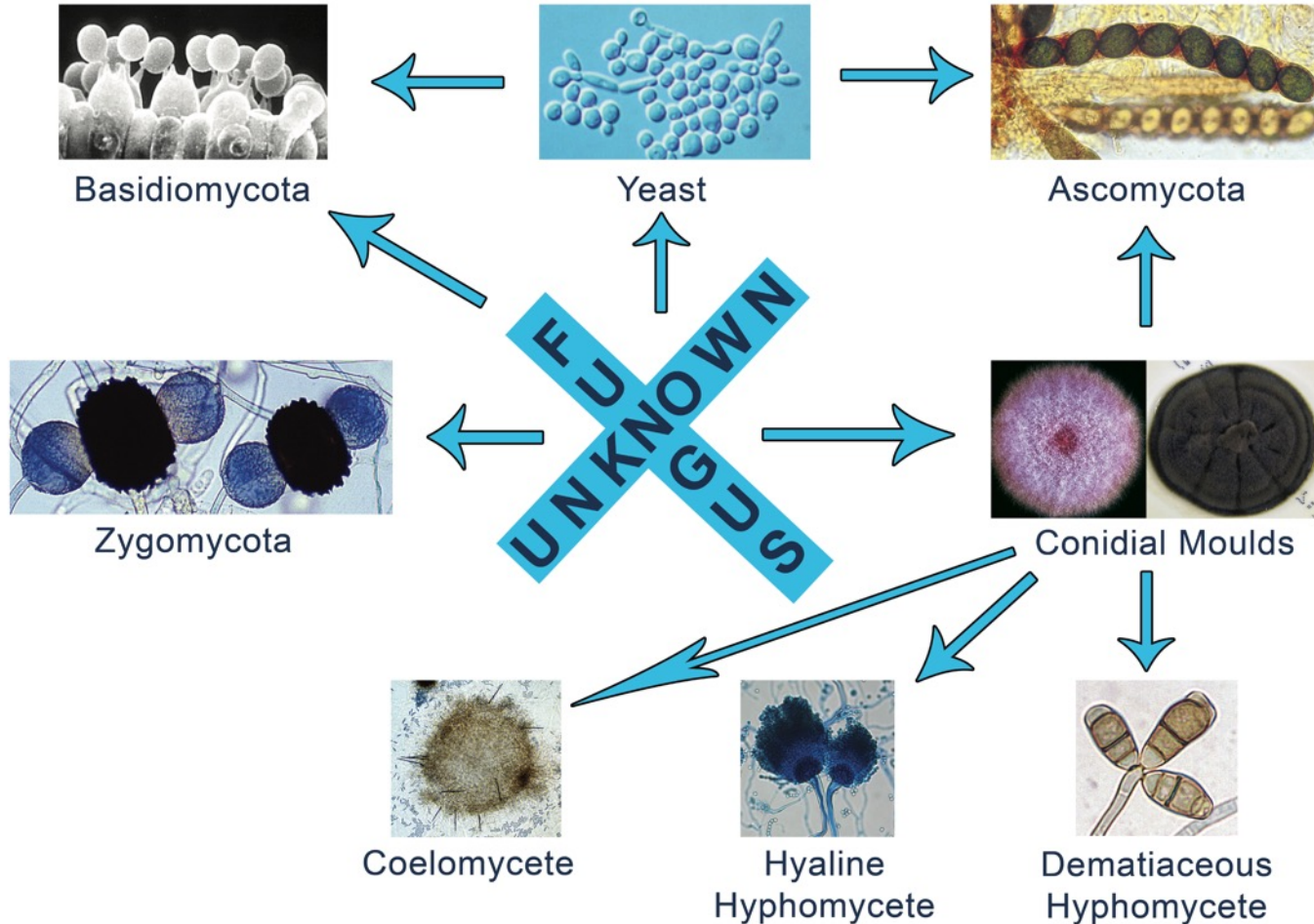
Phenotypic Identification of Conidial Moulds

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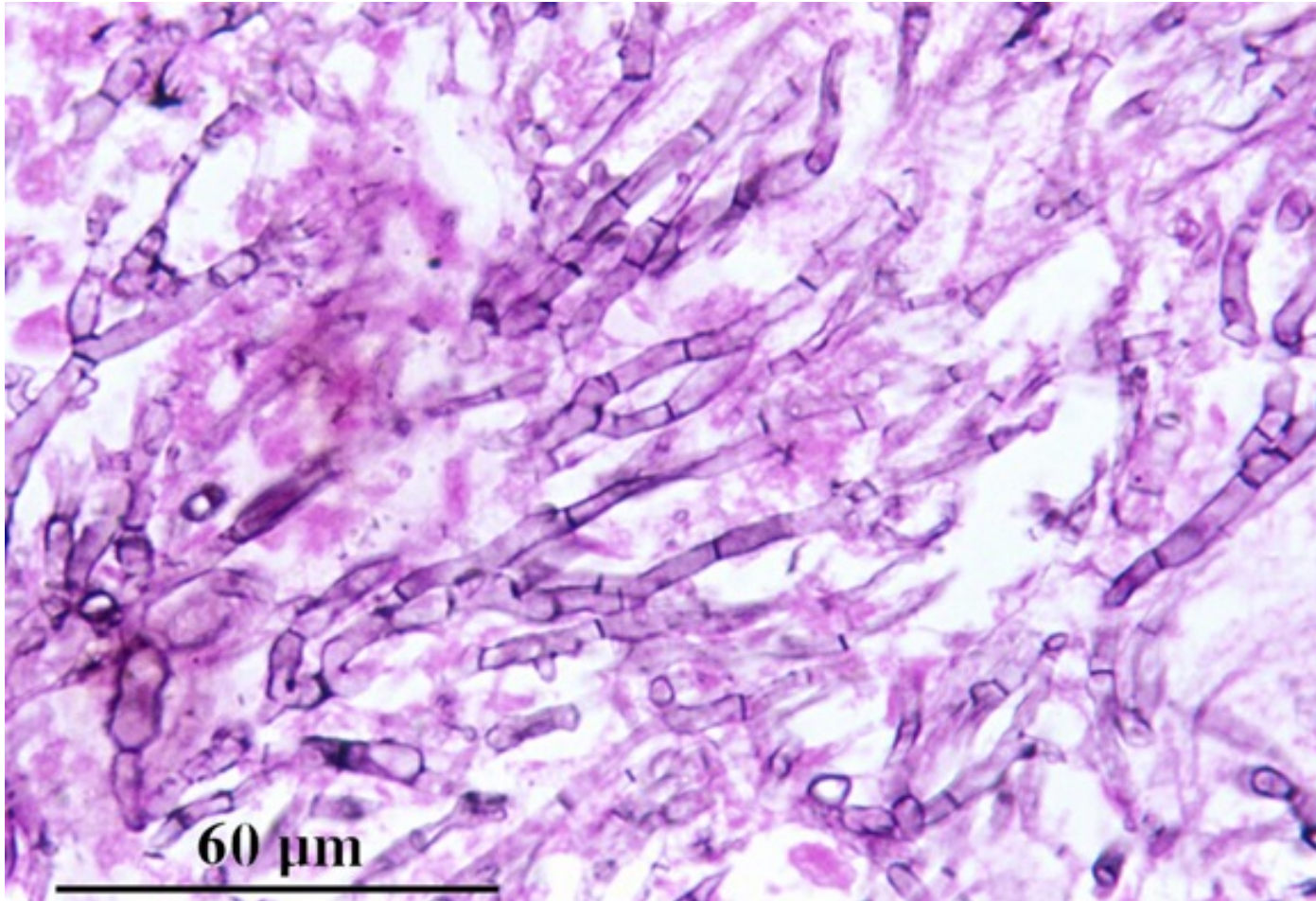
Identification of Medically Important Fungi



Ascomycota: the ascomycetes

- Sac fungi, cup fungi, earth tongues, cramp balls, dung buttons, truffles etc. Also most common conidial moulds [hyphomycetes].
- Saprobes, parasites (esp. of plants), or lichen forming, mostly terrestrial; cosmopolitan (50 orders, 275 families, 3328 genera, 32,325 spp).
- Septate hyphae with simple pores.
- Asexual reproduction by conidia.
- Sexual reproduction by ascospores, typically eight, in an ascus. Asci are often housed in a fruiting body or ascocarp e.g. cleistothecia or perithecia.

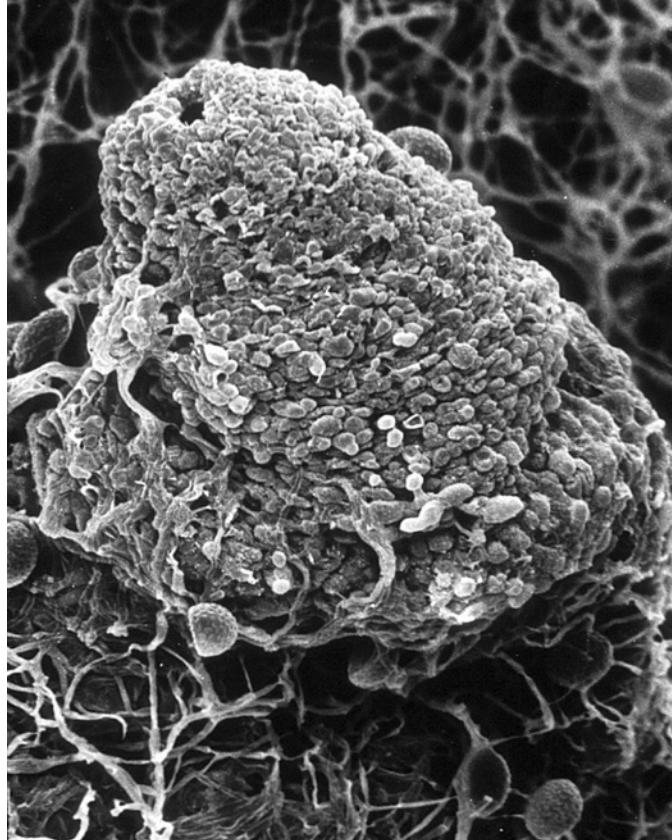
Septate hyphae of *Aspergillus* in lung tissue.



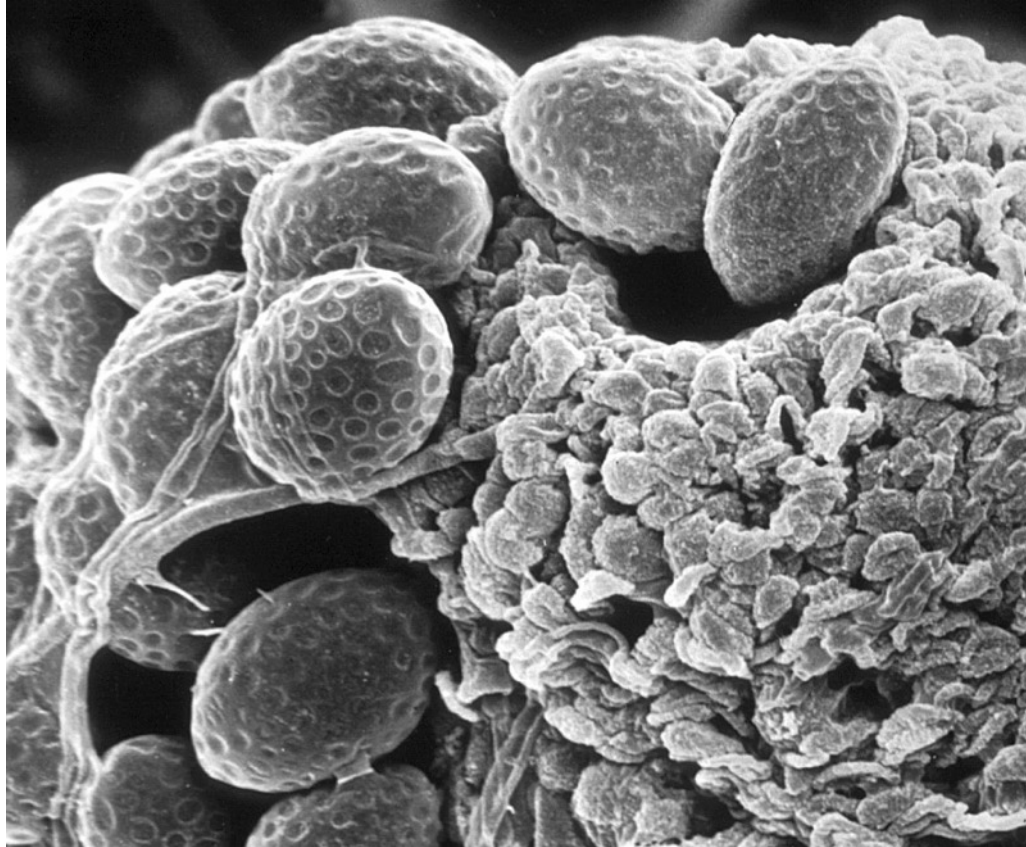
Ascus - 8 ascospores

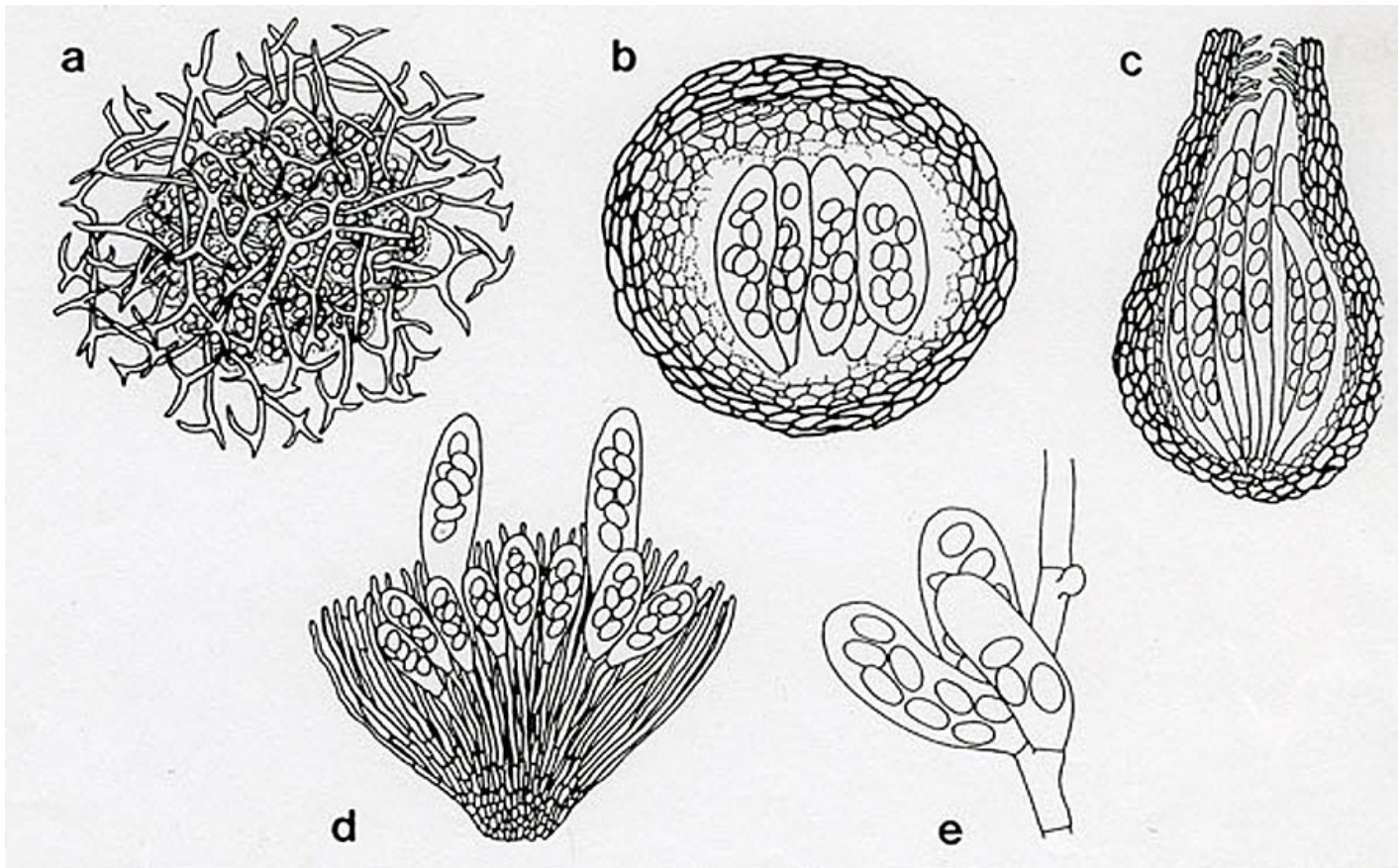


**Perithecium an
ostiolate ascocarp.**



Ascospore release.





(a) Gymnothecium, (b) Cleistothecium,
(c) Perithecium, (d) apothecium, (e) naked asci

Identification of Conidial Moulds

- Mandatory to see microscopic conidial characteristics to make an identification.
- Need a good slide preparation [needle mounts, tape mounts, slide cultures].
- Need a good microscope!
- May also need to stimulate sporulation by using different media like PDA and CMA.

Identification of Hyphomycetes

Culture Characteristics

Least reliable as the media and growth conditions play an important part.

- Surface texture [glabrous, suede-like, powdery, granular, fluffy, downy, cottony etc].
- Surface topography [flat, raised, heaped, folded, domed, radial grooved].
- Surface and reverse pigmentation [white, cream, yellow, brown, green, grey, black etc].
- Growth rate [colony growth < 5 mm in 14 days etc].
- Growth temperature studies [37, 40, 45C].

Culture Characteristics - *Trichophyton*



Surface texture, topography, pigmentation (including the reverse) and growth rate.

Identification of Hyphomycetes

Microscopic Morphology

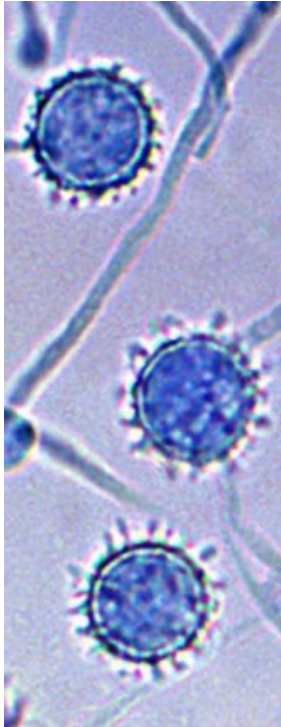
1. Conidial characteristics.

- Septation [amero, didymo, phragmo, dictyo].
- Shape [spherical, subspherical, pyriform, clavate, ellipsoidal etc].
- Size [need graduated eye piece, >10um etc].
- Colour [hyaline or darkly pigmented].
- Wall texture [smooth, rough, verrucose, echinulate etc].
- How many conidial types present?

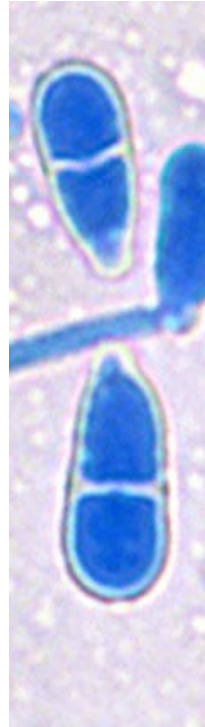
Conidial characteristics

Septation, Shape, Size, Colour, Wall Texture

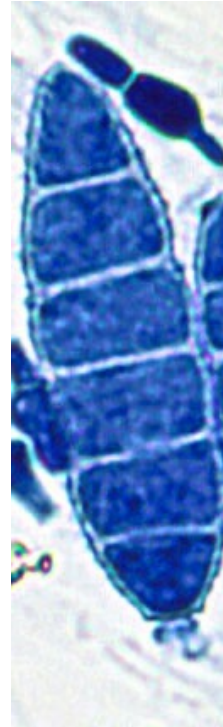
ameroconidia
1-celled



didymoconidia
2-celled



phragmoconidia
multi-celled
transverse
septa only



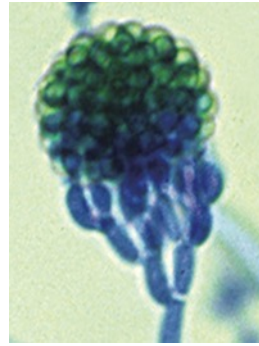
dictyoconidia
multi-celled
transverse &
longitudinal septa



Identification of Hyphomycetes

Microscopic Morphology

2. Arrangement of conidia as they are borne on the conidiogenous cells.
 - Solitary [single or in balls].



- Catenulate – in chains [acropetal or basipetal].

Arrangement of conidia

“acropetal” conidial chains – youngest at tip



Cladophialophora



Cladosporium

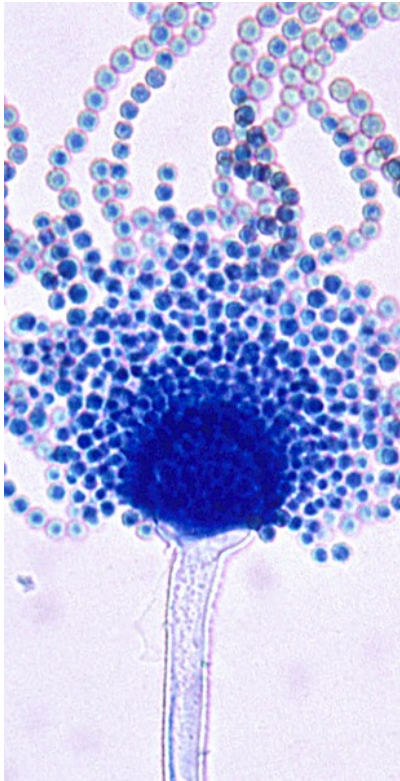


Alternaria



Arrangement of conidia

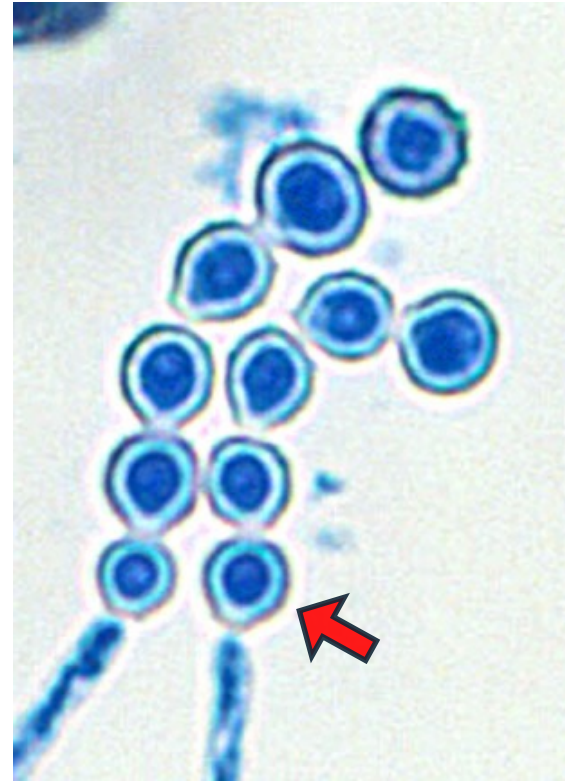
“basipetal” balls and chains – youngest at the base



Aspergillus



Wangiella



Scopulariopsis

Identification of Hyphomycetes

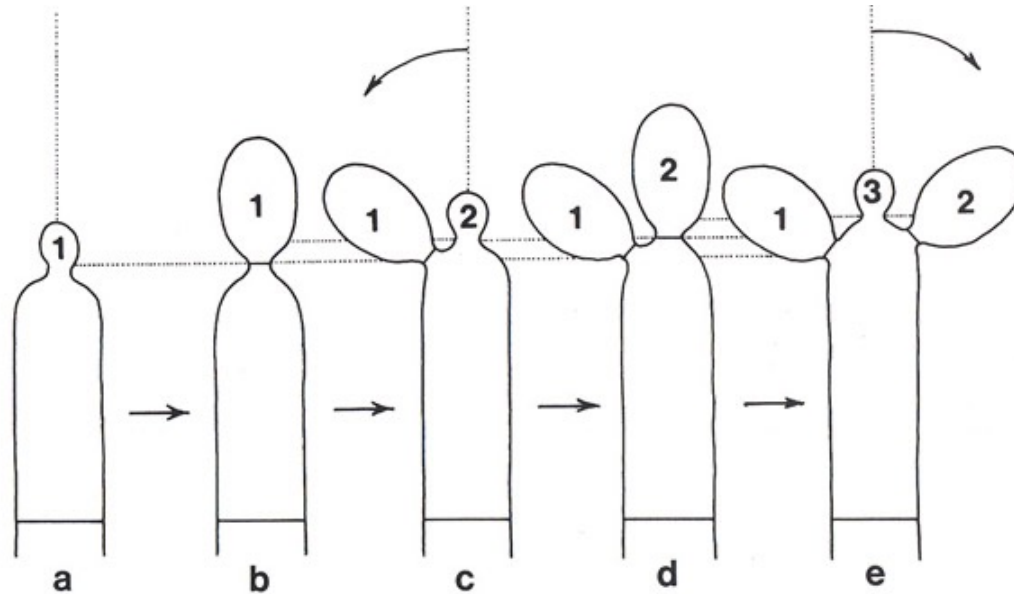
Microscopic Morphology

3. Growth of the conidiogenous cell.
- Determinant - no growth



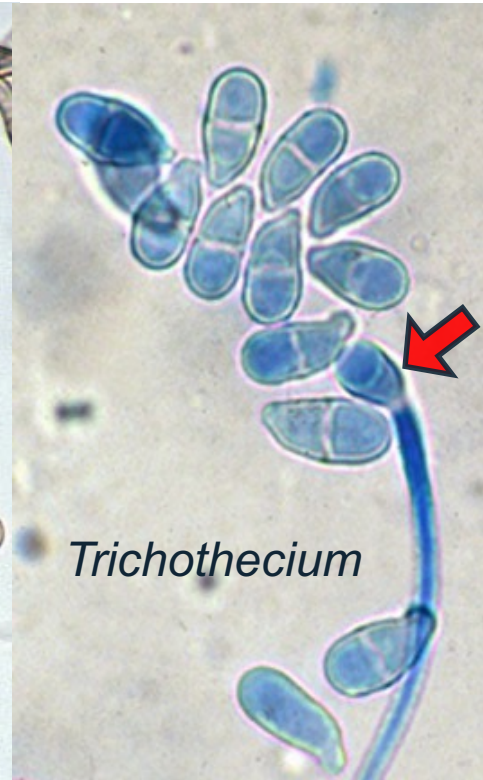
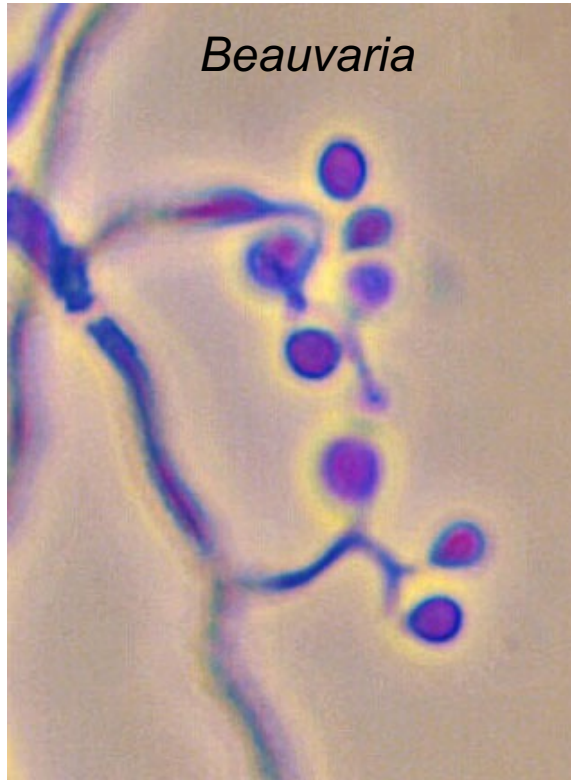
- Sympodial - development of conidia on a geniculate or zig-zag rachis

Sympodial conidiogenesis



Sympodial development
narrow base = rachiform
broad base = raduliform

**Retrogressive
growth of the
conidiogenous cell**



Identification of Hyphomycetes

Microscopic Morphology

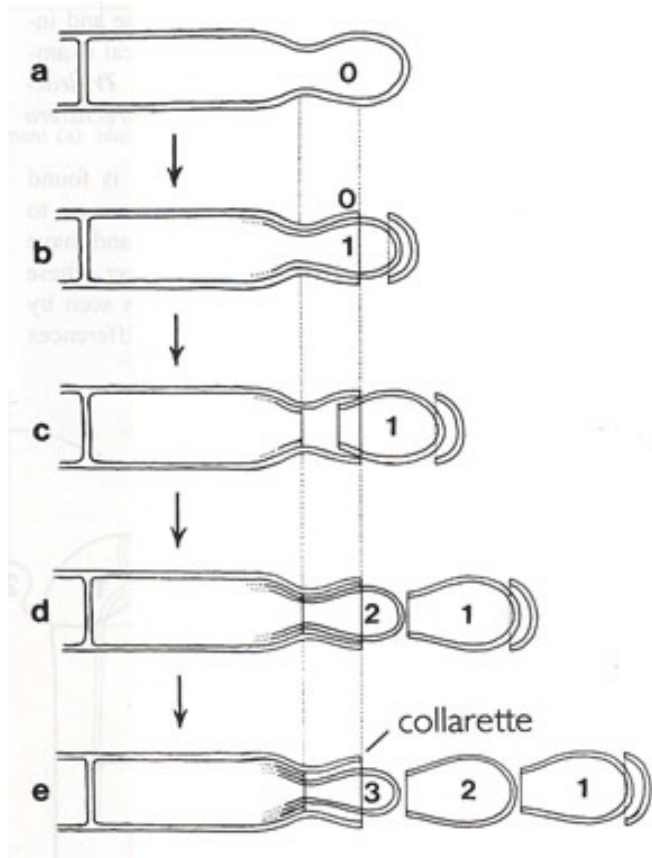
4. Type of conidiogenous cell present.

- Non-specialised

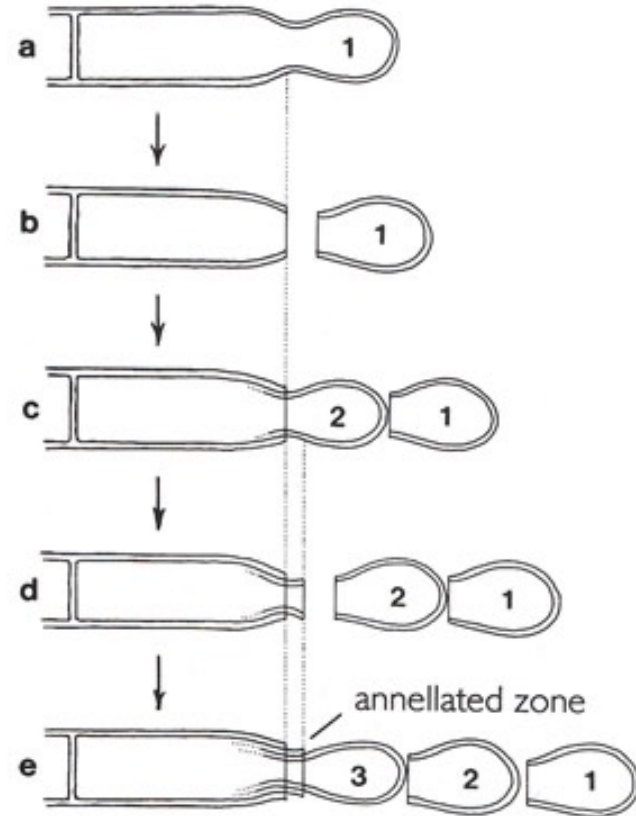


- Phialide
- Annellide

Phialidic

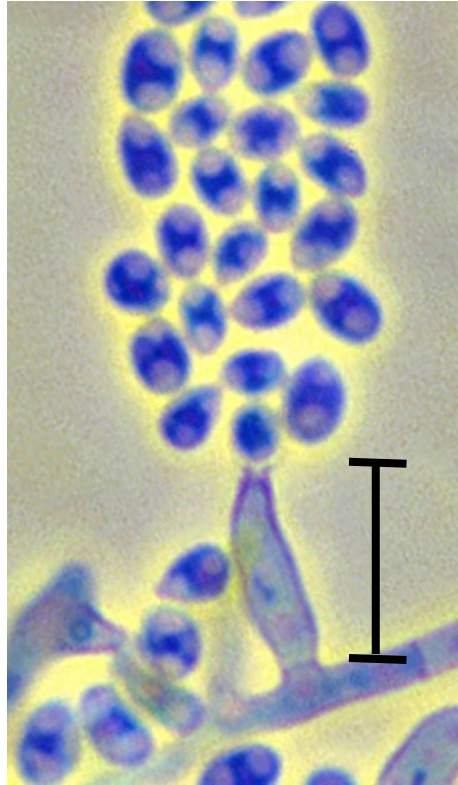


Annellidic

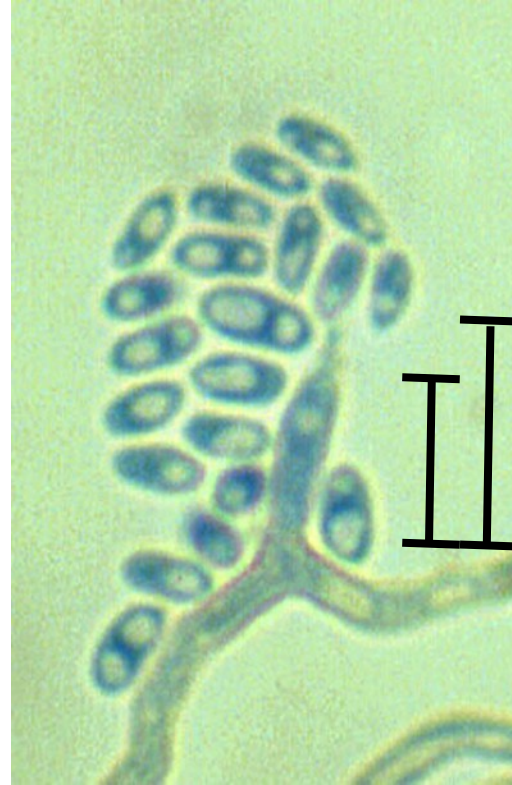


Phialides vs Annelides

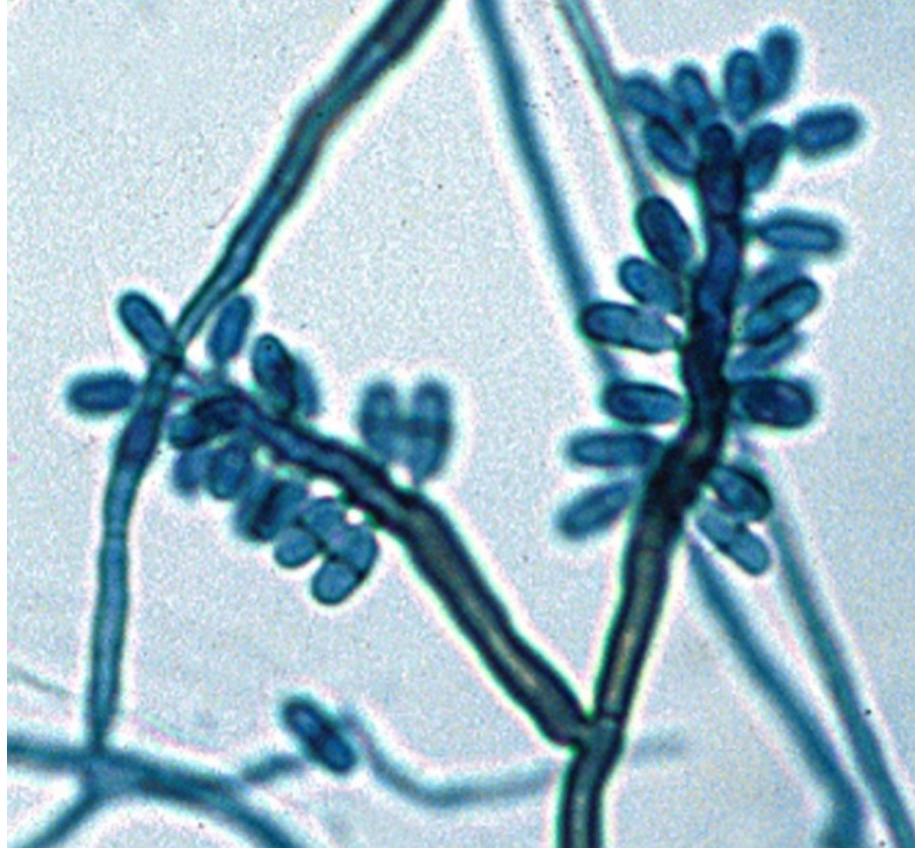
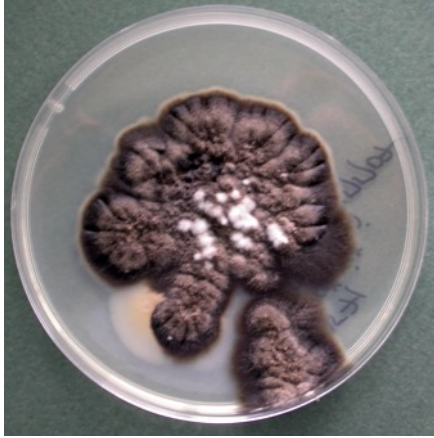
Phialophora

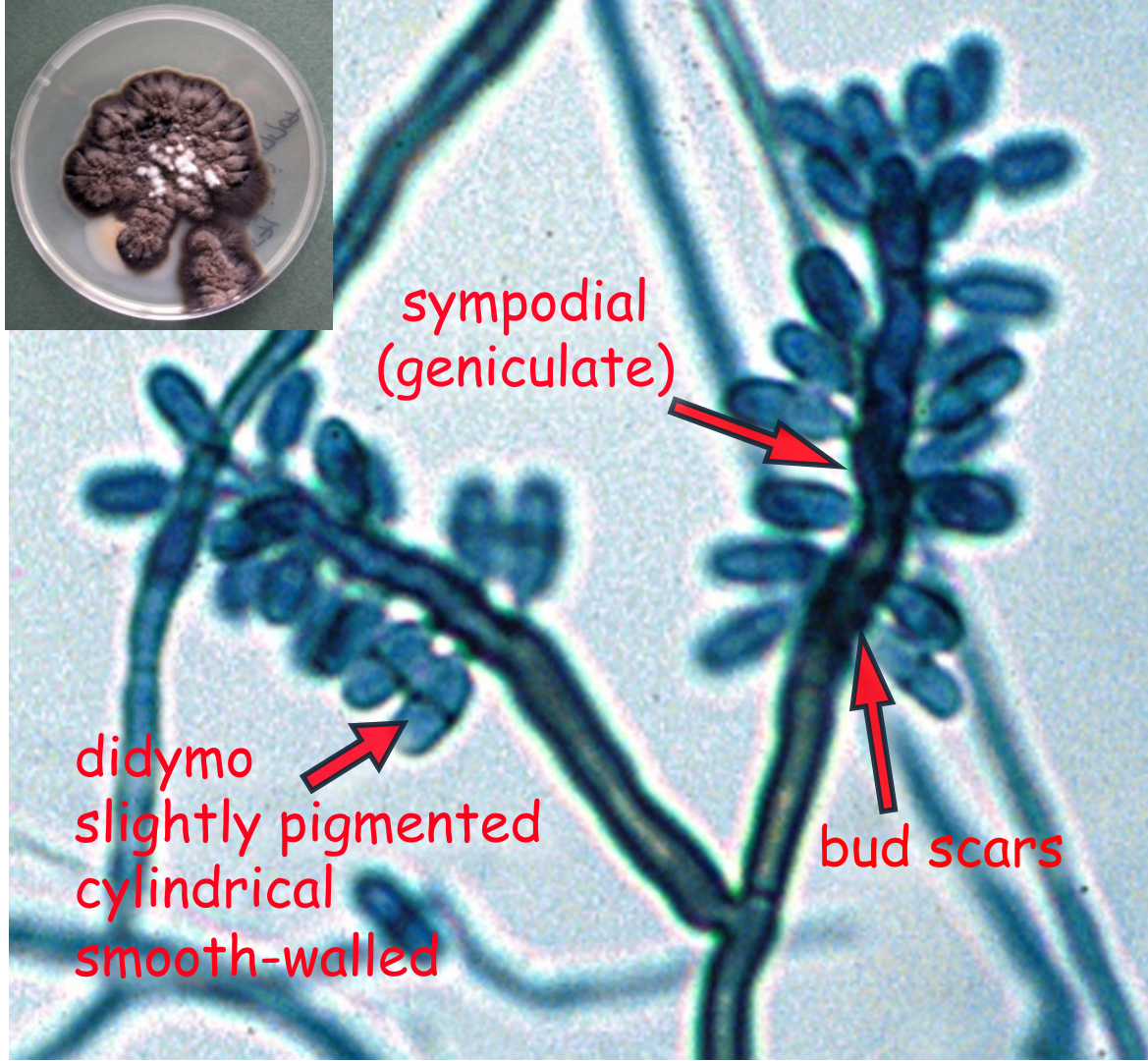


Exophiala



What are my key characters?





sympodial
(geniculate)

didymo
slightly pigmented
cylindrical
smooth-walled

bud scars

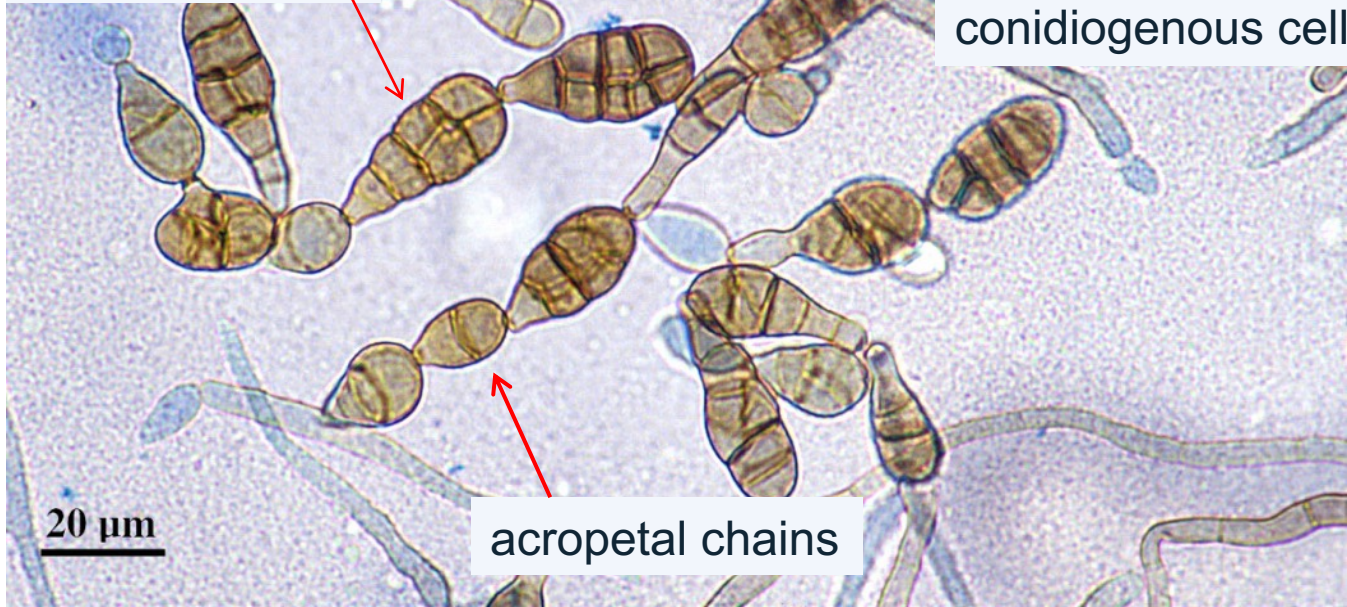
What are my key characters?



dictyoconidia
obovate
large >10 μm
pigmented
smooth-walled



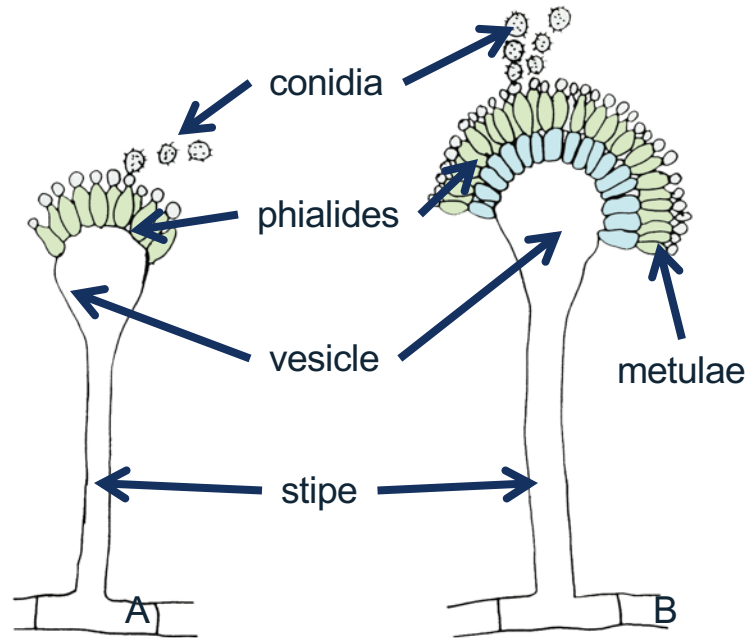
No growth of
conidiogenous cell



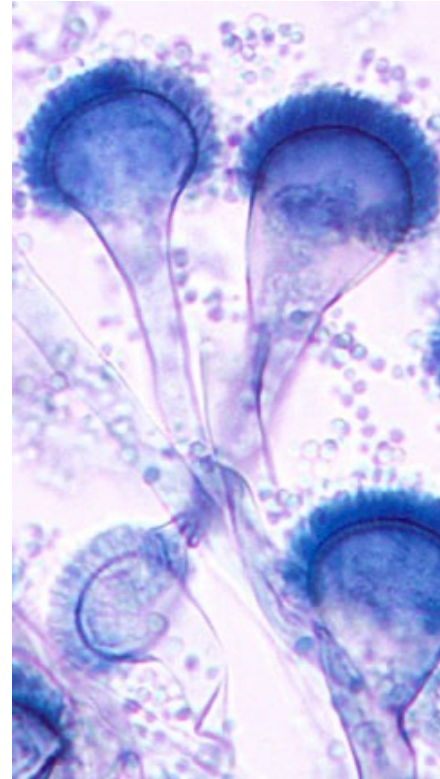
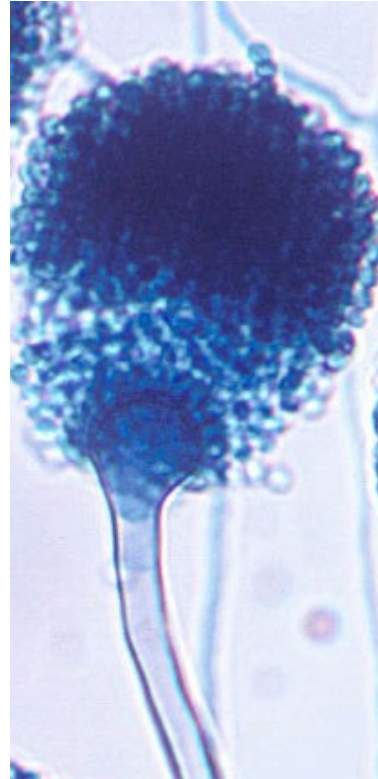
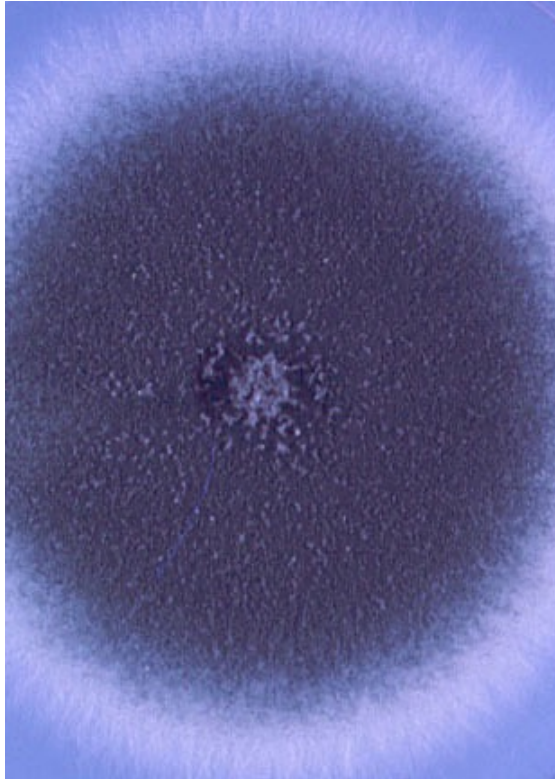
acropetal chains

20 μm

Conidial head morphology in *Aspergillus* (a) uniseriate, (b) biseriate.

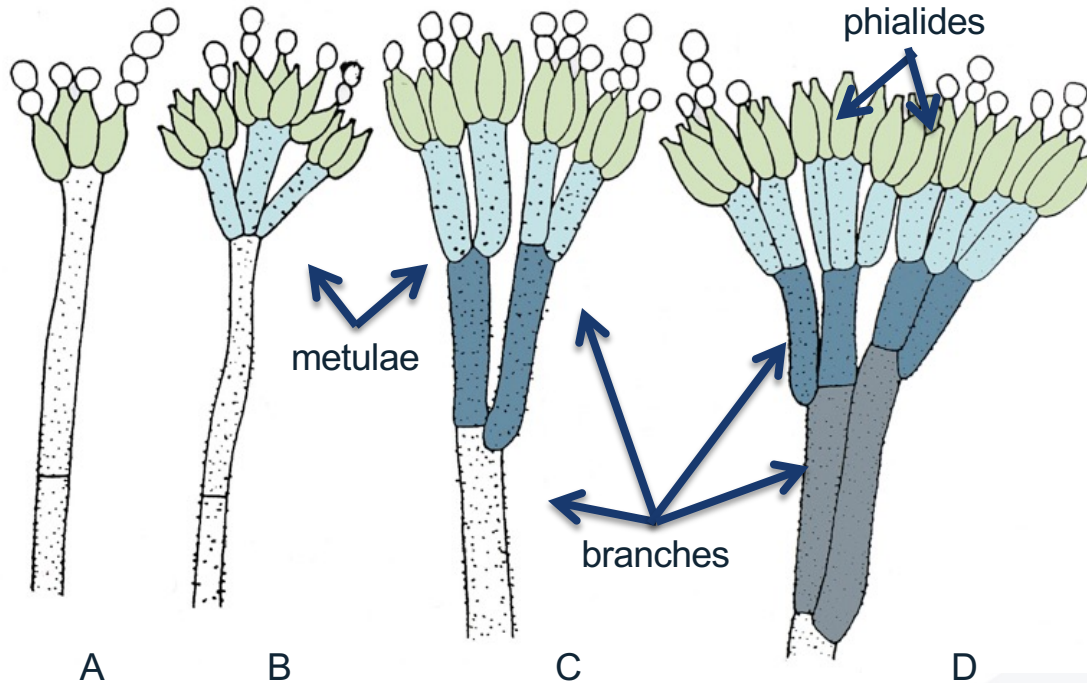


Aspergillus fumigatus



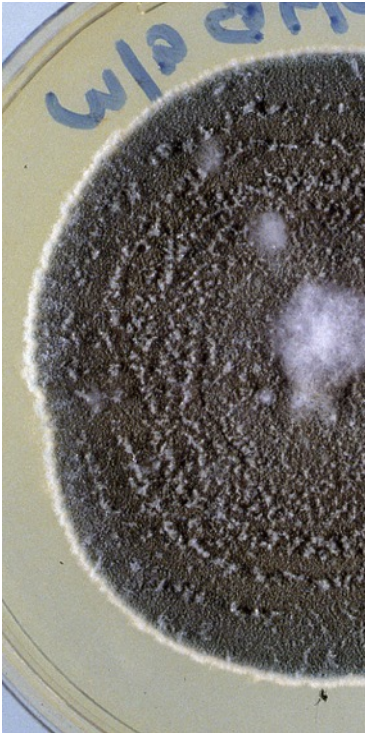
Penicillium species

Types of conidiophore branching in *Penicillium*. (a) simple; (b) one-stage branched; (c) two-stage branched; (d) three-stage branched.



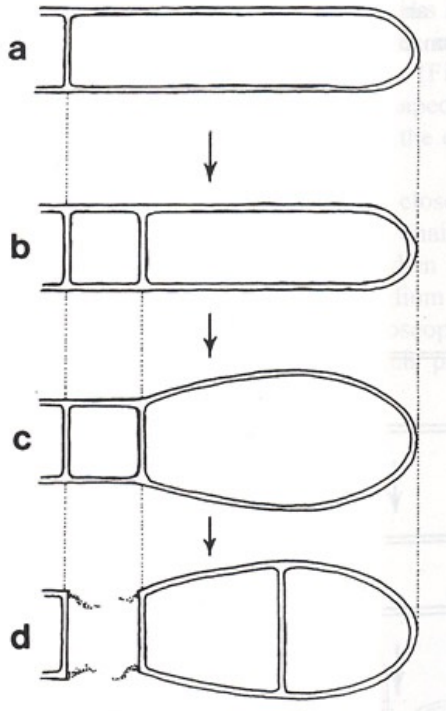
Penicillium species

Conidiophores of *P. verrucosum* var. *cyclopium* showing two-stage branching. Simple conidiophore of *P. cheresanum* showing long chains of single-celled conidia.

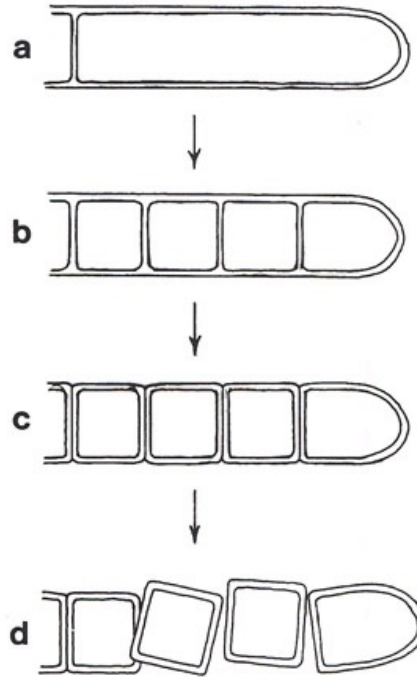


Thallic Conidiogenesis

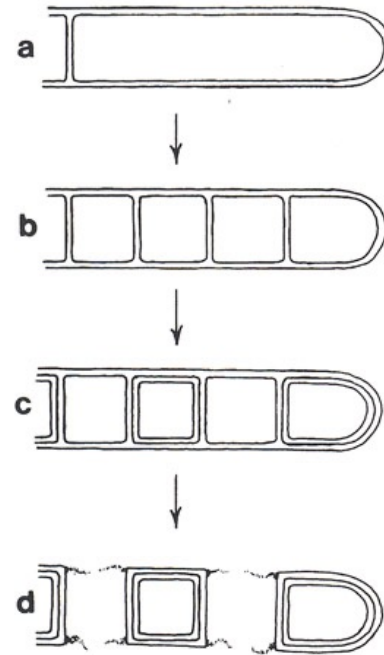
Holothallic



Holoarthric



Enterarthric



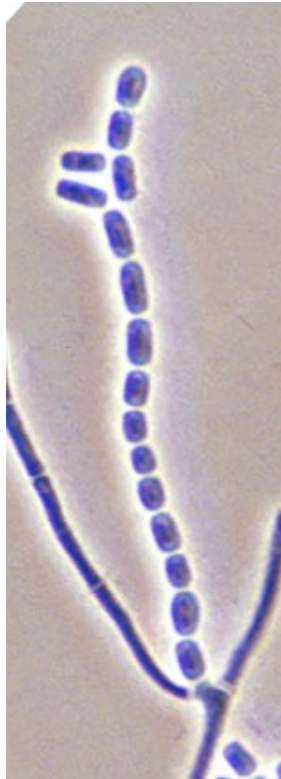
Thallic conidiogenesis

holothallic



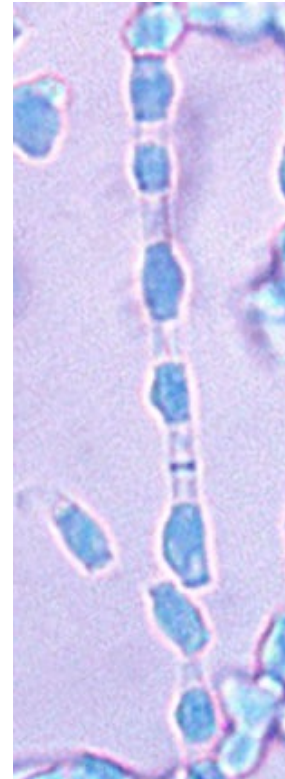
Epidermophyton

holoarthric



Geotrichum

enteroarthric



Geomyces

Coccidioides immitis



200-300 laboratory acquired systemic infections

Its' not always that easy!

- Many uncommon moulds may present (especially from non-sterile sites) so remember growth at 37C is an important selector for medical fungi.
- Often can not see the essential identification characters.
- Can not find a suitable key or reference.
- Non-sporulating moulds (now use ITS + sequencing).

Mould identification

1. Need to see the required characters
 - sporulating culture
 - slide culture + good microscope
 - careful observation
2. Learn mycology terminology and keys
3. Practice and reference books