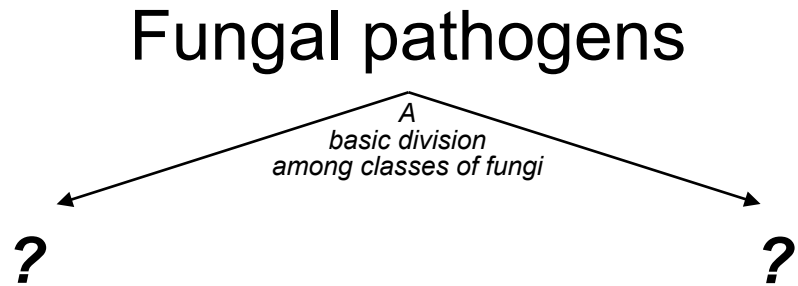
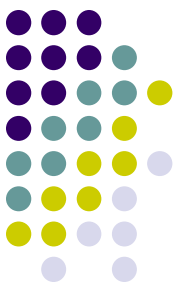


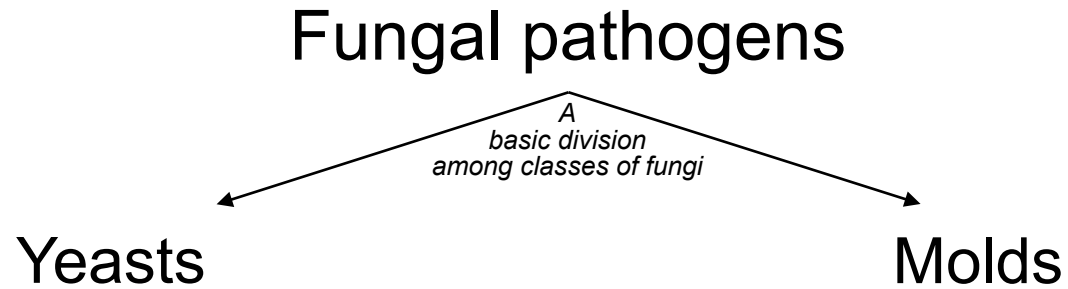
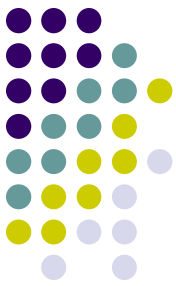
Common Ocular Fungal Pathogens



Fungal pathogens come in two very basic flavors—what are they?

Common Ocular Fungal Pathogens

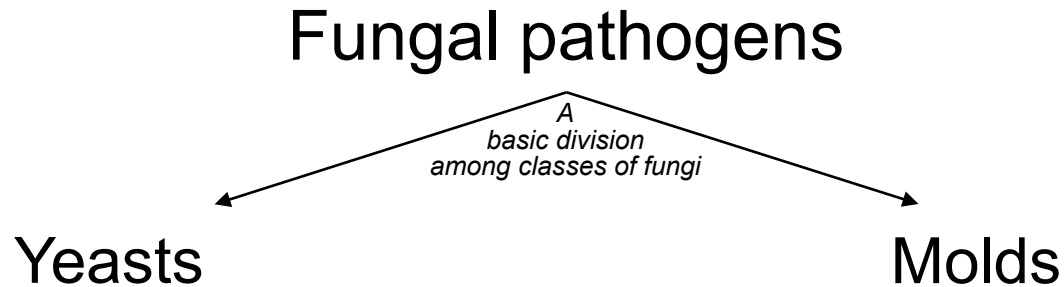
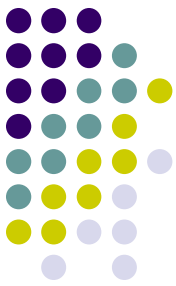
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Fungal pathogens come in two very basic flavors—what are they?

Common Ocular Fungal Pathogens

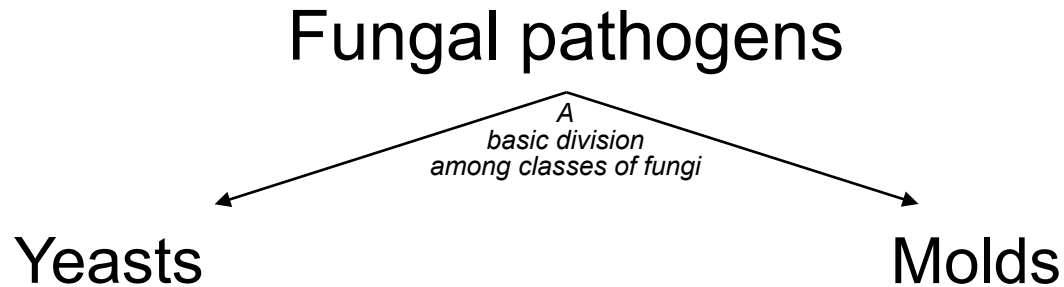
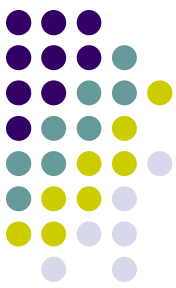
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Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

Common Ocular Fungal Pathogens

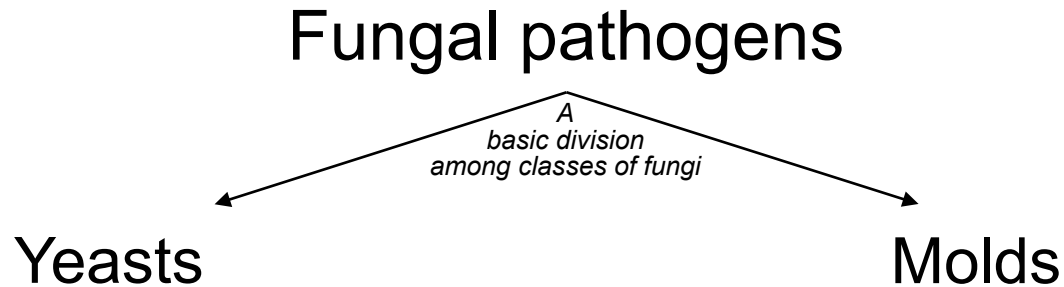
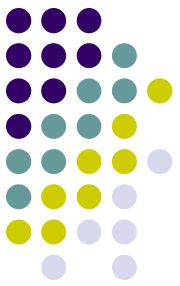


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Their appearance

Common Ocular Fungal Pathogens



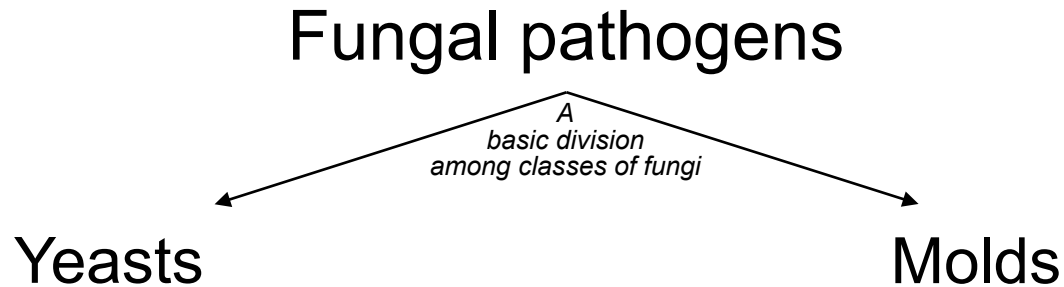
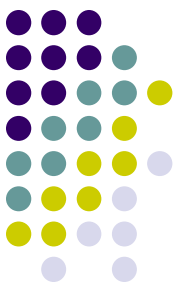
Fungal pathogens come in two very basic flavors—what are they?

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Their appearance

What do yeasts look like?

Common Ocular Fungal Pathogens



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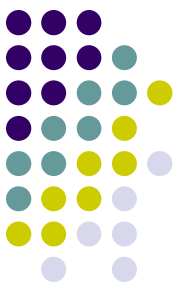
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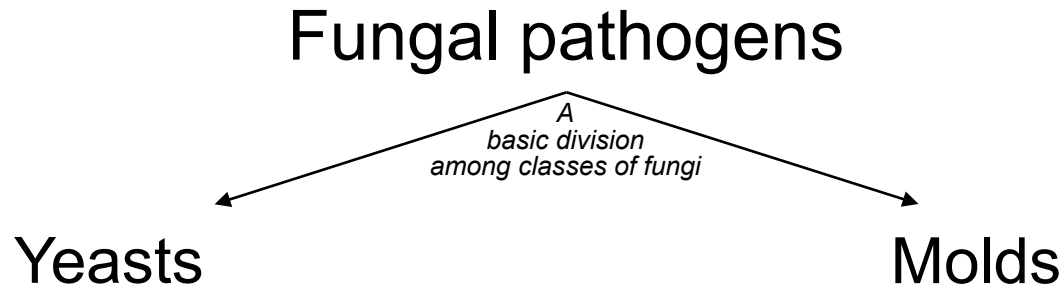
What do yeasts look like?

Round, single-celled organisms

Common Ocular Fungal Pathogens



7



Fungal pathogens come in two very basic flavors—what are they?

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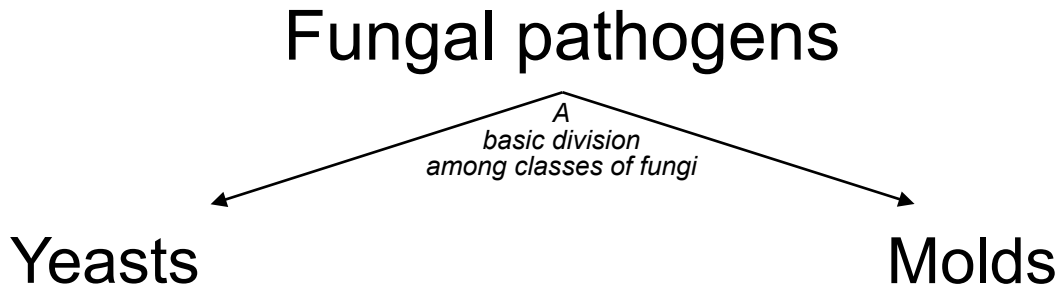
Their appearance

What do yeasts look like?

Round, single-celled organisms

What do molds look like?

Common Ocular Fungal Pathogens



Fungal pathogens come in two very basic flavors—what are they?

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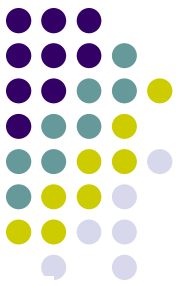
Their appearance

What do yeasts look like?

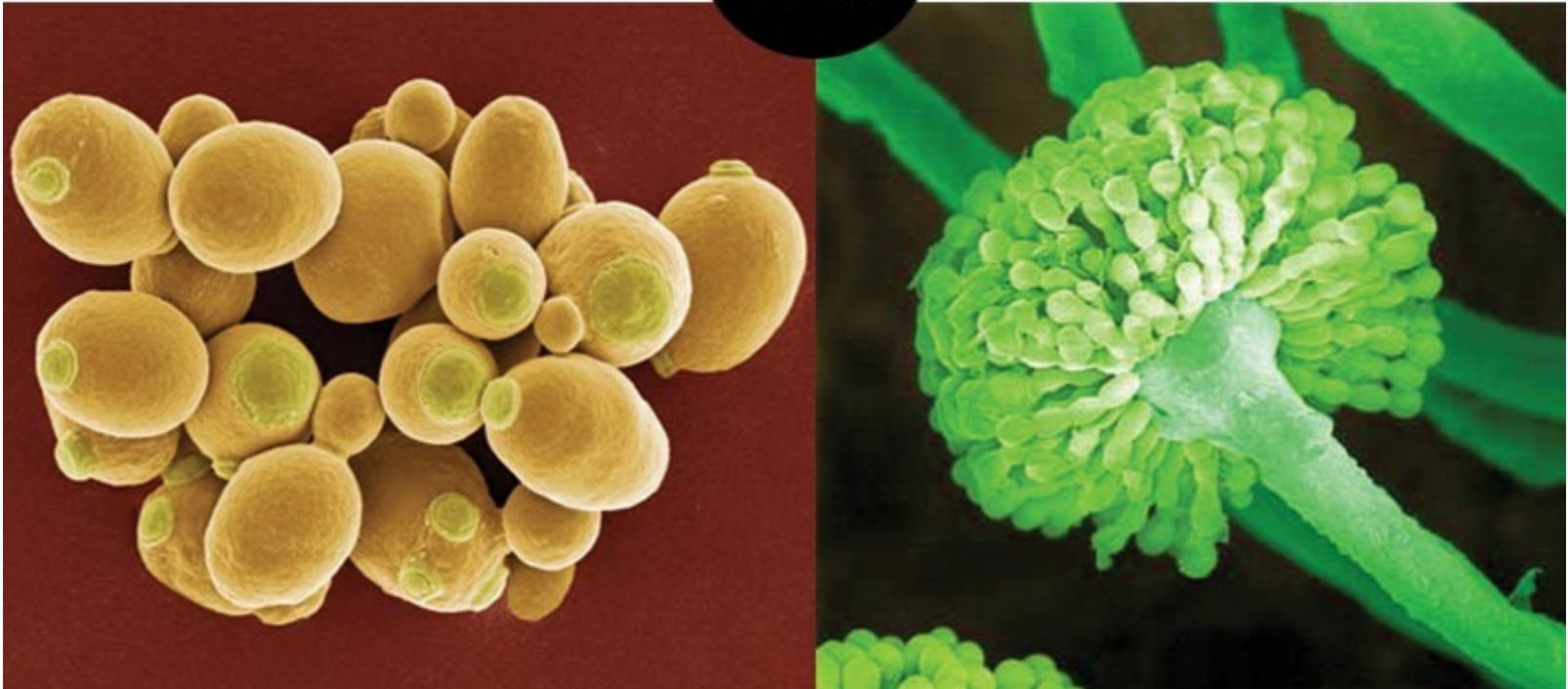
Round, single-celled organisms

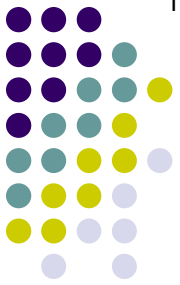
What do molds look like?

Multicellular, filamentous organisms

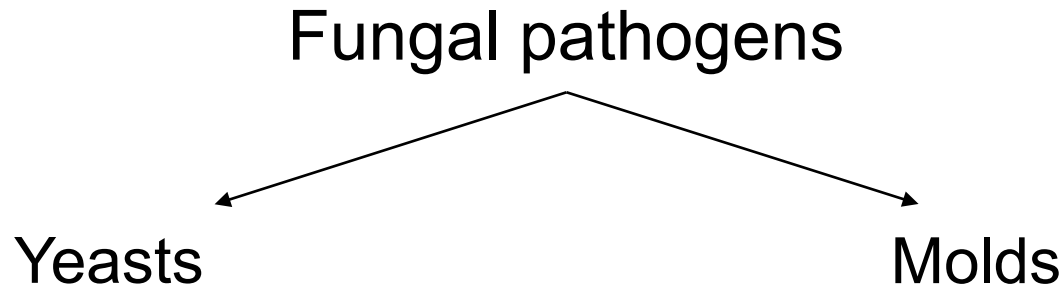


Yeasts **VS** Molds





Common Ocular Fungal Pathogens



Fungal pathogens come in two very basic flavors—what are they?

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Their appearance

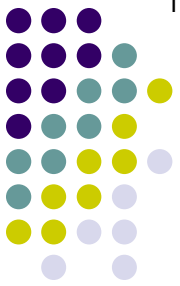
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Round, single-celled organisms

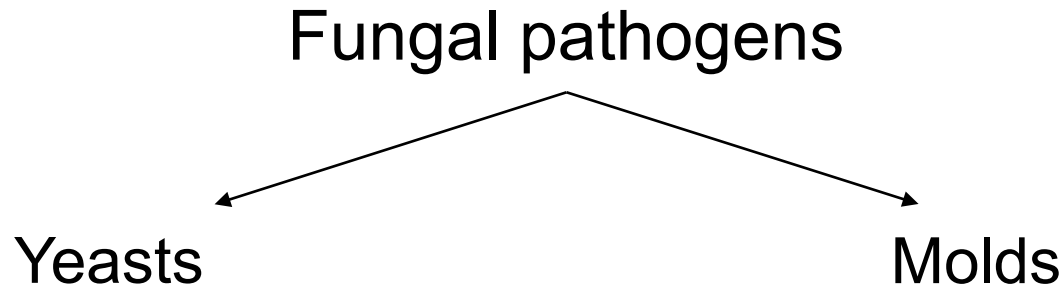
What do molds look like?

Multicellular, **filamentous** organisms

What's the formal term for the filaments formed by molds?



Common Ocular Fungal Pathogens



Fungal pathogens come in two very basic flavors—what are they?

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Their appearance

What do yeasts look like?

Round, single-celled organisms

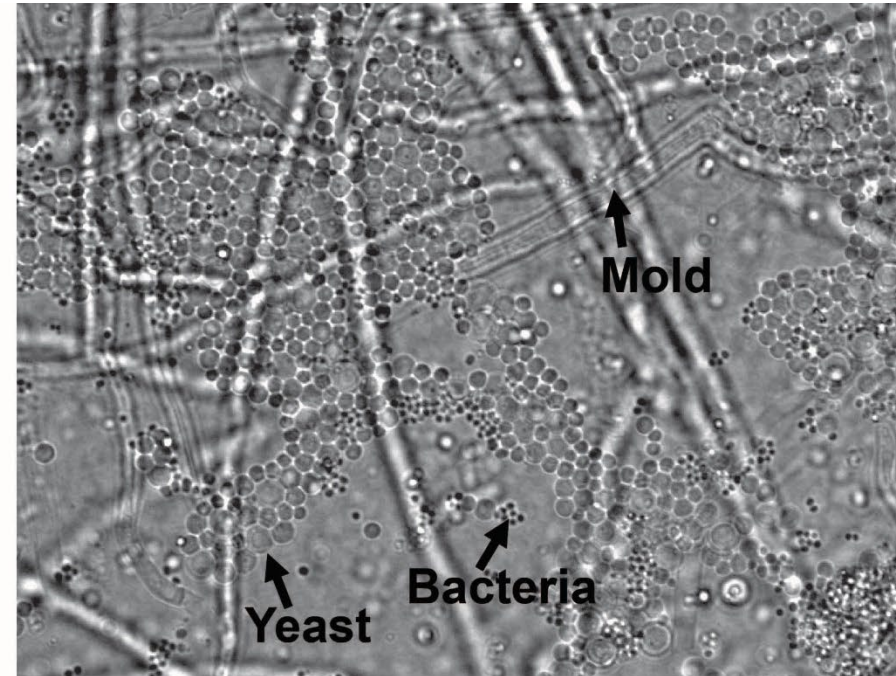
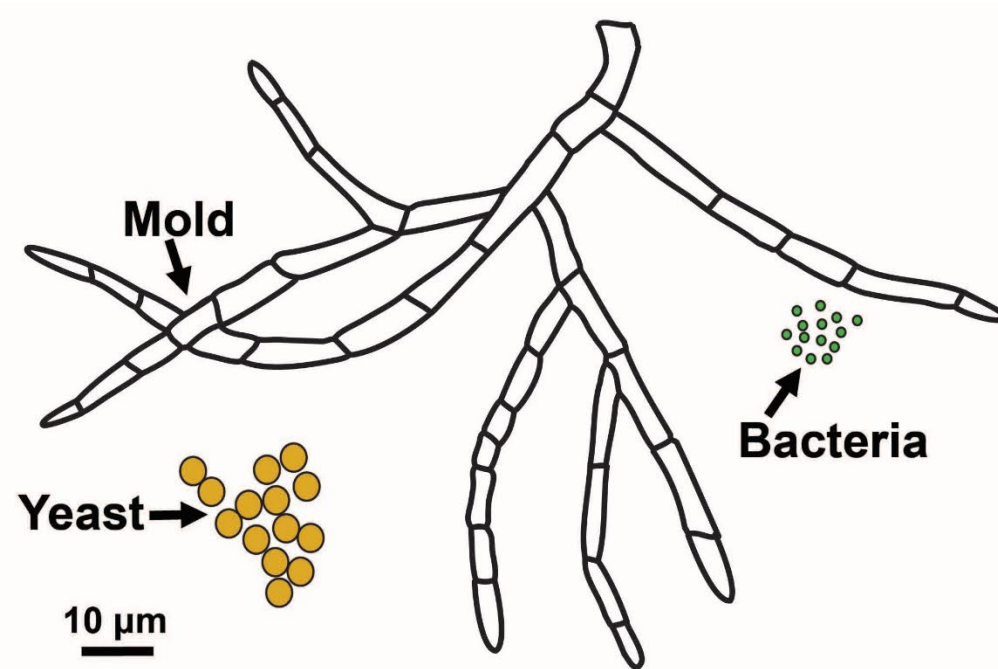
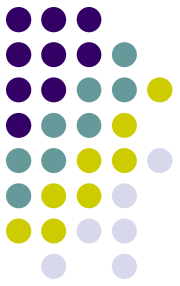
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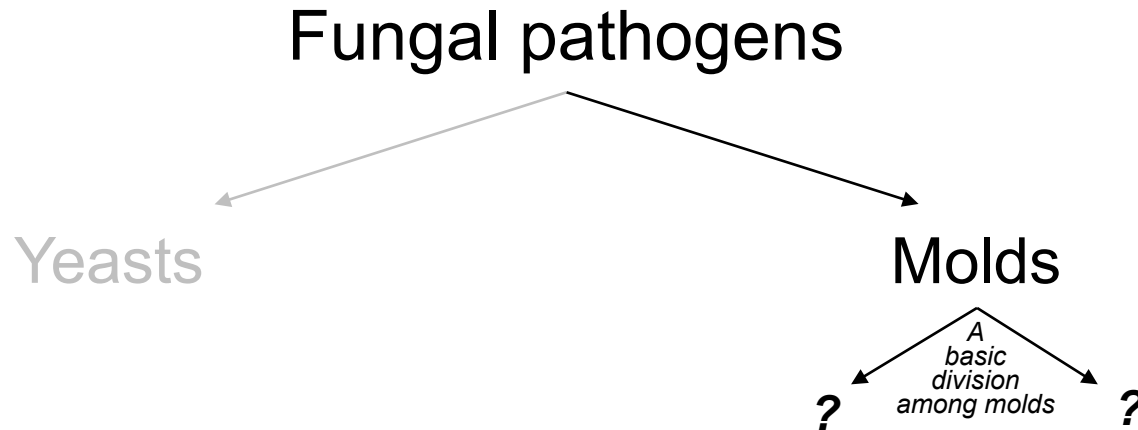
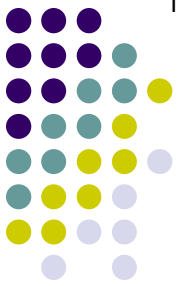
Hyphae

Common Ocular Fungal Pathogens



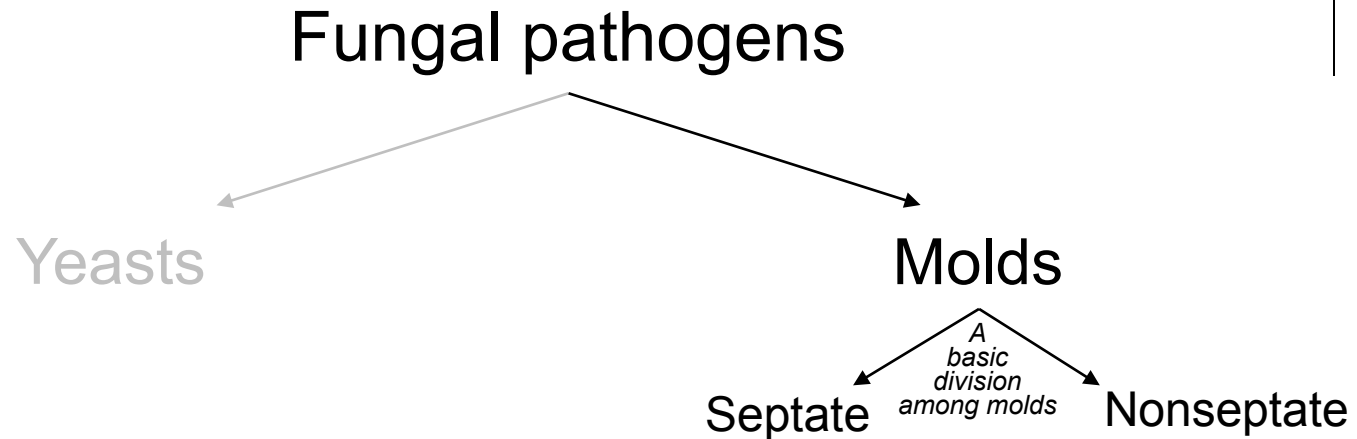
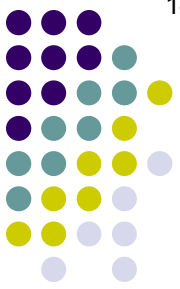
Yeast vs Molds (vs bacteria for scale)

Common Ocular Fungal Pathogens



Molds are further divided into two broad categories—what are they?

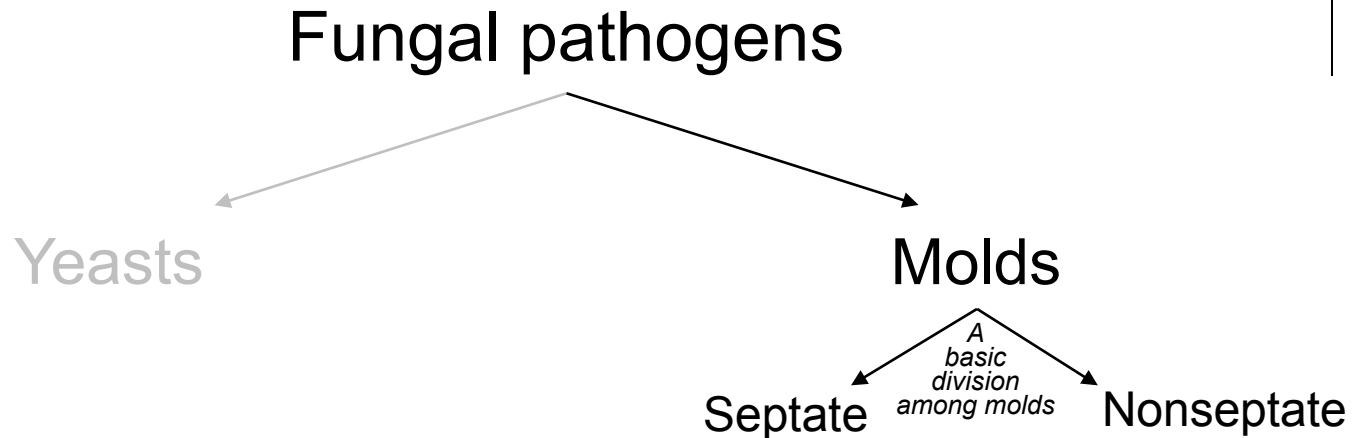
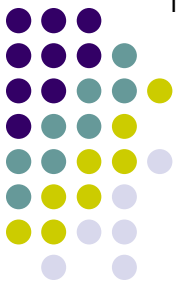
Common Ocular Fungal Pathogens



Molds are further divided into two broad categories—what are they?

Based on the appearance of their hyphae, they are classified as either **septated** or **nonseptated**

Common Ocular Fungal Pathogens

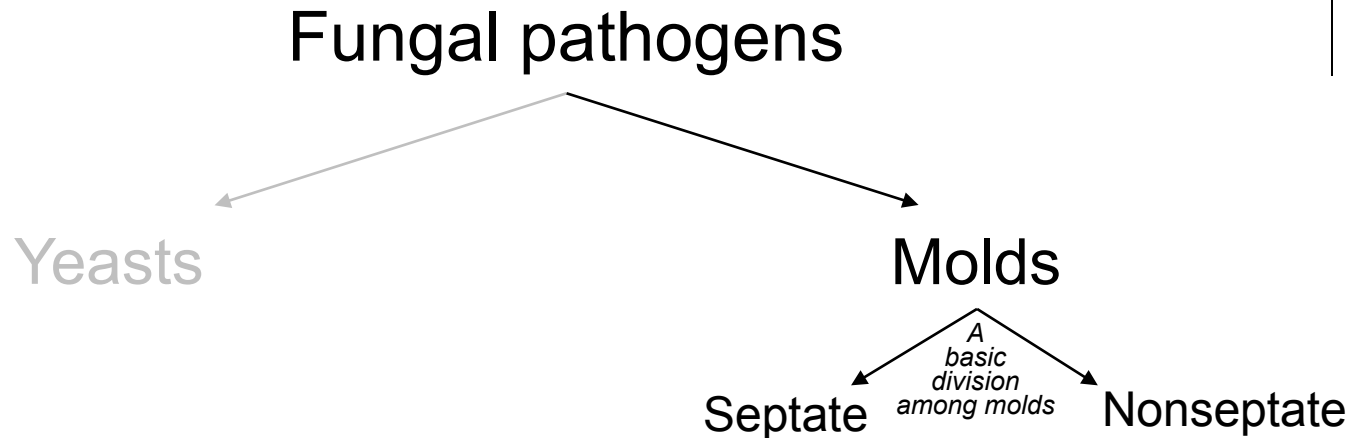
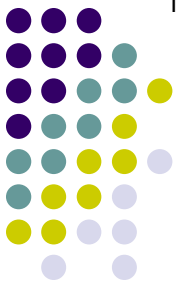


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What are septa?

Common Ocular Fungal Pathogens



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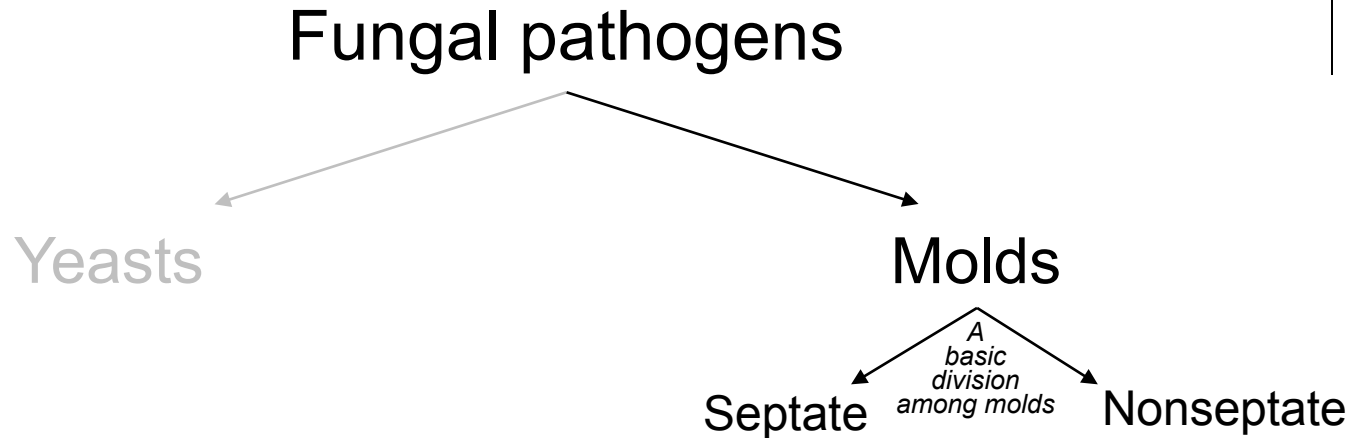
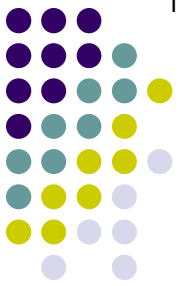
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What are septa?

Cross-walls within hyphae that subdivide them into a series of individual compartments.

Common Ocular Fungal Pathogens

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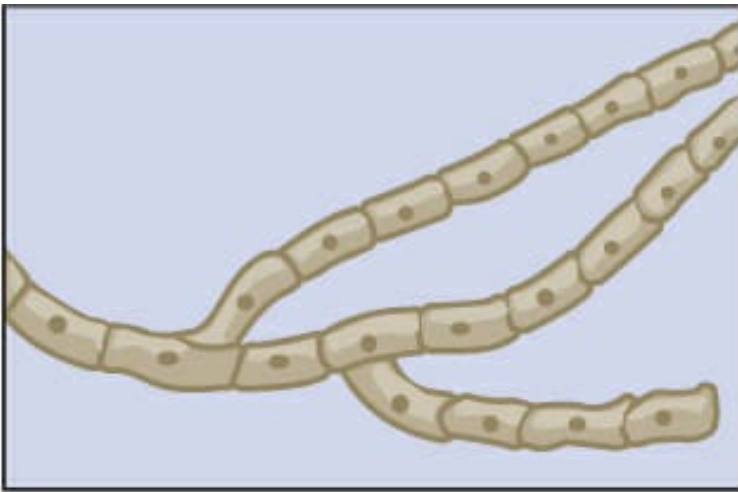
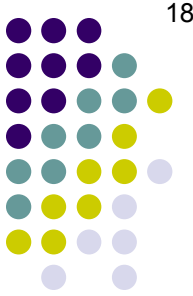
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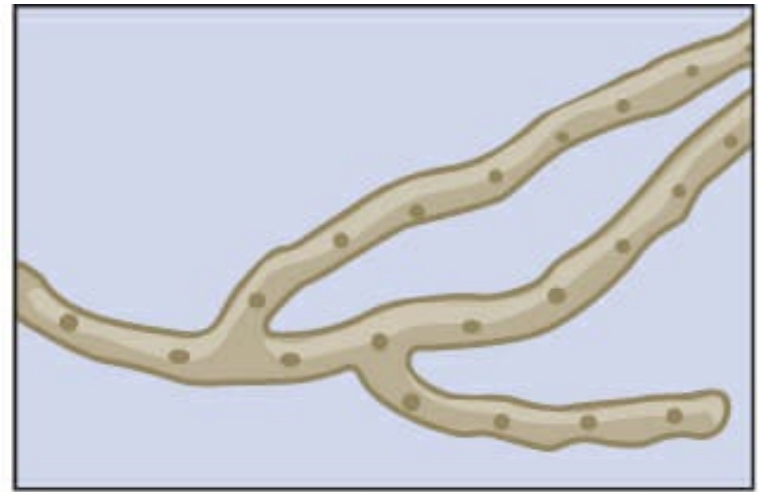
What are septa?

Cross-walls within hyphae that subdivide them into a series of individual compartments. Septate molds have these cross-walls; nonseptate molds do not.

Common Ocular Fungal Pathogens



Septate

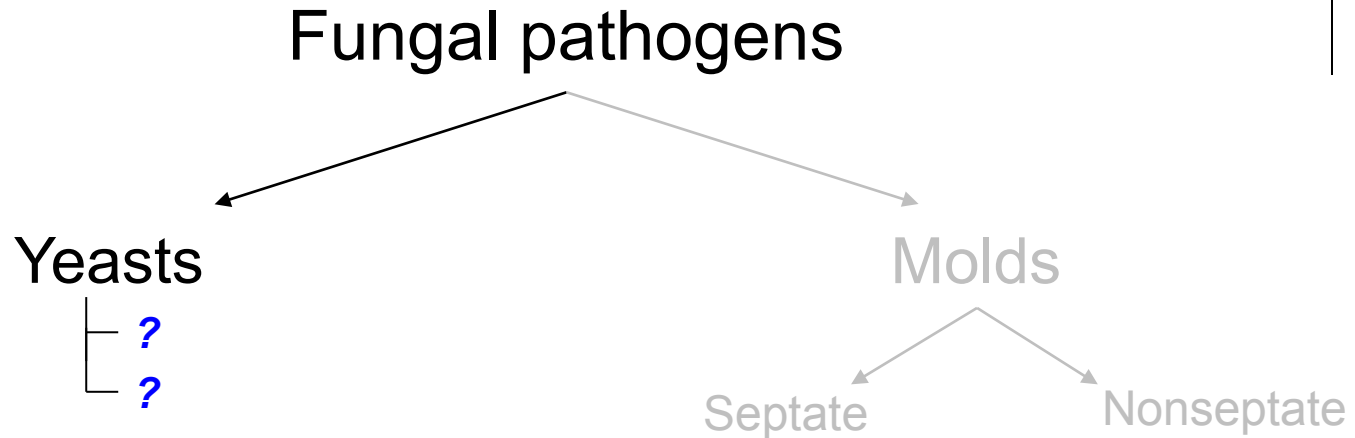
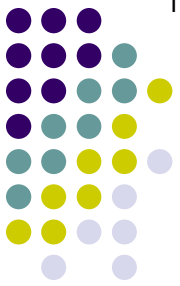


Nonseptate

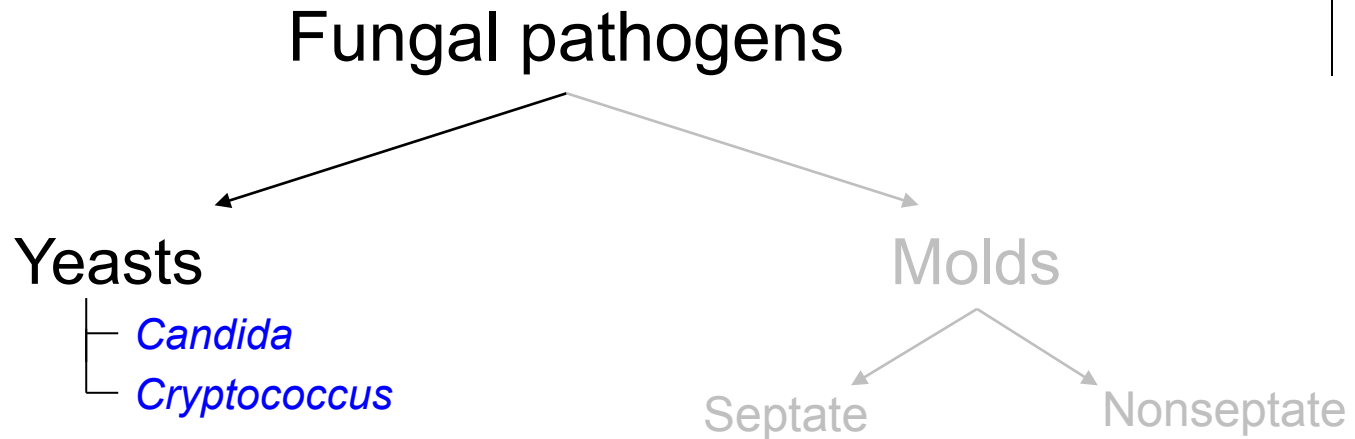
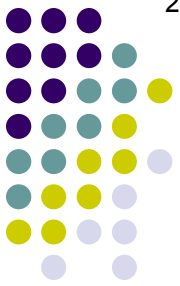
Molds

Common Ocular Fungal Pathogens

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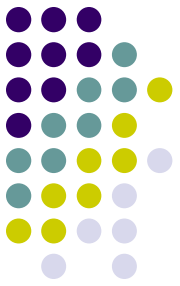


Two species account for the majority of yeast-mischief involving the eyes—what are they?

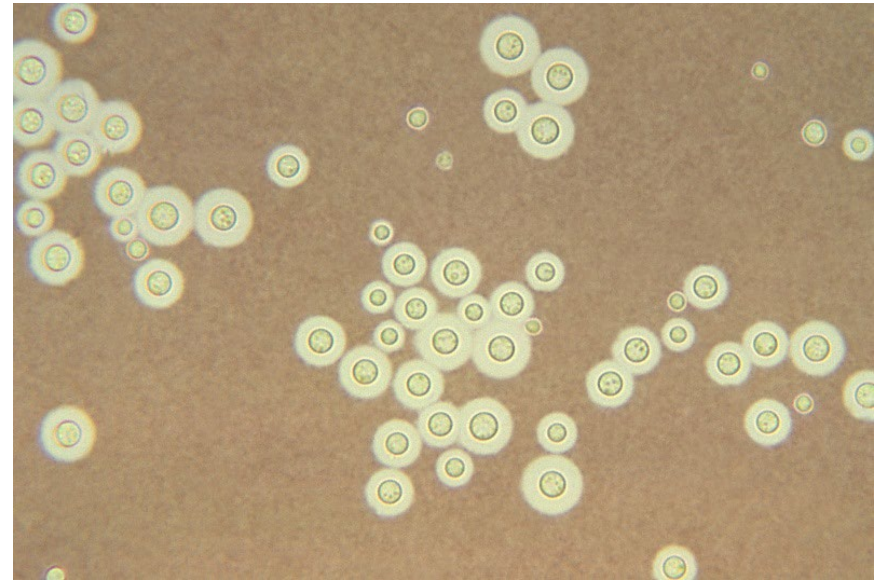


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Common Ocular Fungal Pathogens



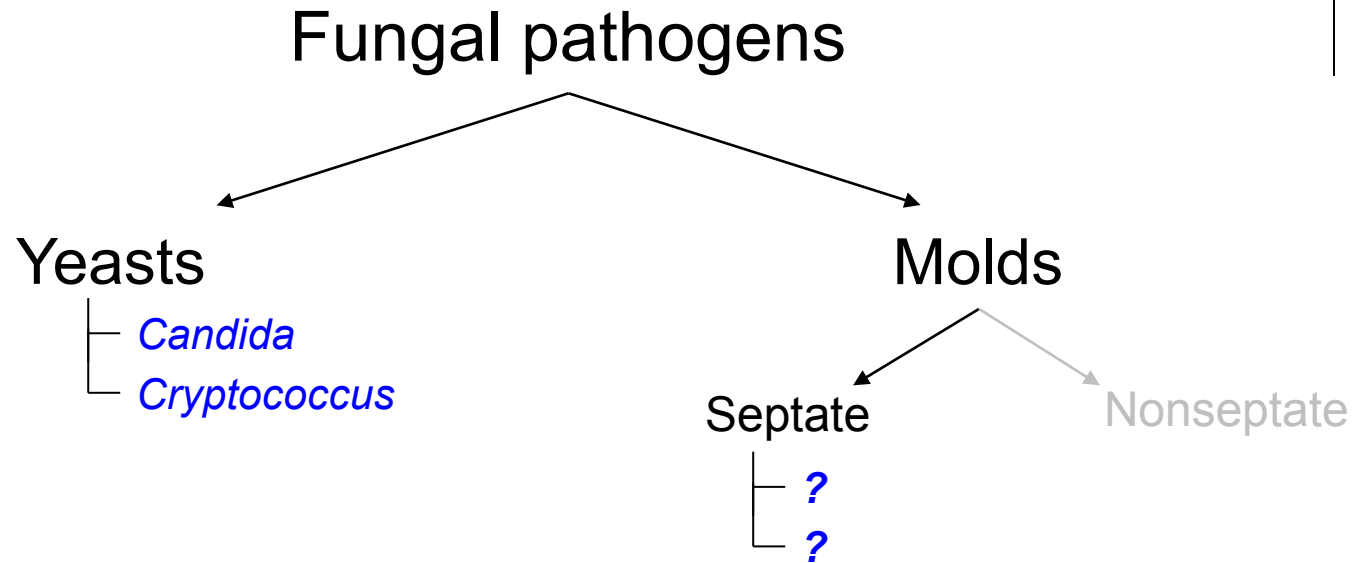
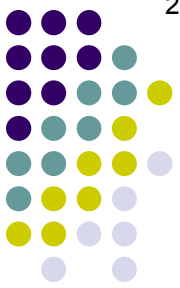
Candida. The 'budding' appearance is typical, and is a good field mark for the species



Cryptococcus. Note the 'India ink' look—this is a good way to identify this species

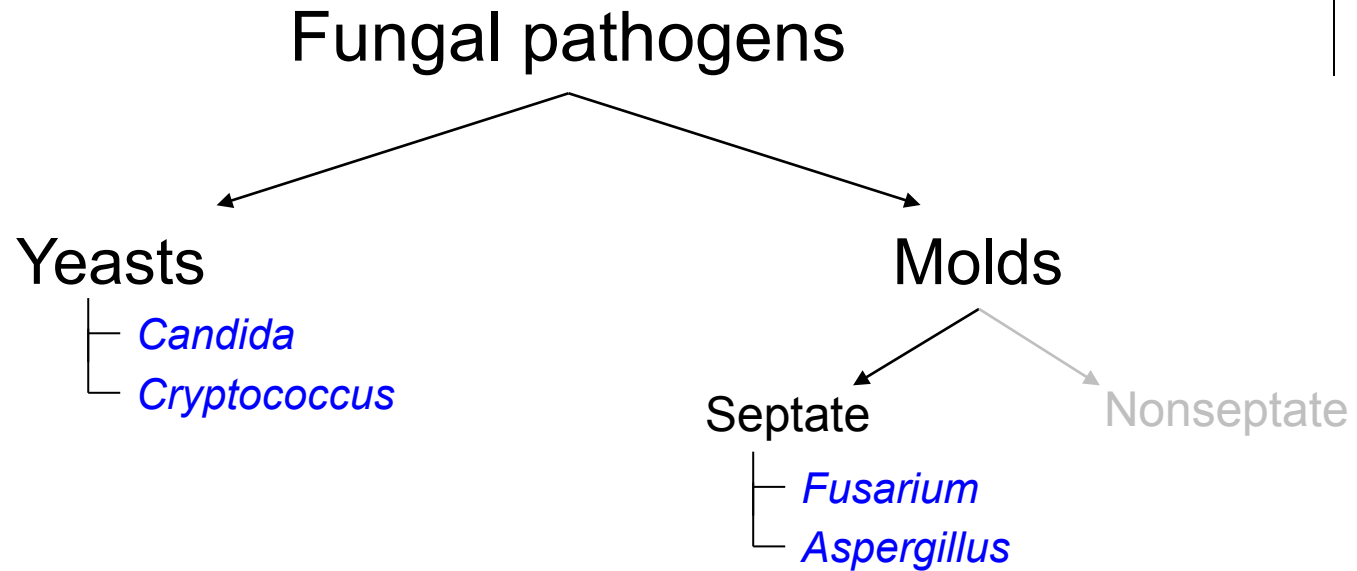
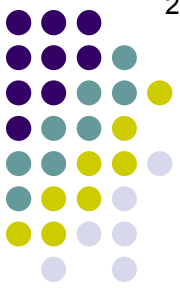
Yeasts

Common Ocular Fungal Pathogens



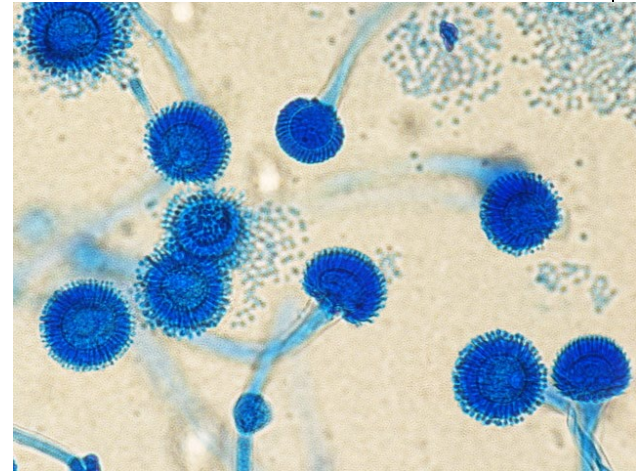
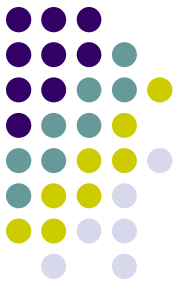
Two species account for the majority of septated-mold eye issues—what are they?

Common Ocular Fungal Pathogens

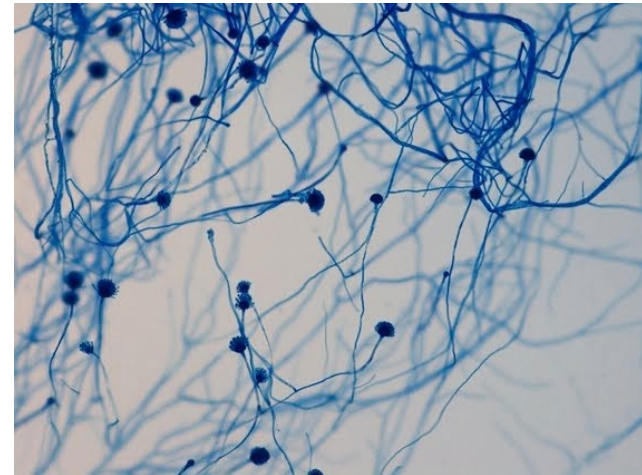


Two species account for the majority of septated-mold eye issues—what are they?

Common Ocular Fungal Pathogens



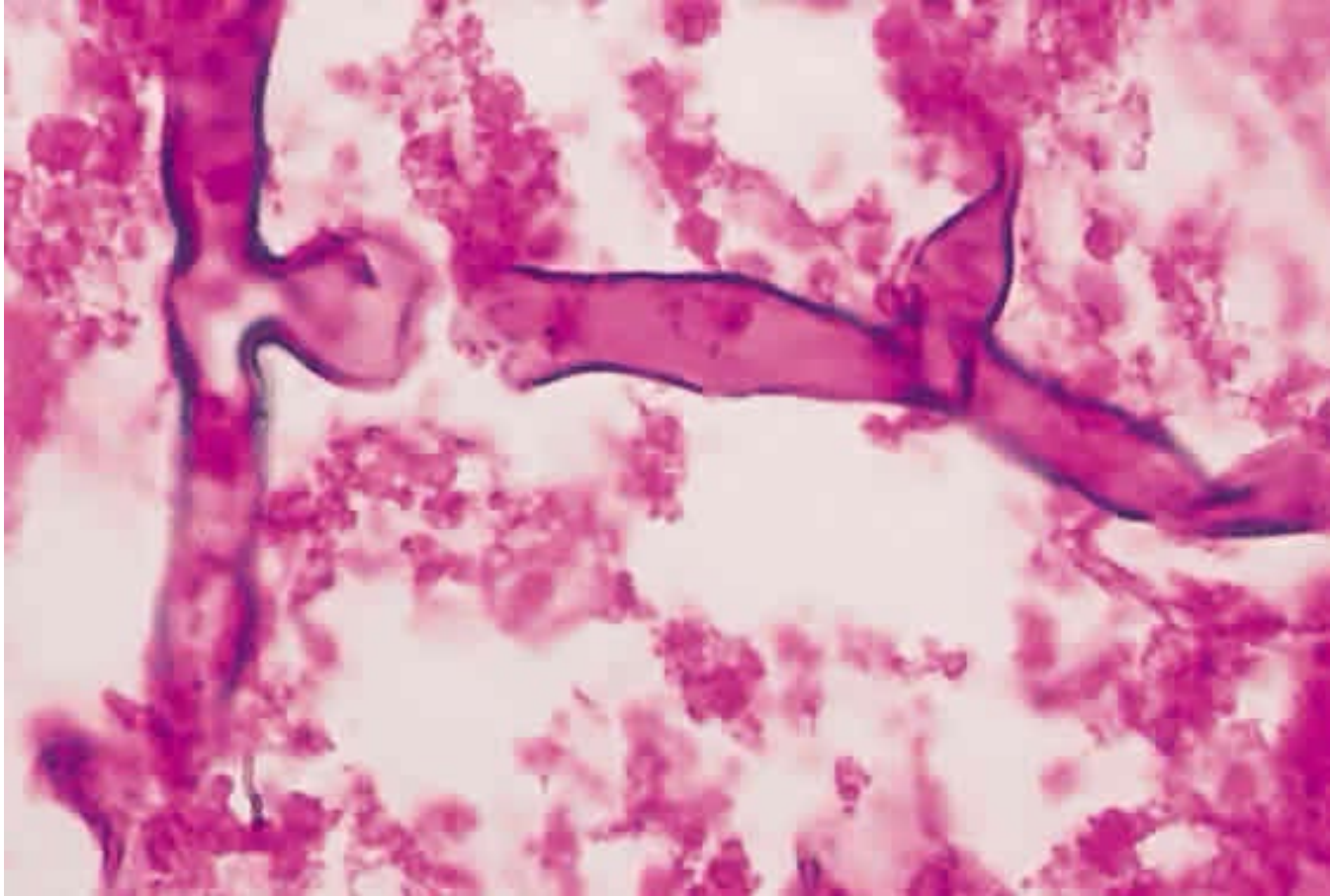
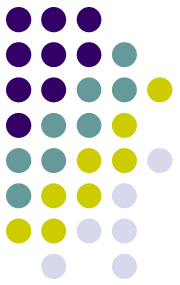
Fusarium



Aspergillus. Note the blue-bulb looking whatchamacallits

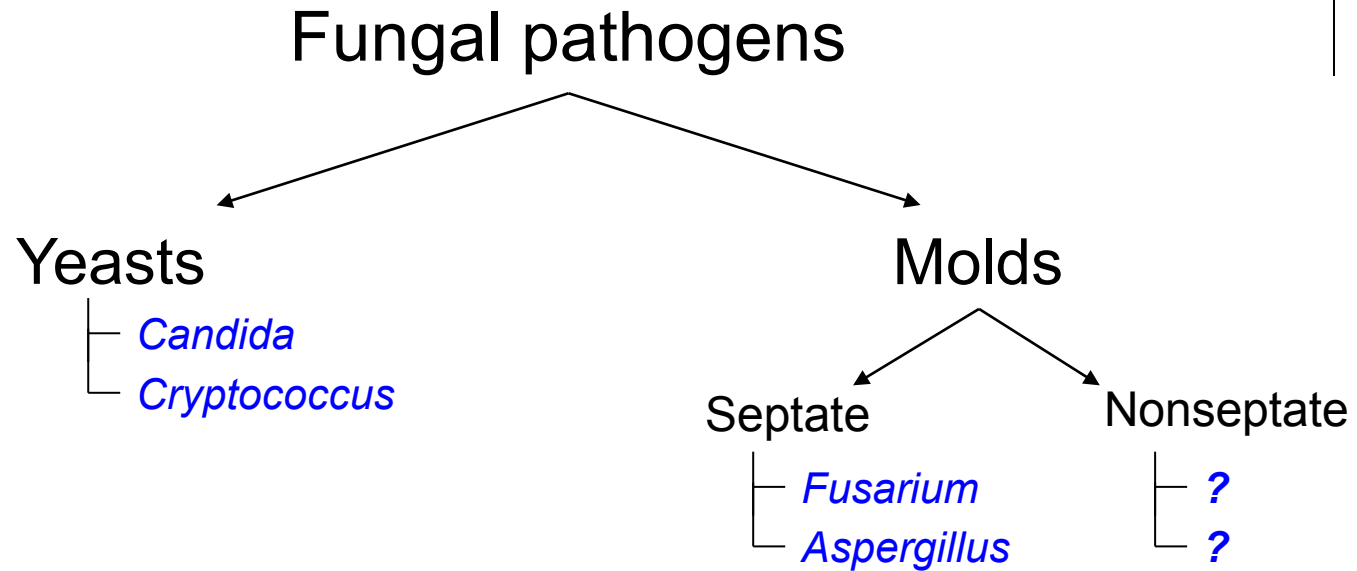
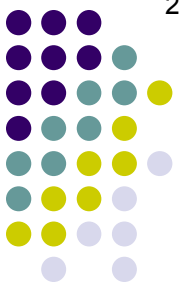
Sepeated molds

Common Ocular Fungal Pathogens



A high-mag *Aspergillus* photo may demonstrate 'broad hyphae,' a classic descriptor of the bug

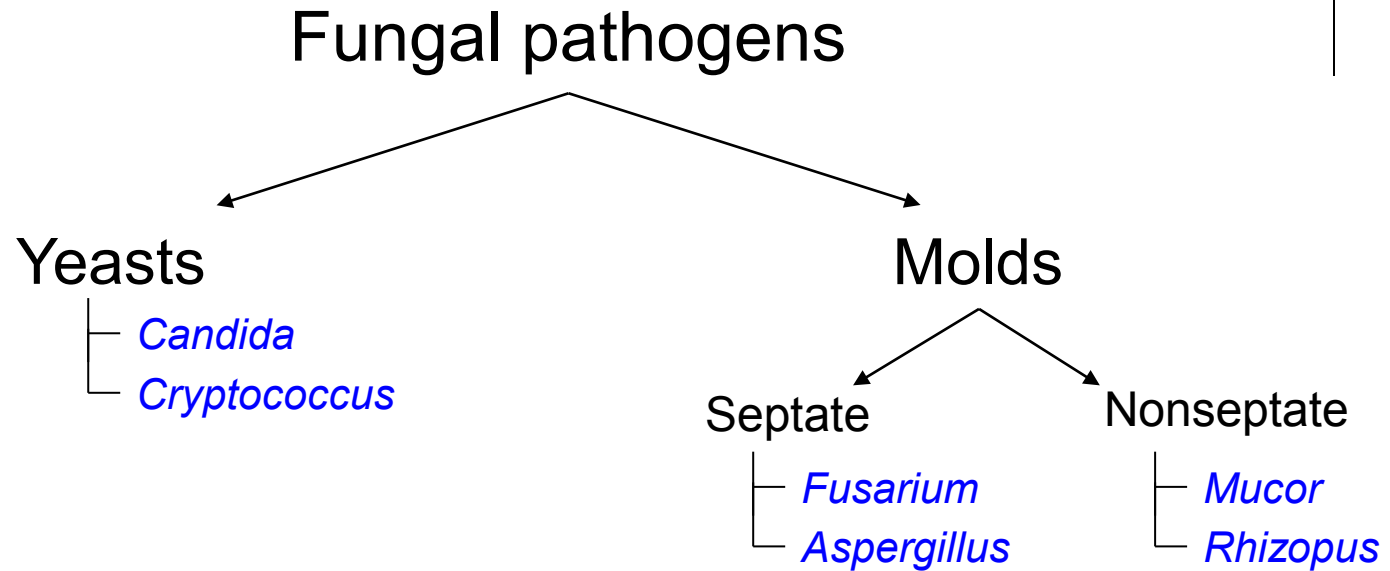
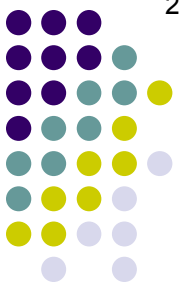
Common Ocular Fungal Pathogens



Two species account for the majority of non-septated-mold eye issues—what are they?

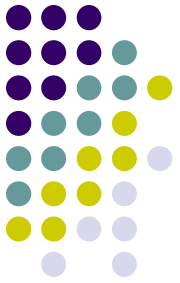
Common Ocular Fungal Pathogens

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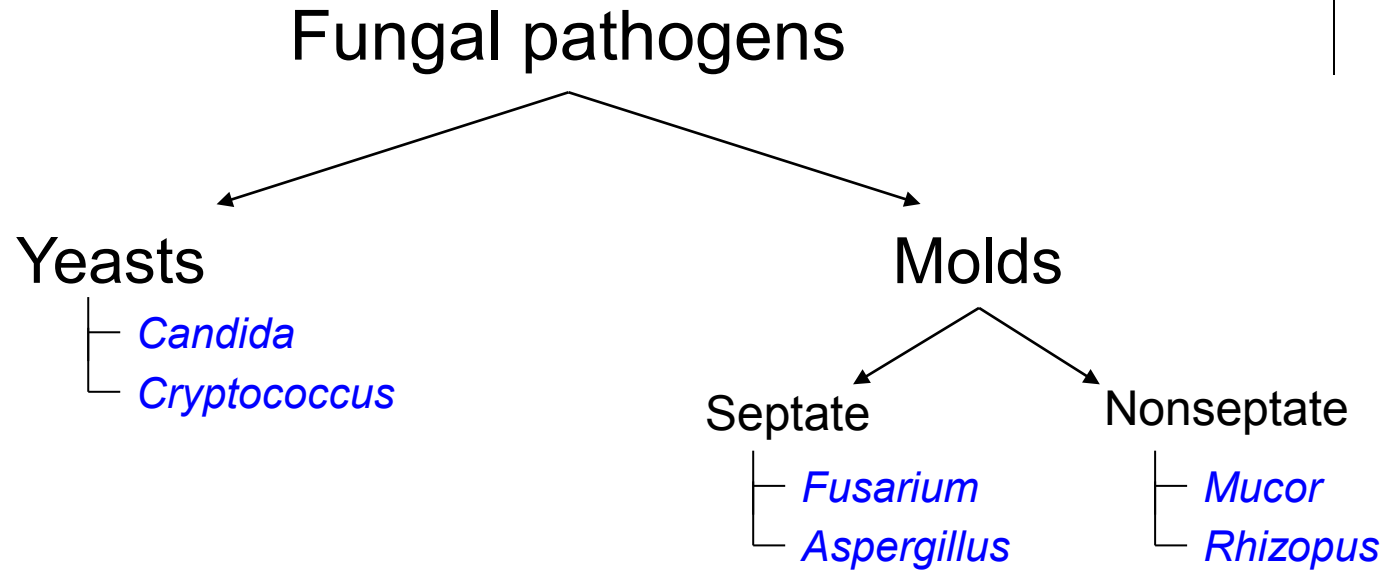
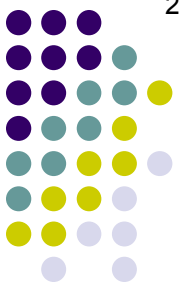
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Common Ocular Fungal Pathogens

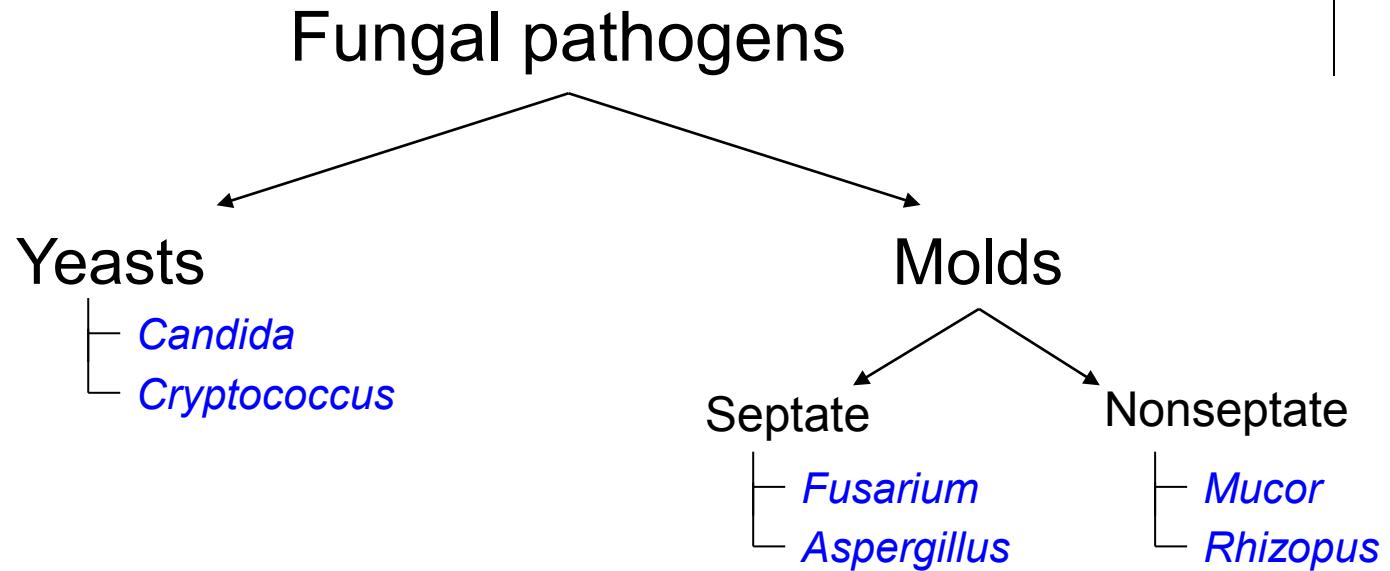
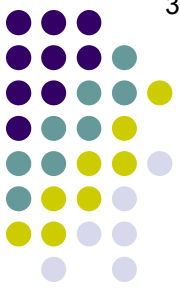


No pic of *Mucor/Rhizopus*, as I don't think you'll be asked to ID it. Caveat emptor.

Common Ocular Fungal Pathogens



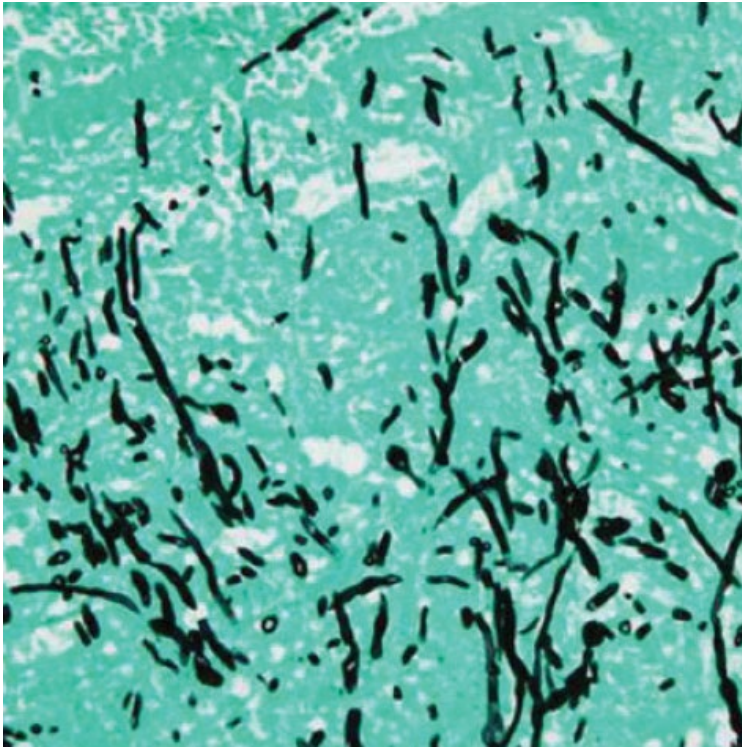
What is the go-to stain for fungi?



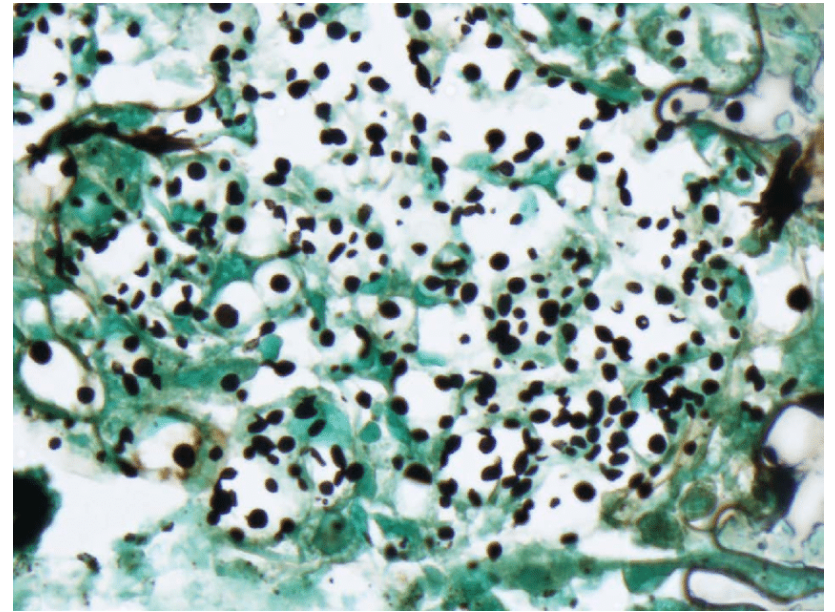
What is the go-to stain for fungi?

Gomori methenamine (many others work as well)

Common Ocular Fungal Pathogens



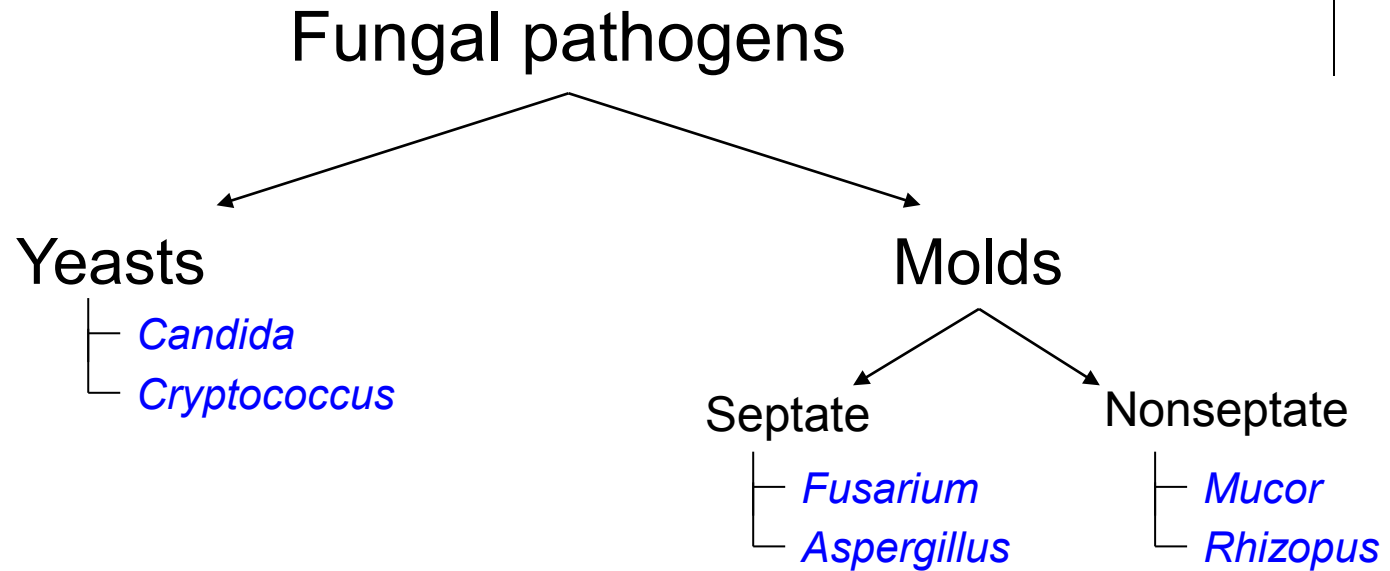
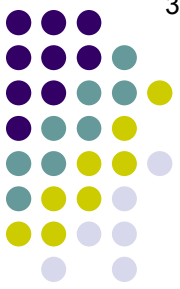
Aspergillus



Cryptococcus

Gomori methenamine stain

Common Ocular Fungal Pathogens

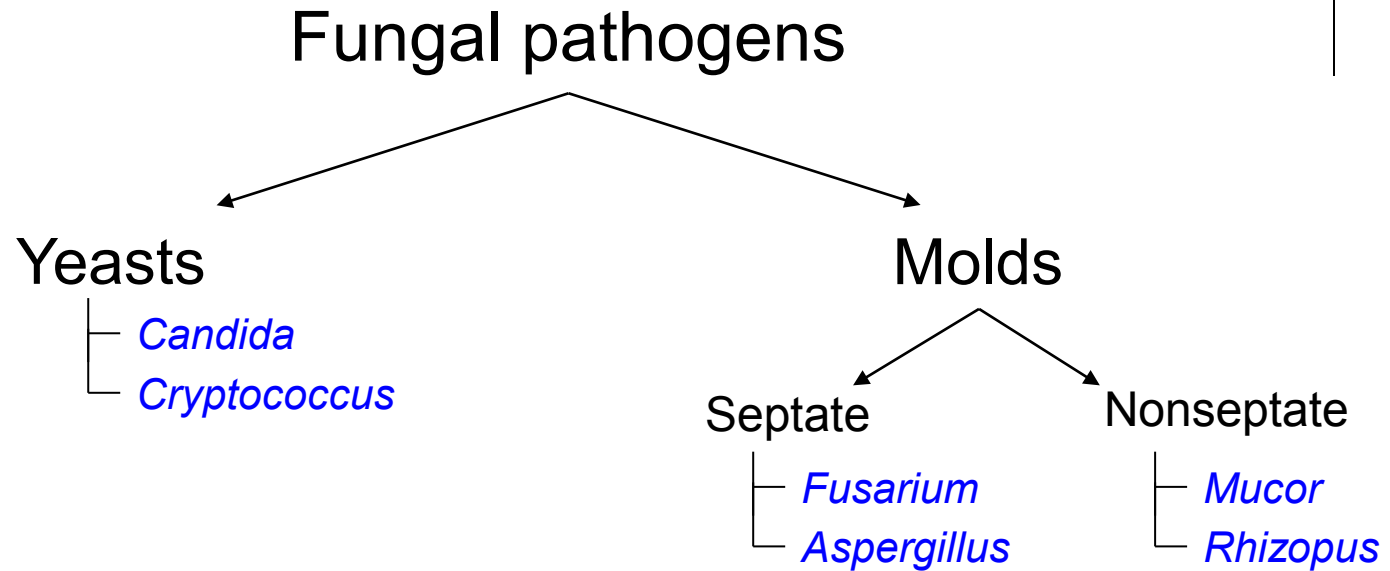
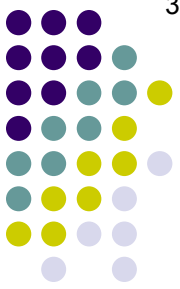


What is the go-to stain for fungi?

Gomori methenamine (many others work as well)

Which is the only fungus that will take a Gram stain?

Common Ocular Fungal Pathogens



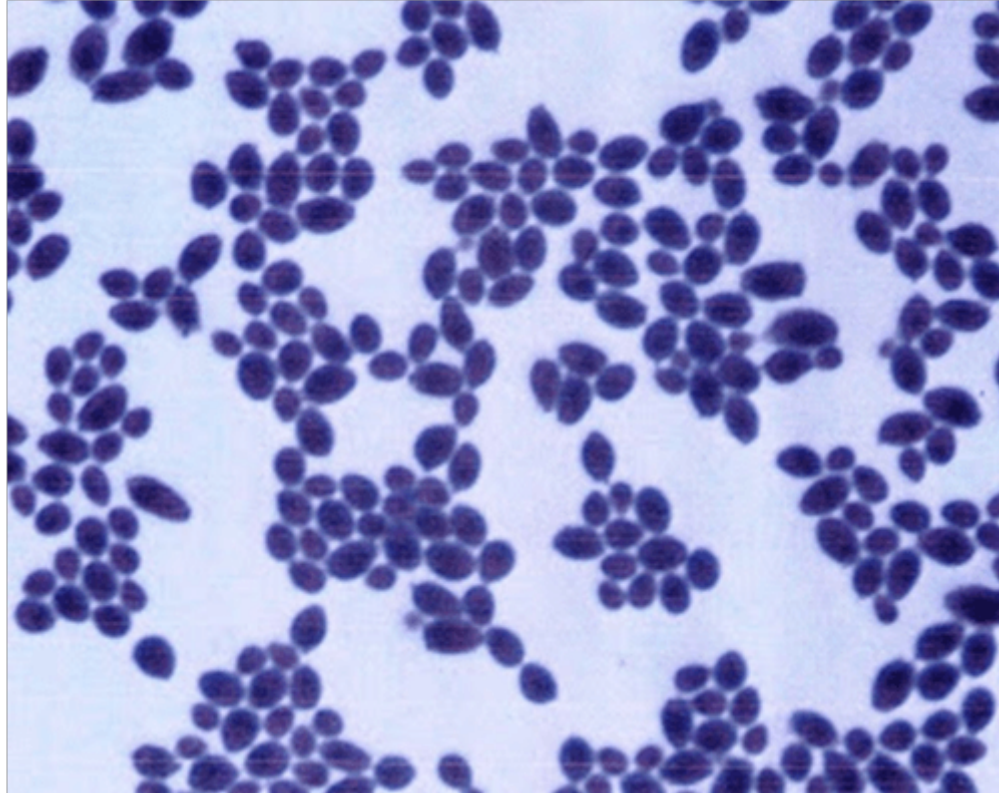
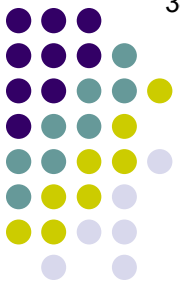
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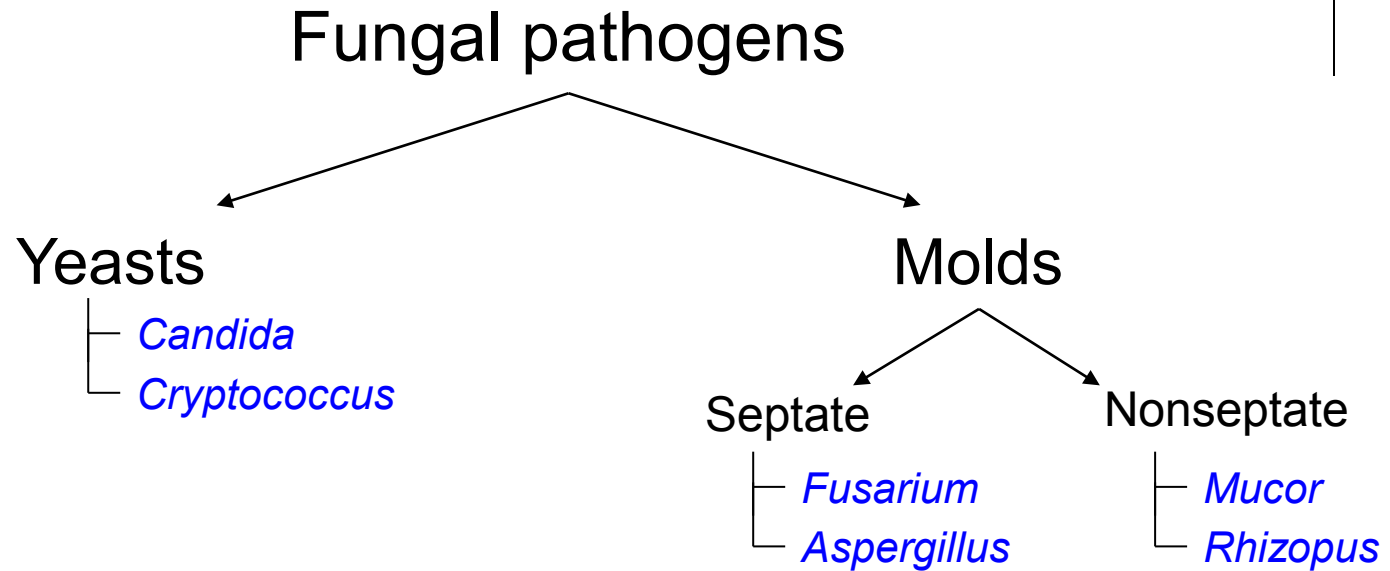
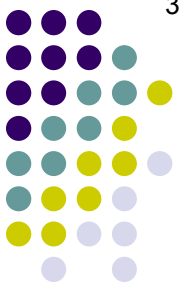
Candida

Common Ocular Fungal Pathogens



Candida: Gram stain

Common Ocular Fungal Pathogens

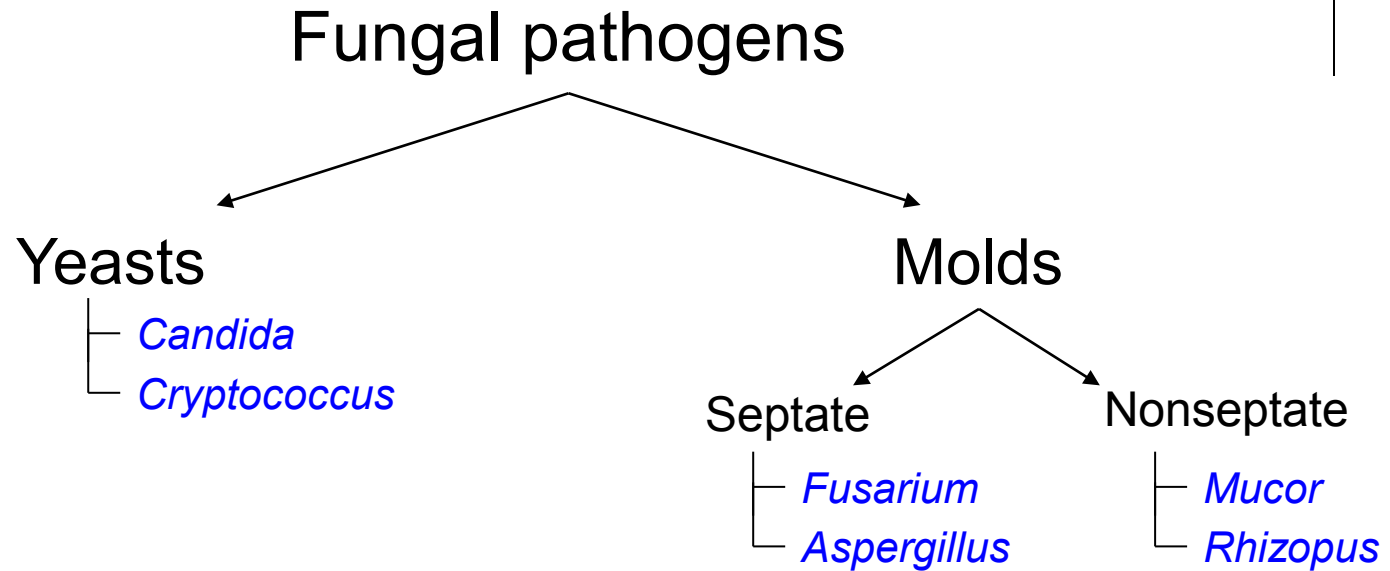


What is the go-to stain for fungi?

Gomori methenamine (many others work as well)

When working up a suspected fungal keratitis, what culture medium should you use?

Common Ocular Fungal Pathogens

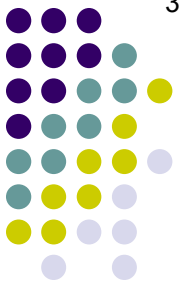


What is the go-to stain for fungi?

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When working up a suspected fungal keratitis, what culture medium should you use?

Sabouraud

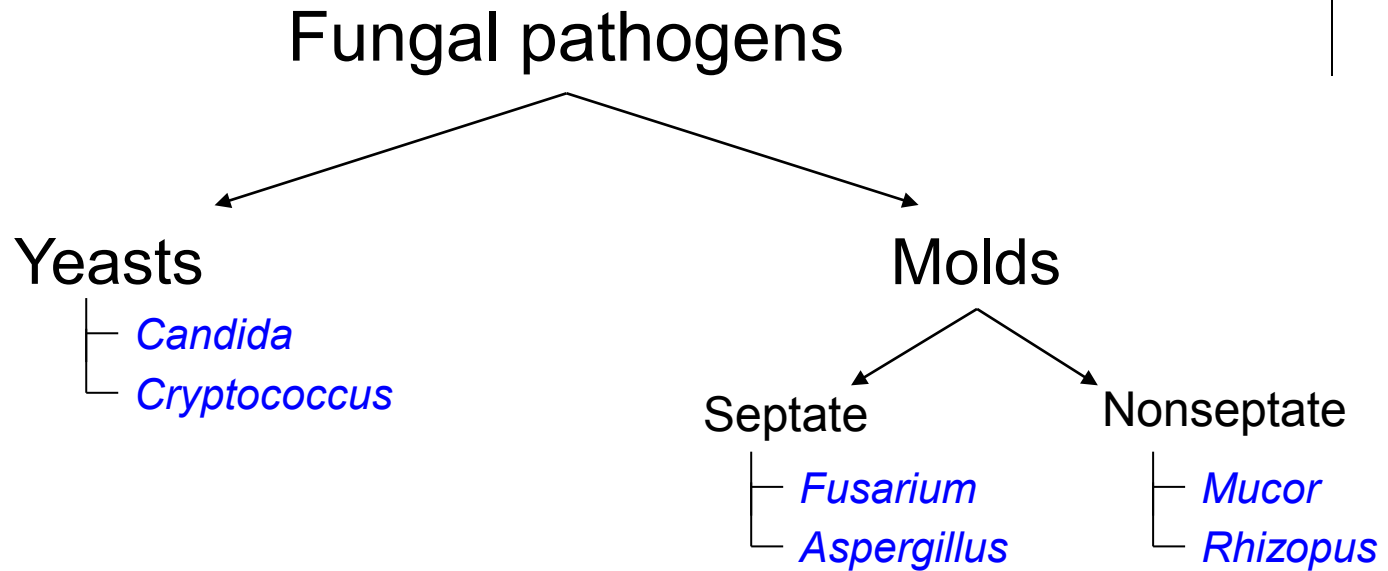
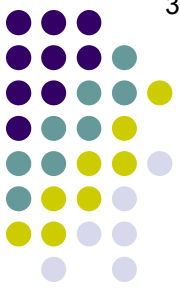


Common Ocular Fungal Pathogens



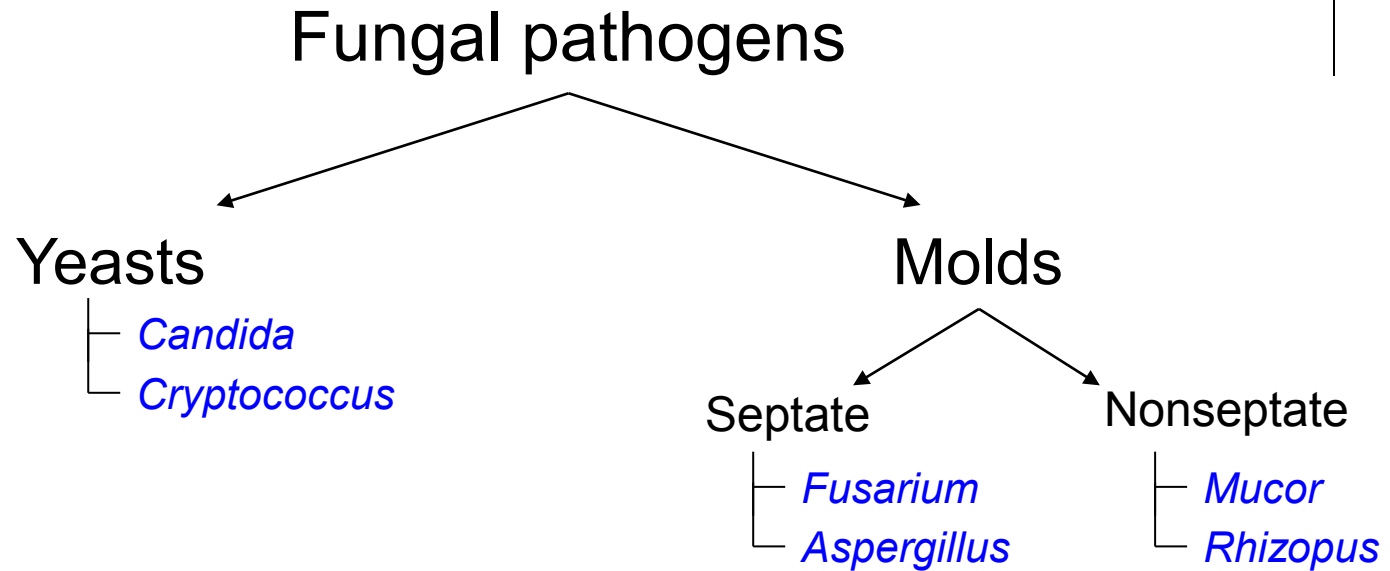
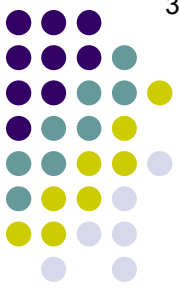
Candida growing on Sabouraud

Common Ocular Fungal Pathogens



Certain fungi have a strong association with particular climates.

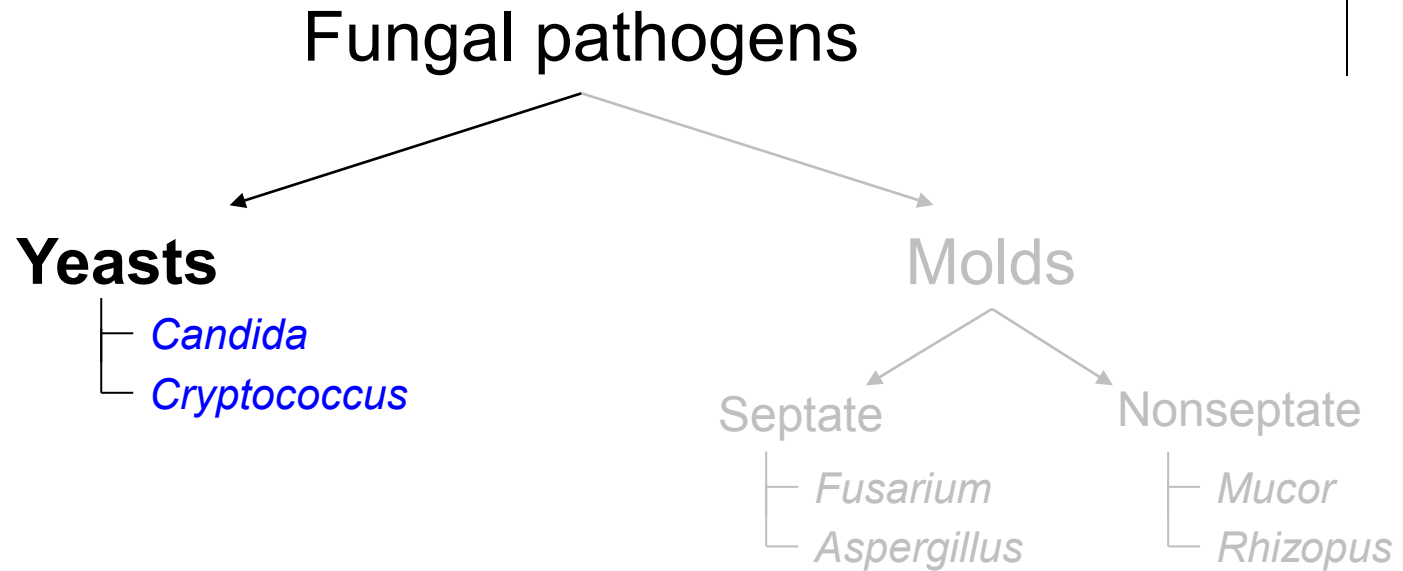
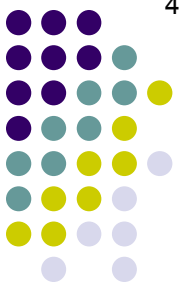
Common Ocular Fungal Pathogens



Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes:

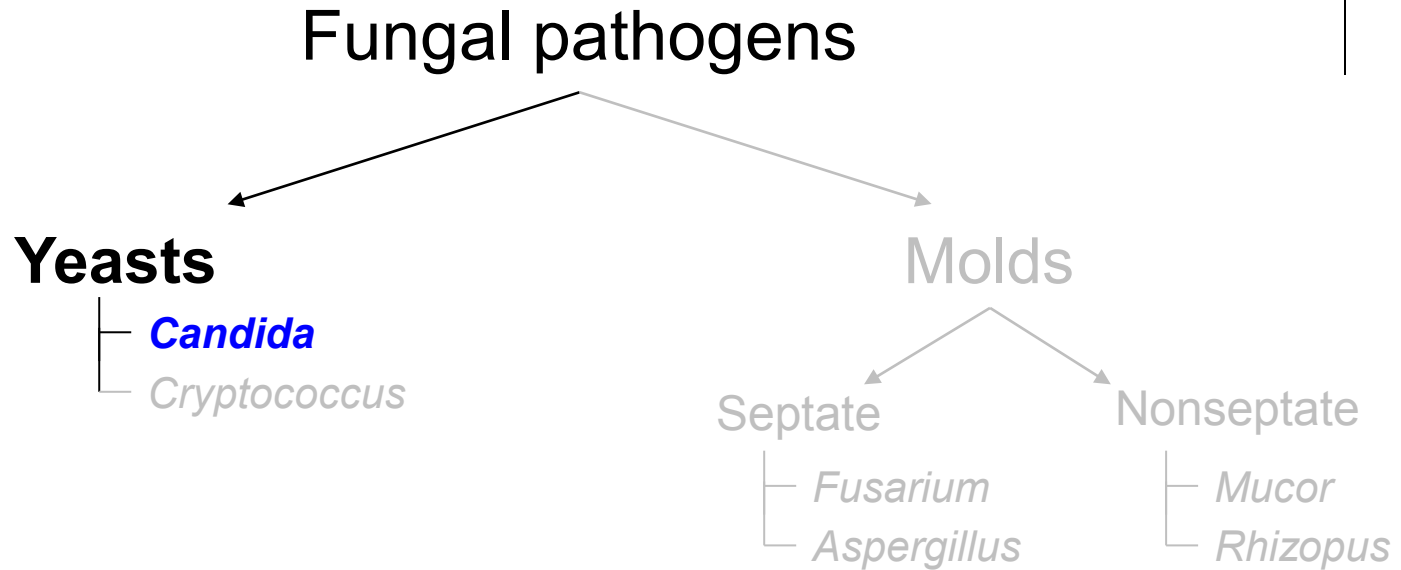
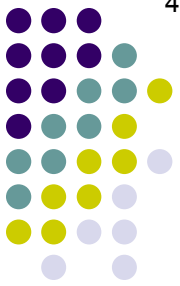
Common Ocular Fungal Pathogens



Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially

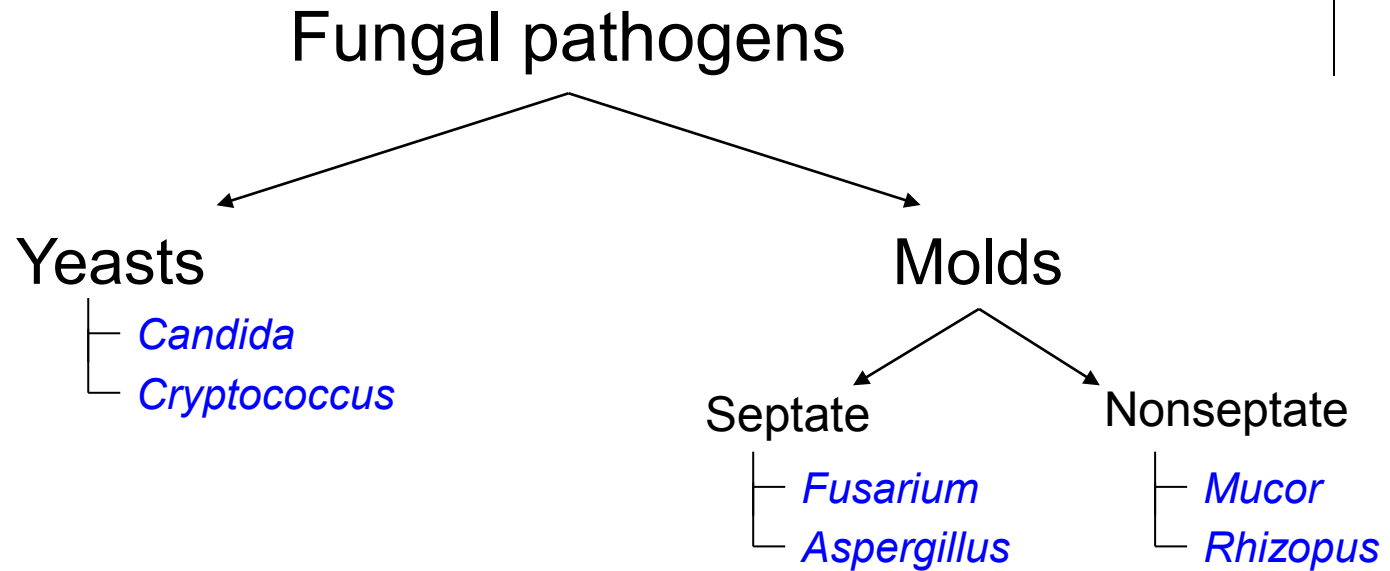
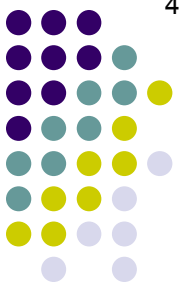




Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially Candida

Common Ocular Fungal Pathogens

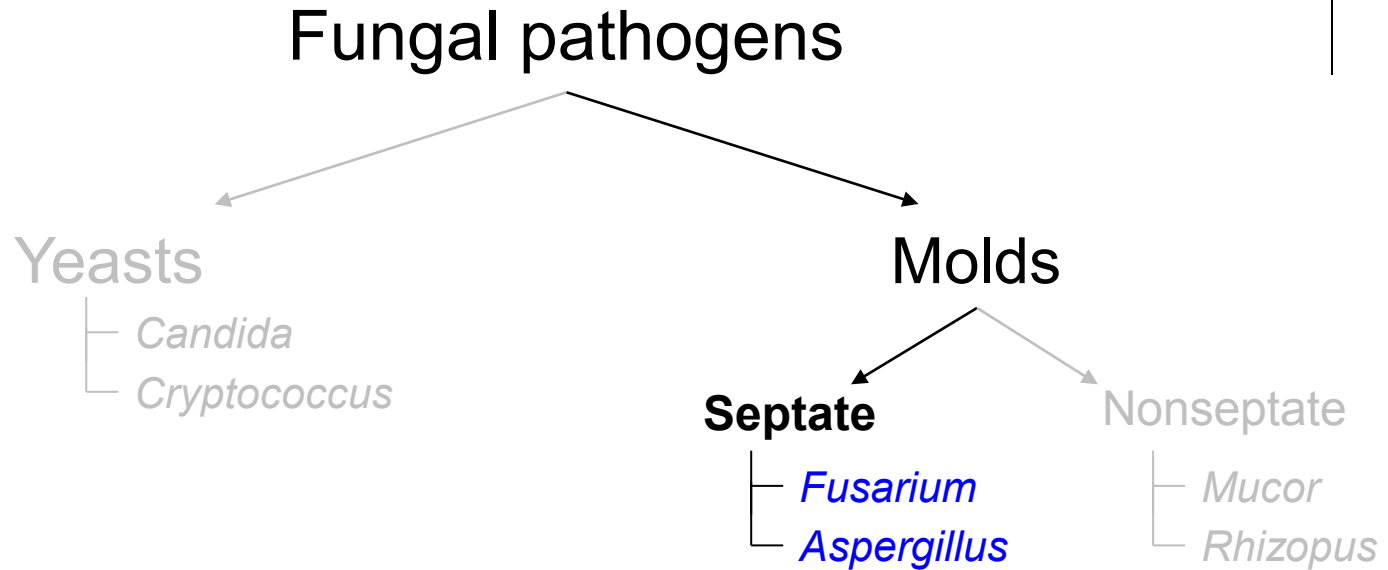
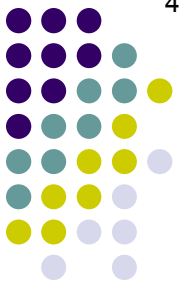


Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially Candida

Warm, humid climes:

Common Ocular Fungal Pathogens



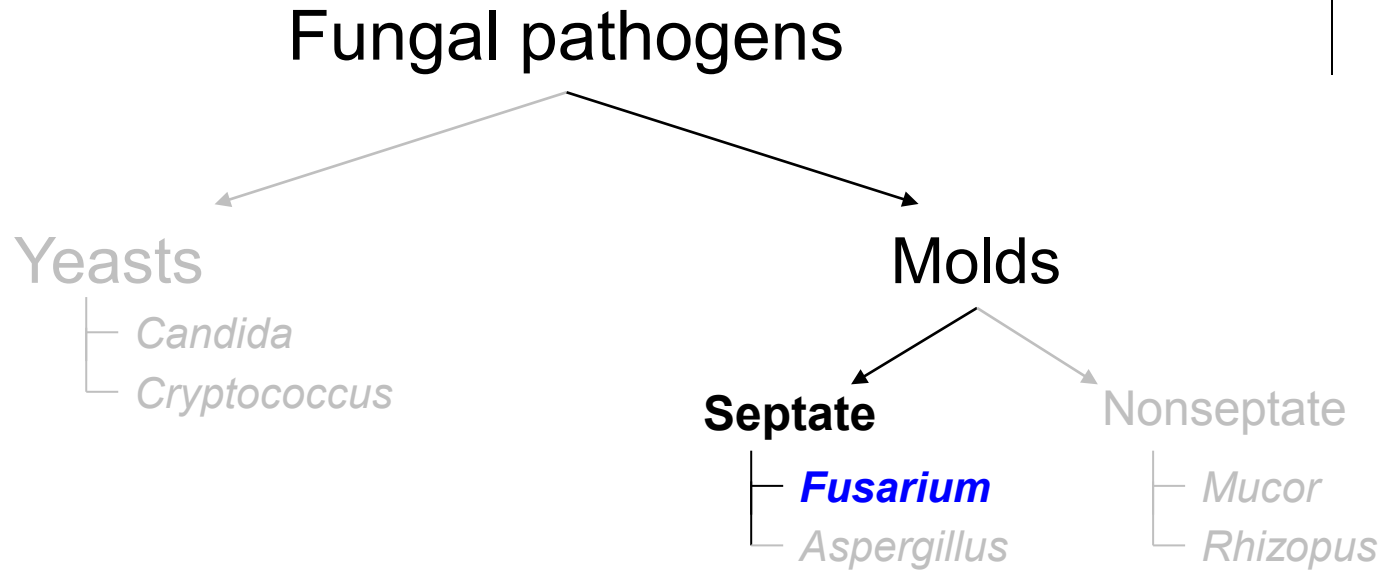
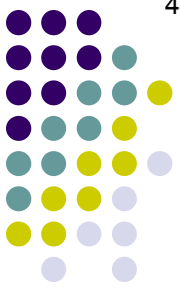
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Warm, humid climes: Septated molds, especially



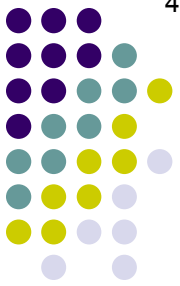
Common Ocular Fungal Pathogens



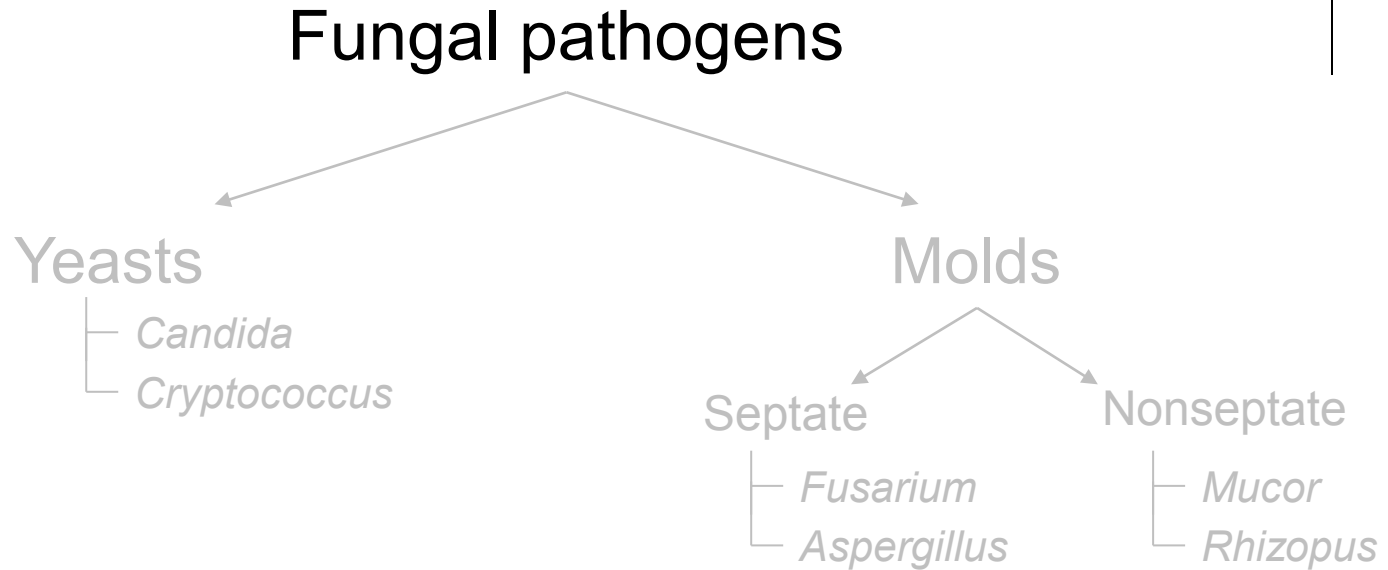
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially Candida

Warm, humid climes: Septated molds, especially Fusarium



Common Ocular Fungal Pathogens



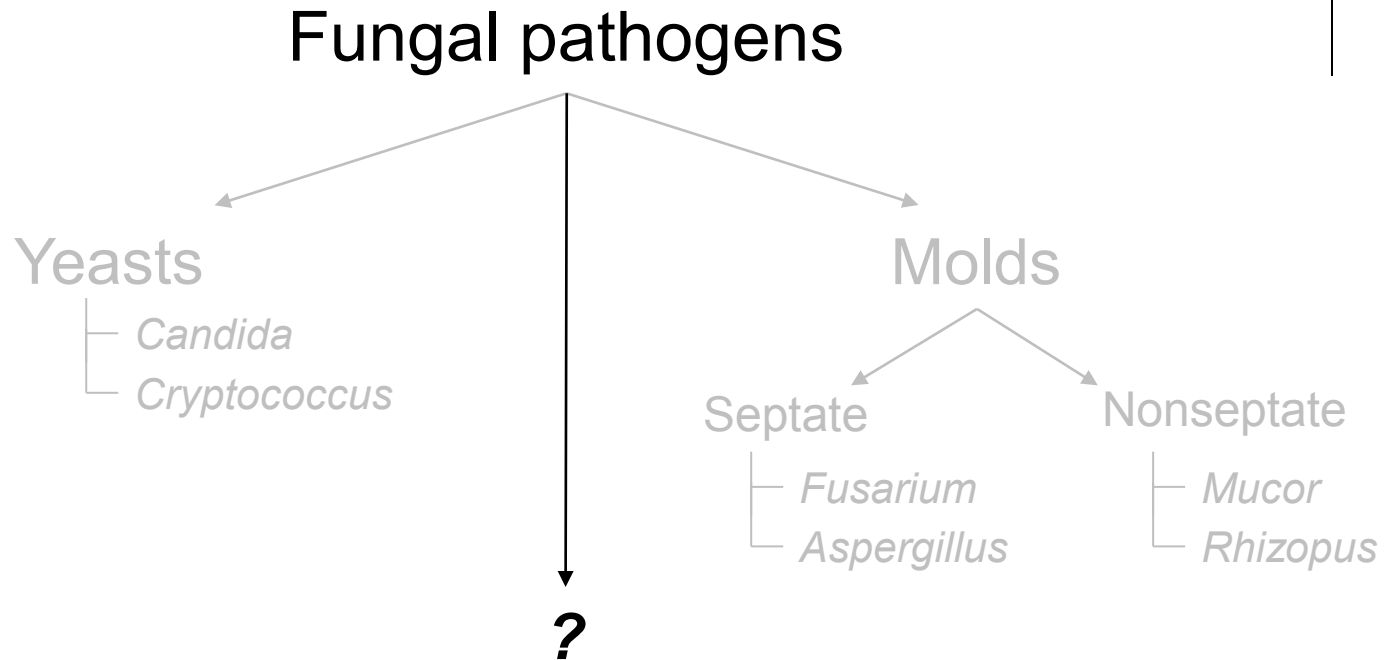
Certain fungal pathogens are associated with specific climates. When you hear of a fungal pathogen, what should come to mind?

These are the associations to bear in mind

Cool, northern climates	↔	Candida
Warm, humid climates	↔	Fusarium

No question—proceed when ready

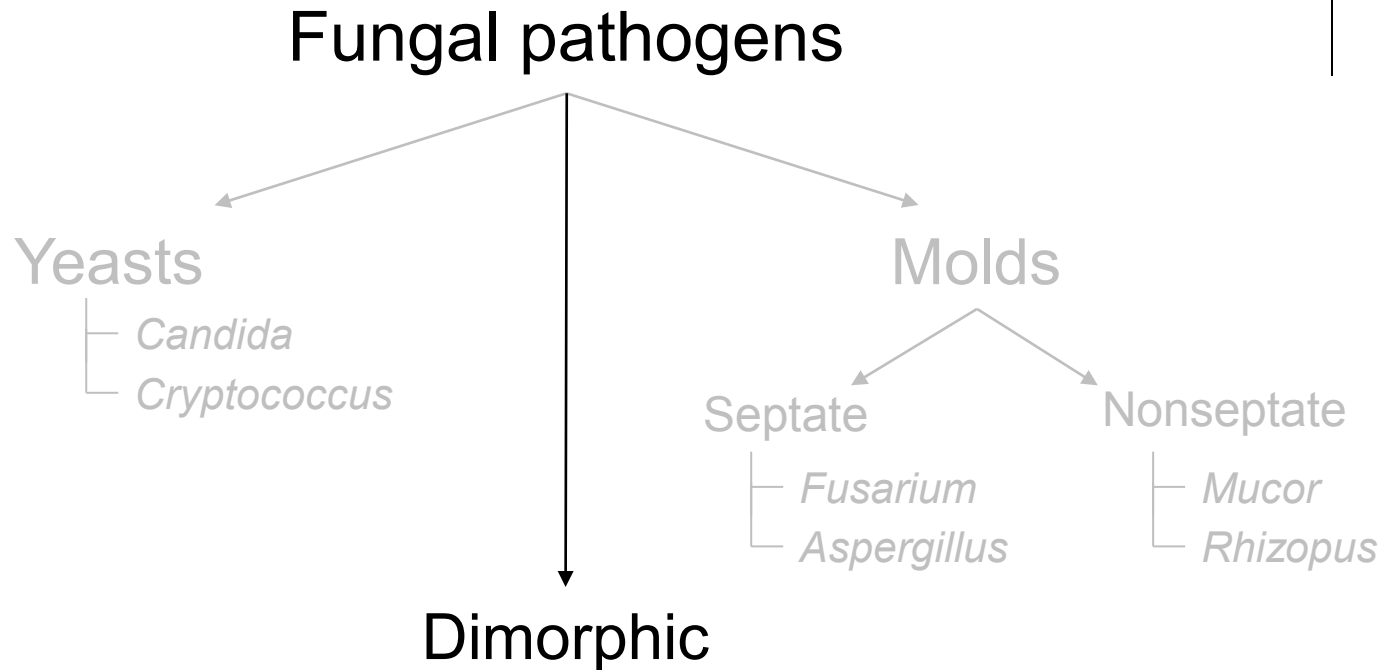
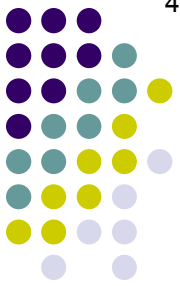
Common Ocular Fungal Pathogens



Final basic-science topic: Some fungi exist as yeast in the body, but as mold in the environment. What is the term for such fungi?

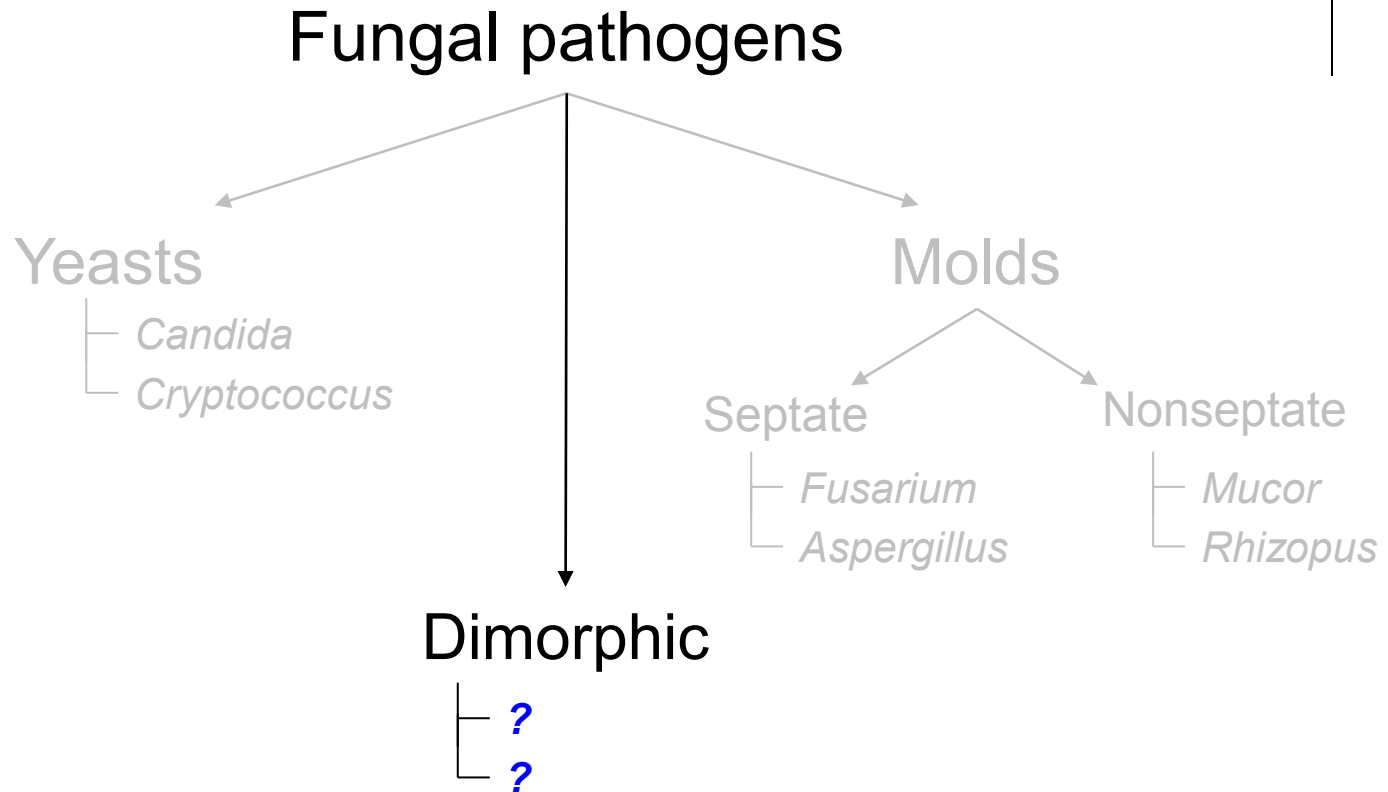
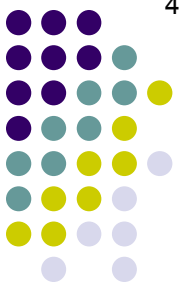
Common Ocular Fungal Pathogens

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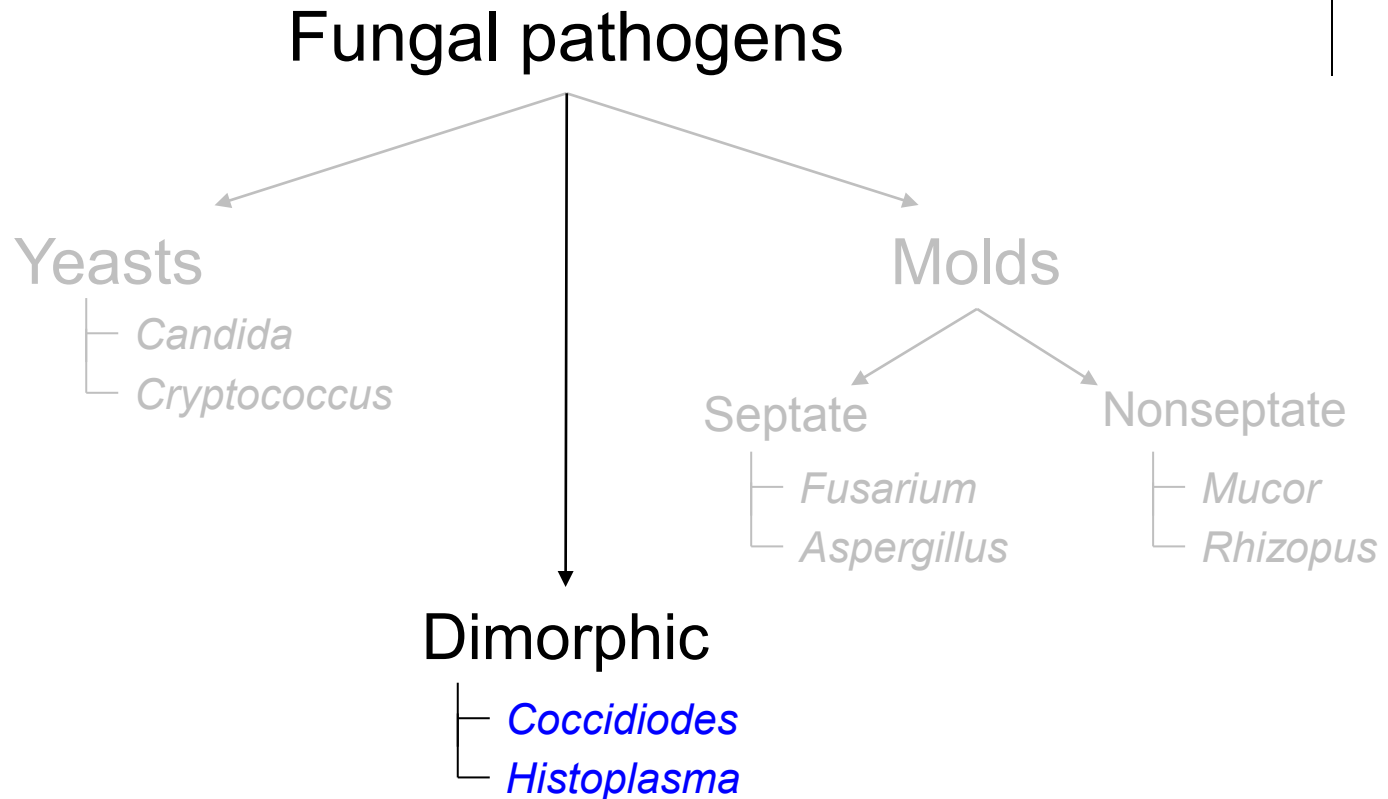
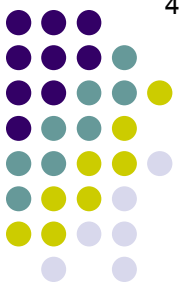
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Common Ocular Fungal Pathogens



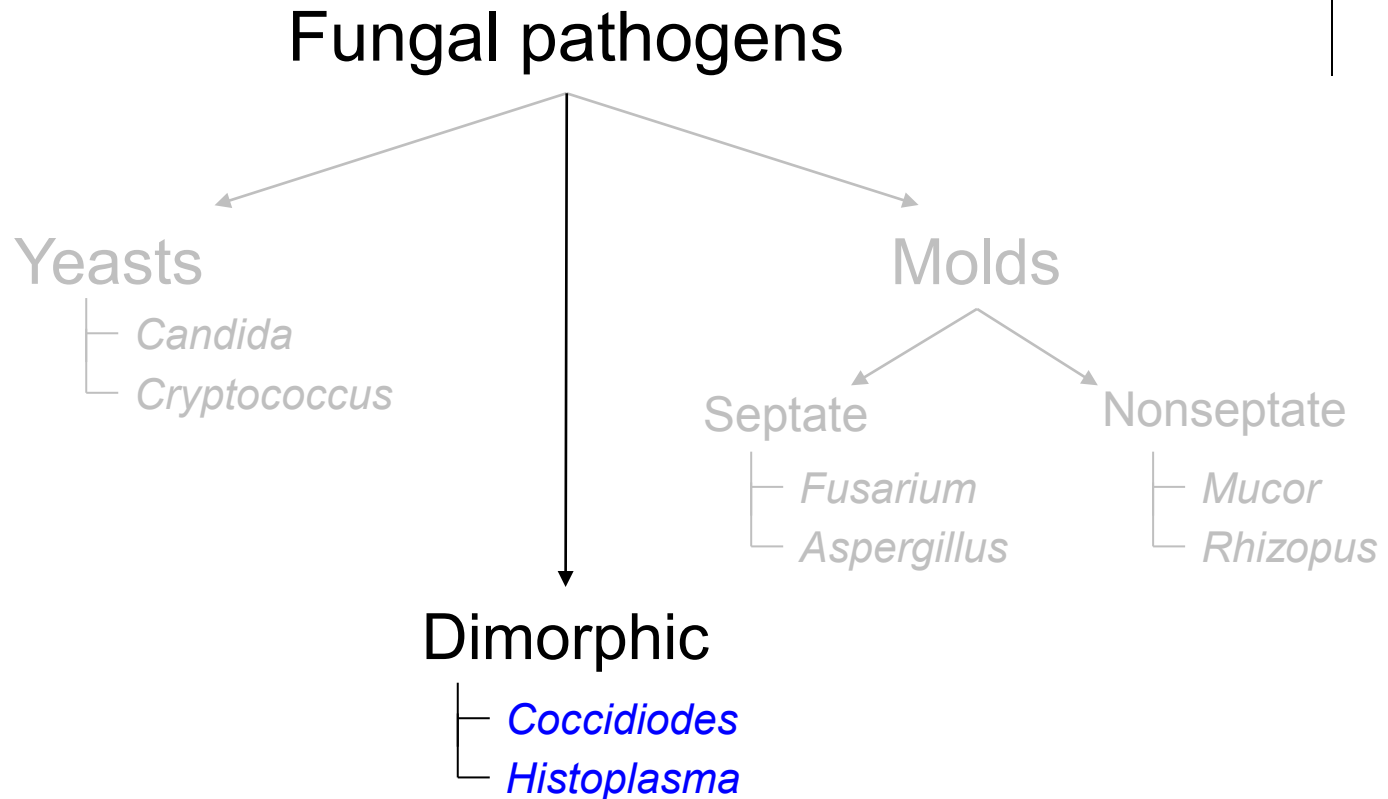
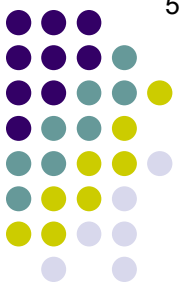
Two species account for the majority of dimorphic fungi issues—what are they?

Common Ocular Fungal Pathogens



Two species account for the majority of dimorphic fungi issues—what are they?

Common Ocular Fungal Pathogens

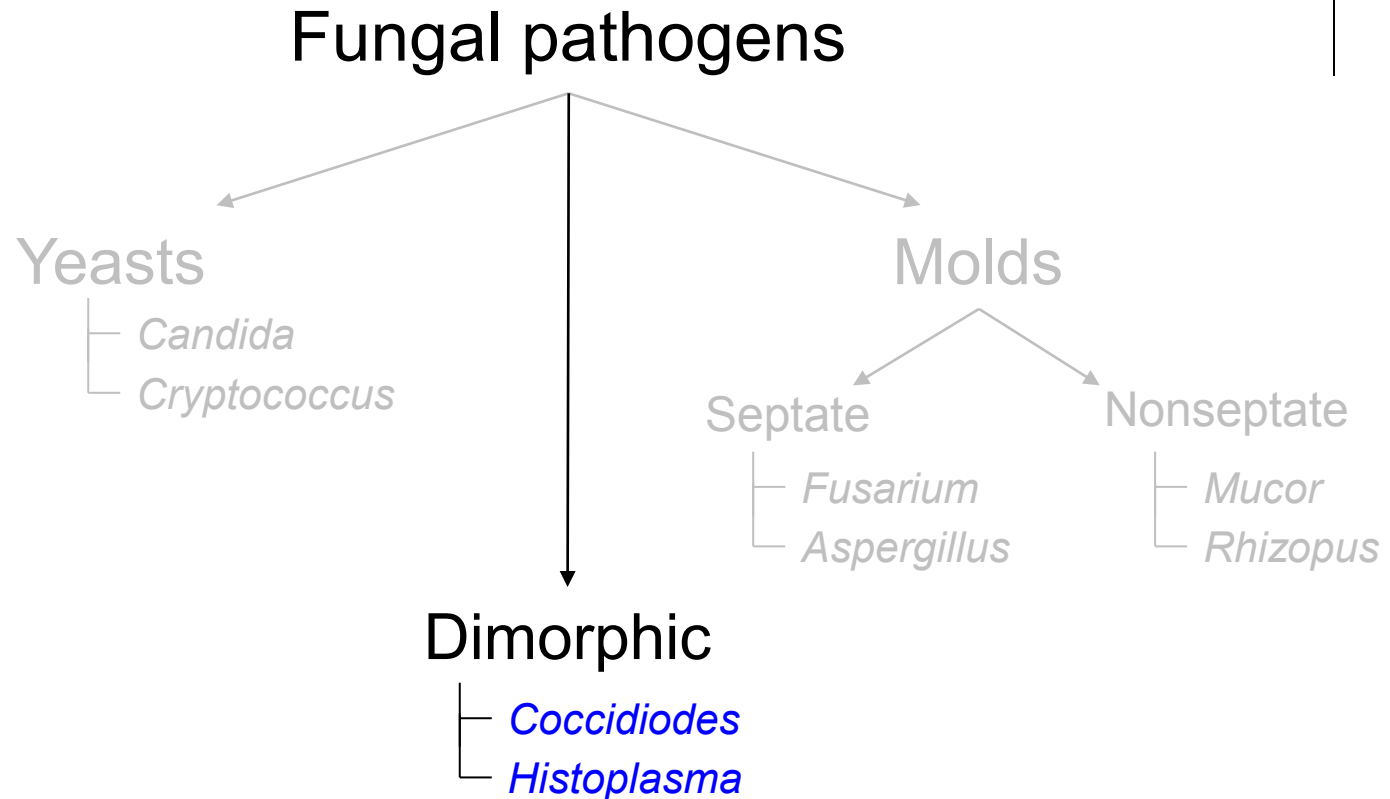
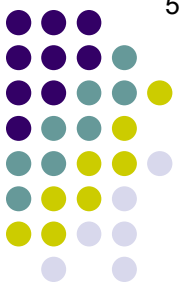


Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidioides: ?

Histoplasma

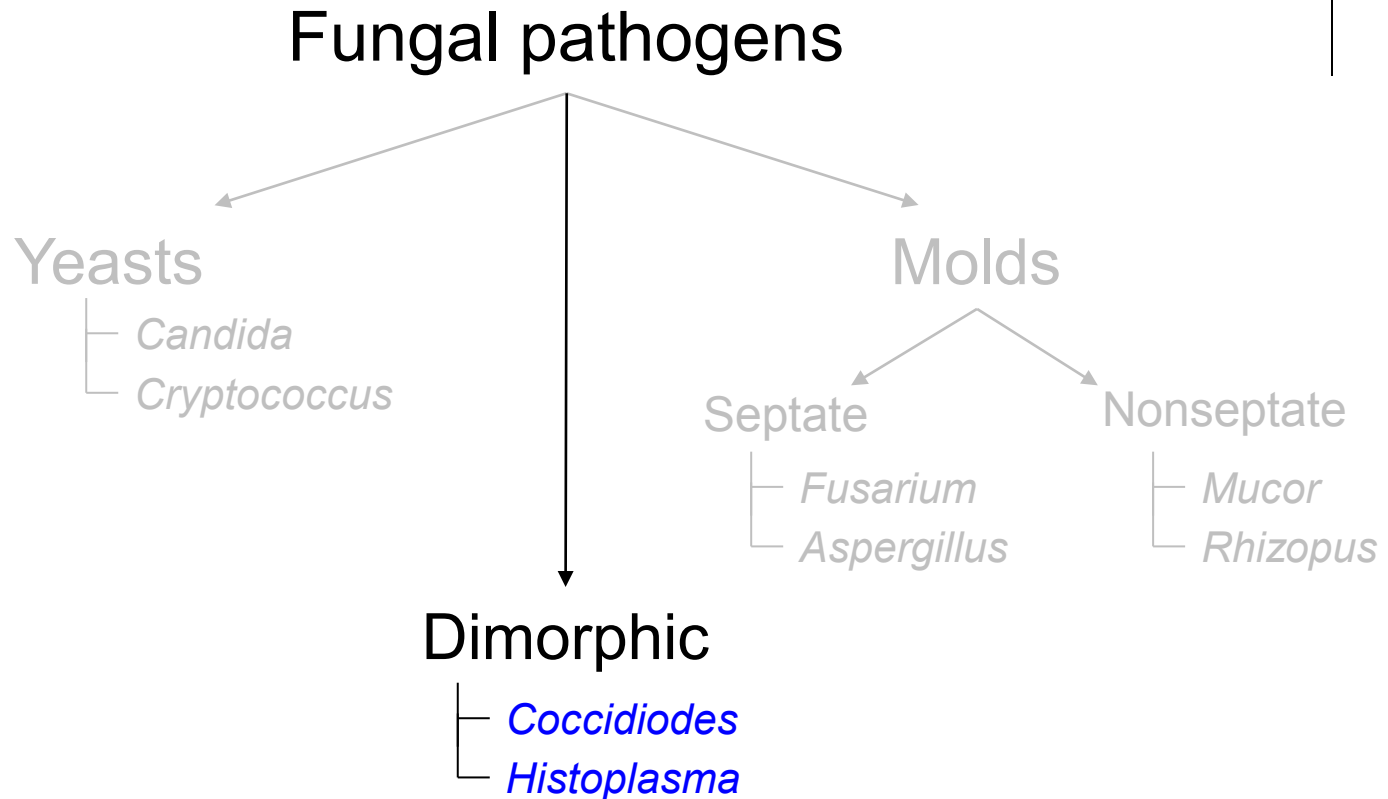
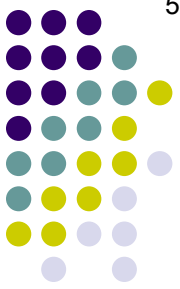
Common Ocular Fungal Pathogens



Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidioides: The Southwest, particularly the two words Valley in Cali
Histoplasma

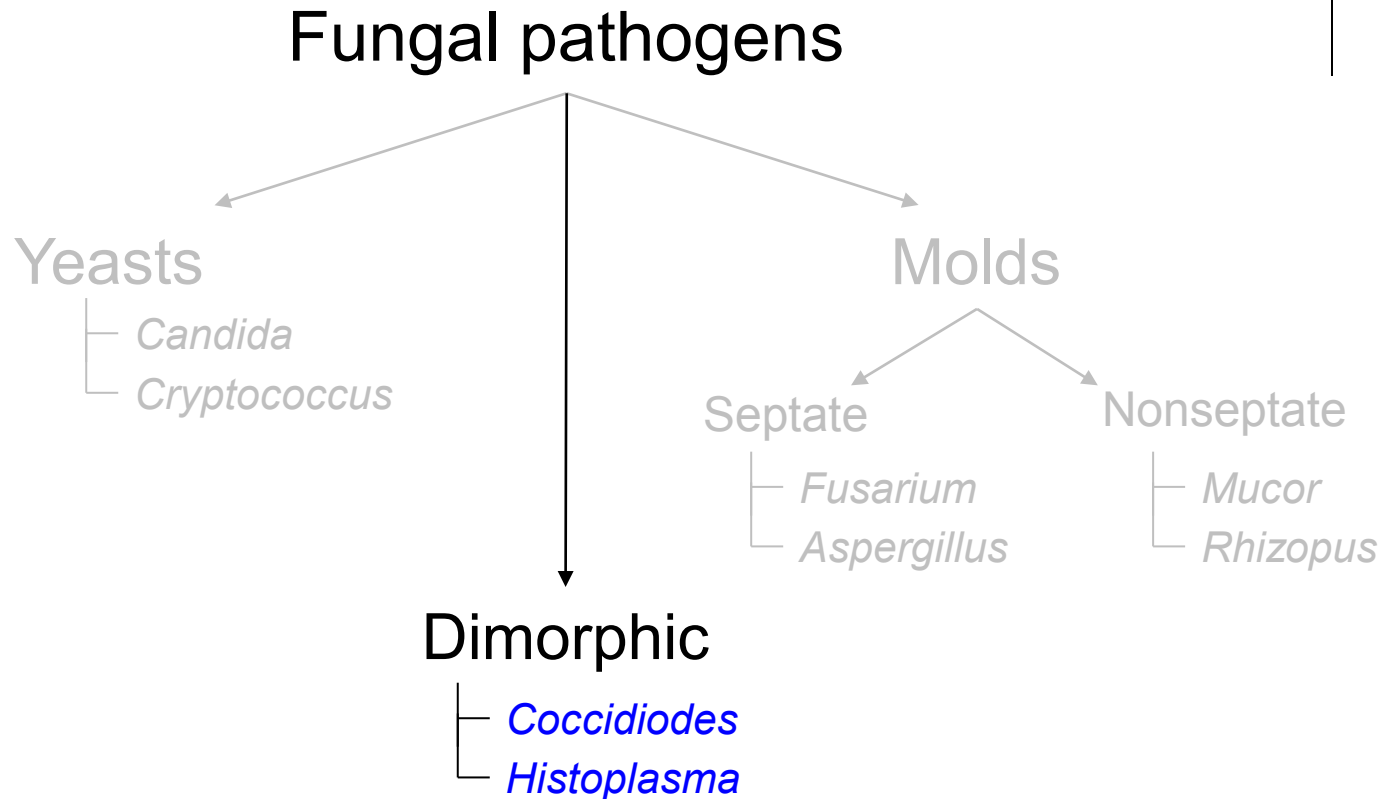
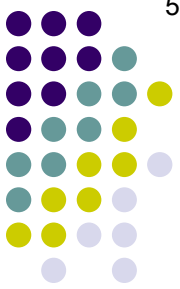
Common Ocular Fungal Pathogens



Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?

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Common Ocular Fungal Pathogens

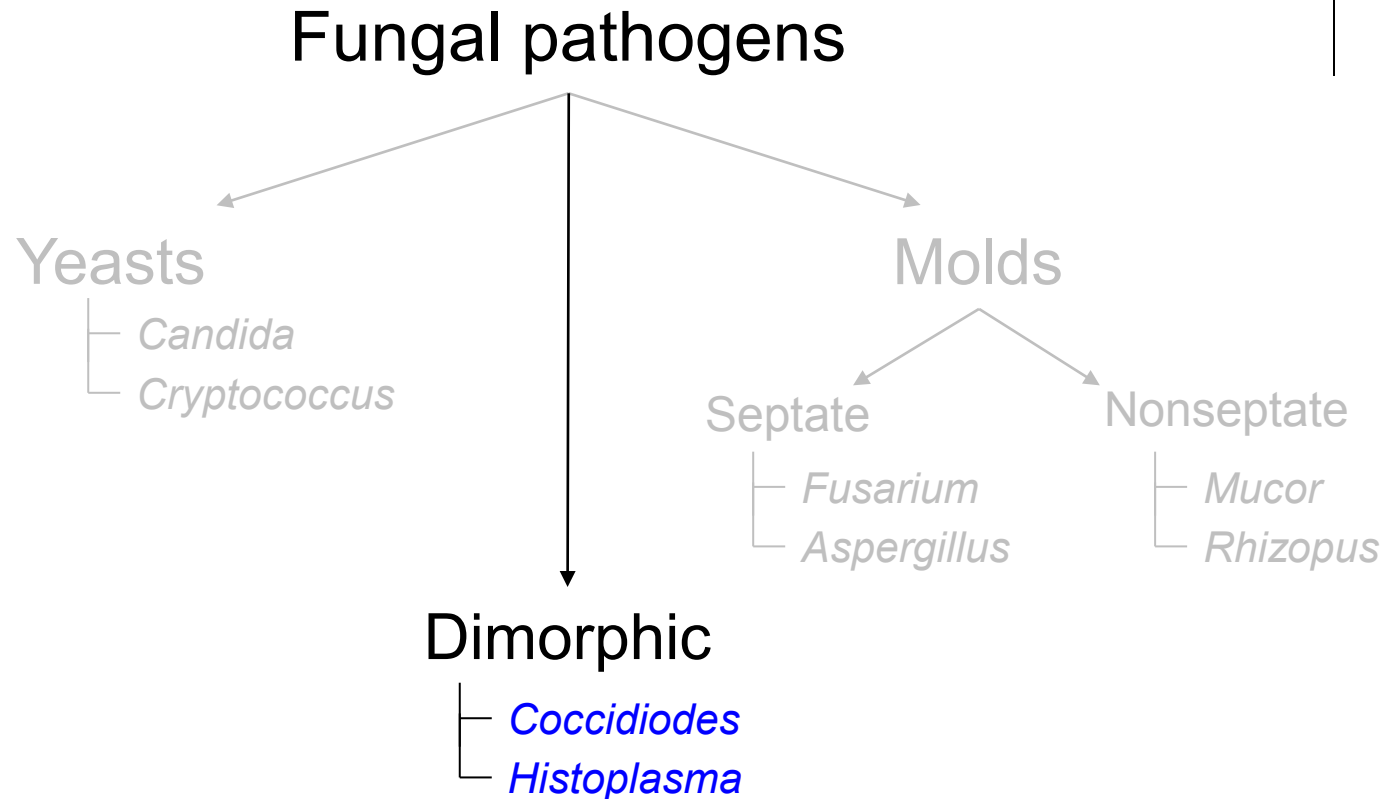
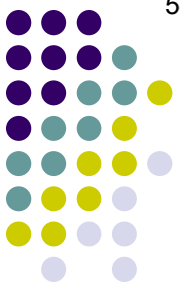


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Common Ocular Fungal Pathogens

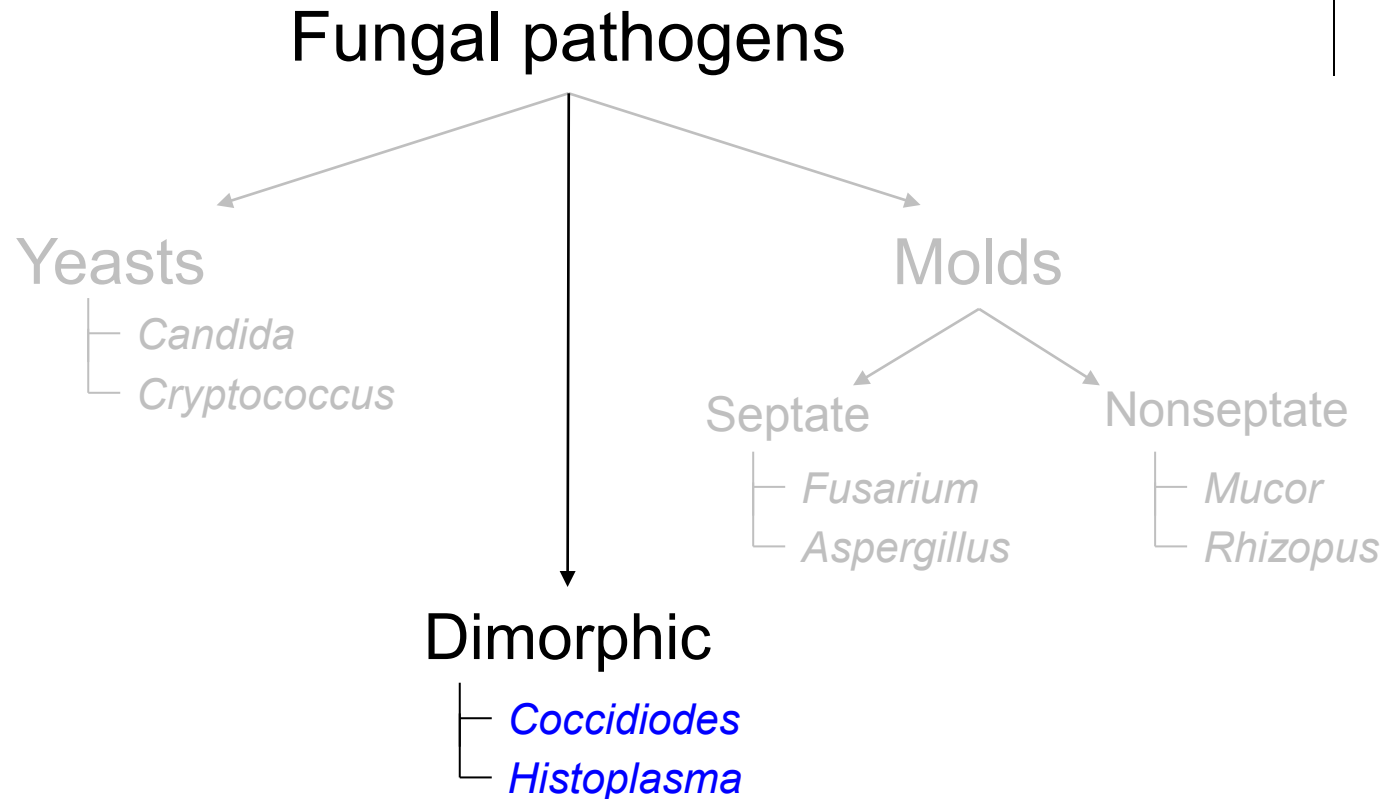
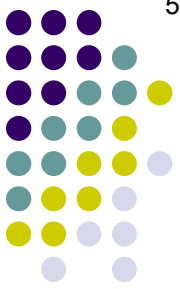


Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidioides: The Southwest, particularly the San Joaquin Valley in Cali

Histoplasma: The [] and [] River valleys

Common Ocular Fungal Pathogens

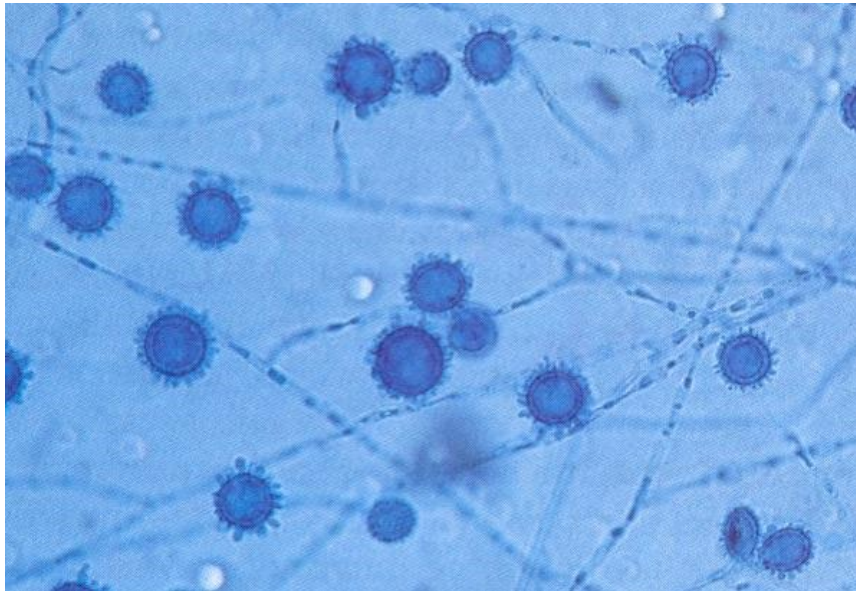
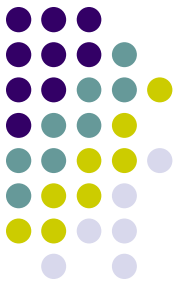


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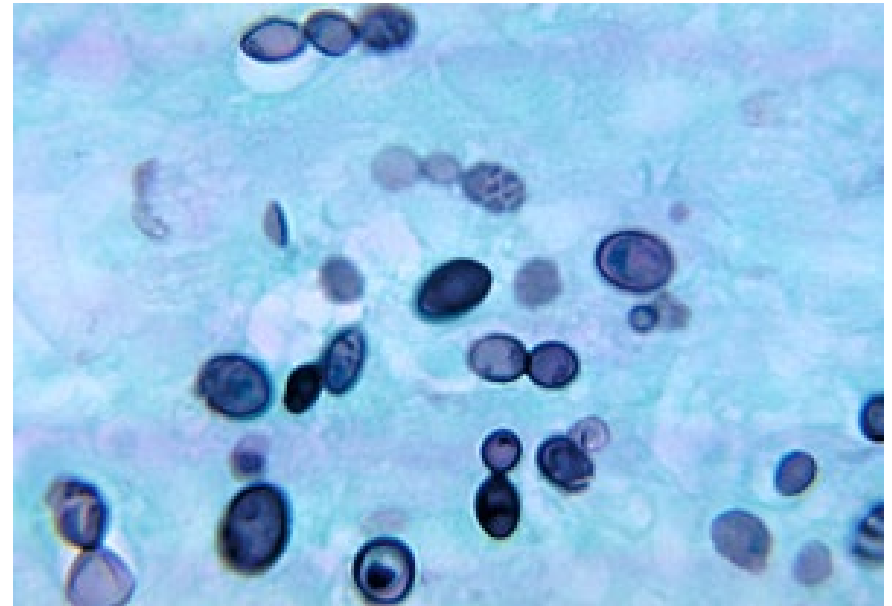
Coccidioides: The Southwest, particularly the San Joaquin Valley in Cali

Histoplasma: The Ohio and Mississippi River valleys

Common Ocular Fungal Pathogens

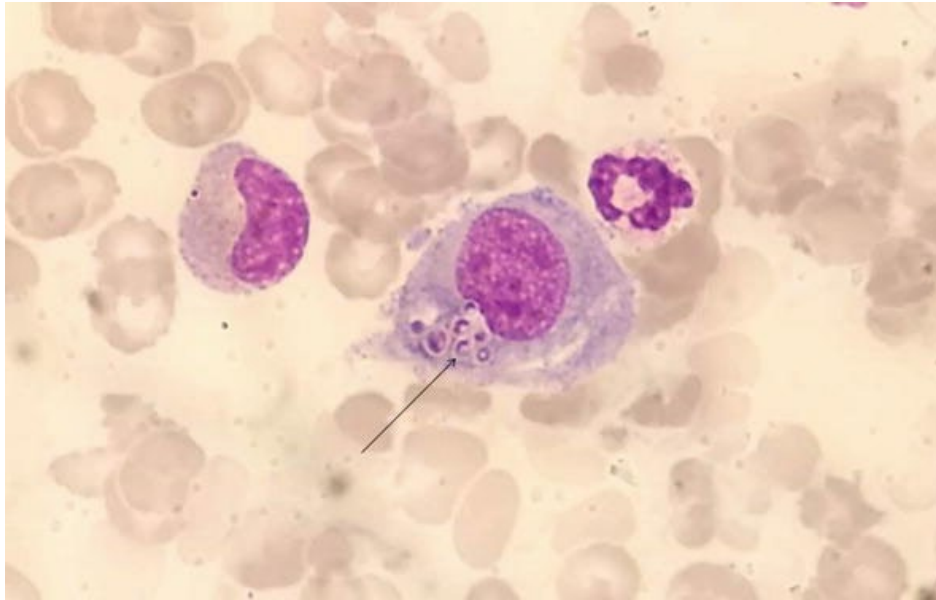
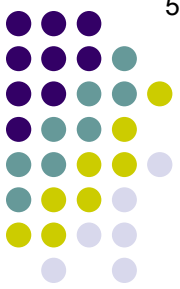


H capsulatum: Mold (filamentous) form



H capsulatum: Yeast form

Common Ocular Fungal Pathogens



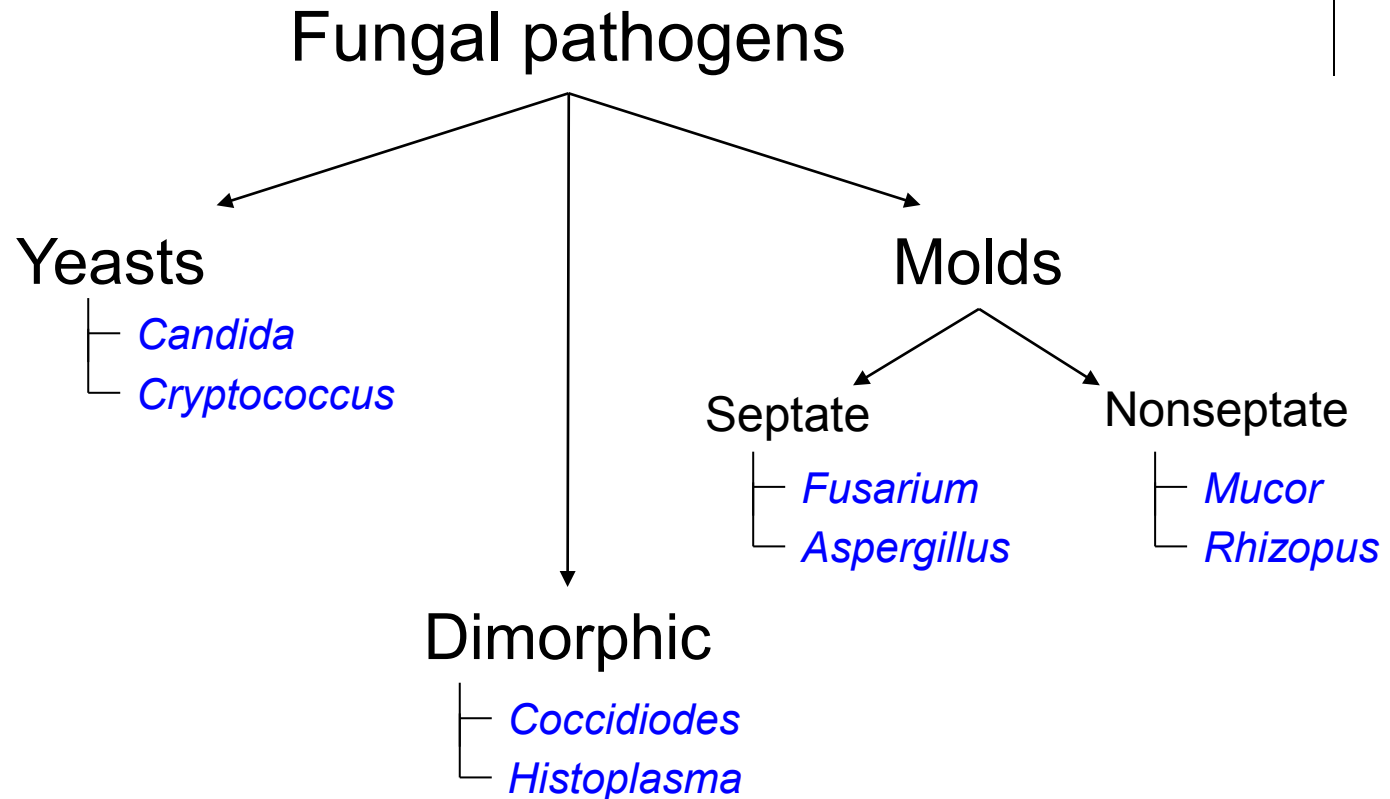
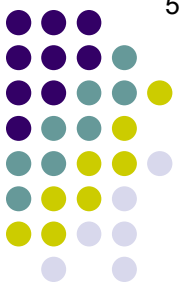
Histoplasma, yeast form, in a macrophage



Coccidioides: Note the 'spherule' shape

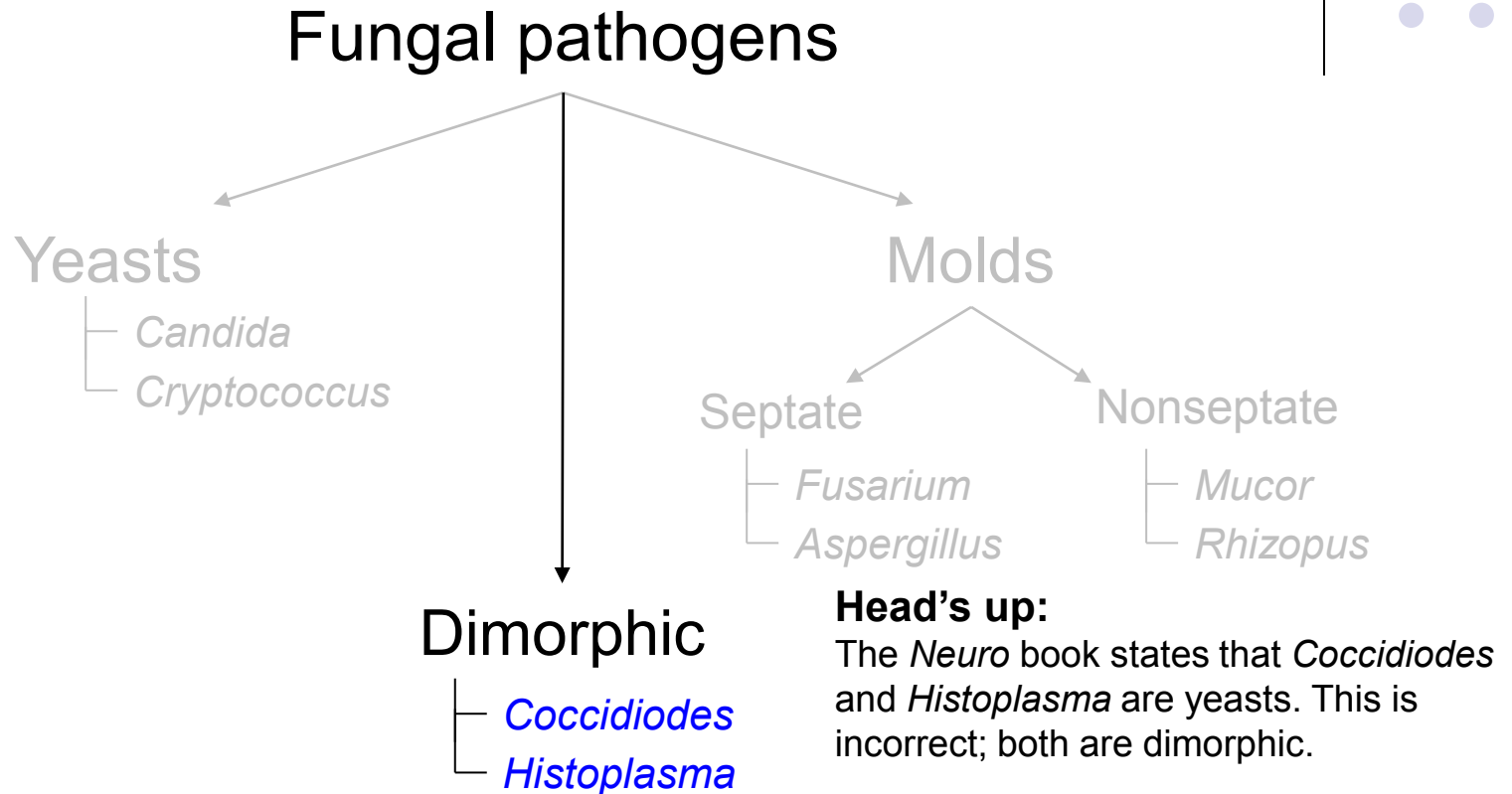
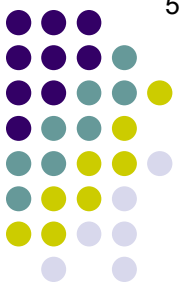
Dimorphic pathogens

Common Ocular Fungal Pathogens

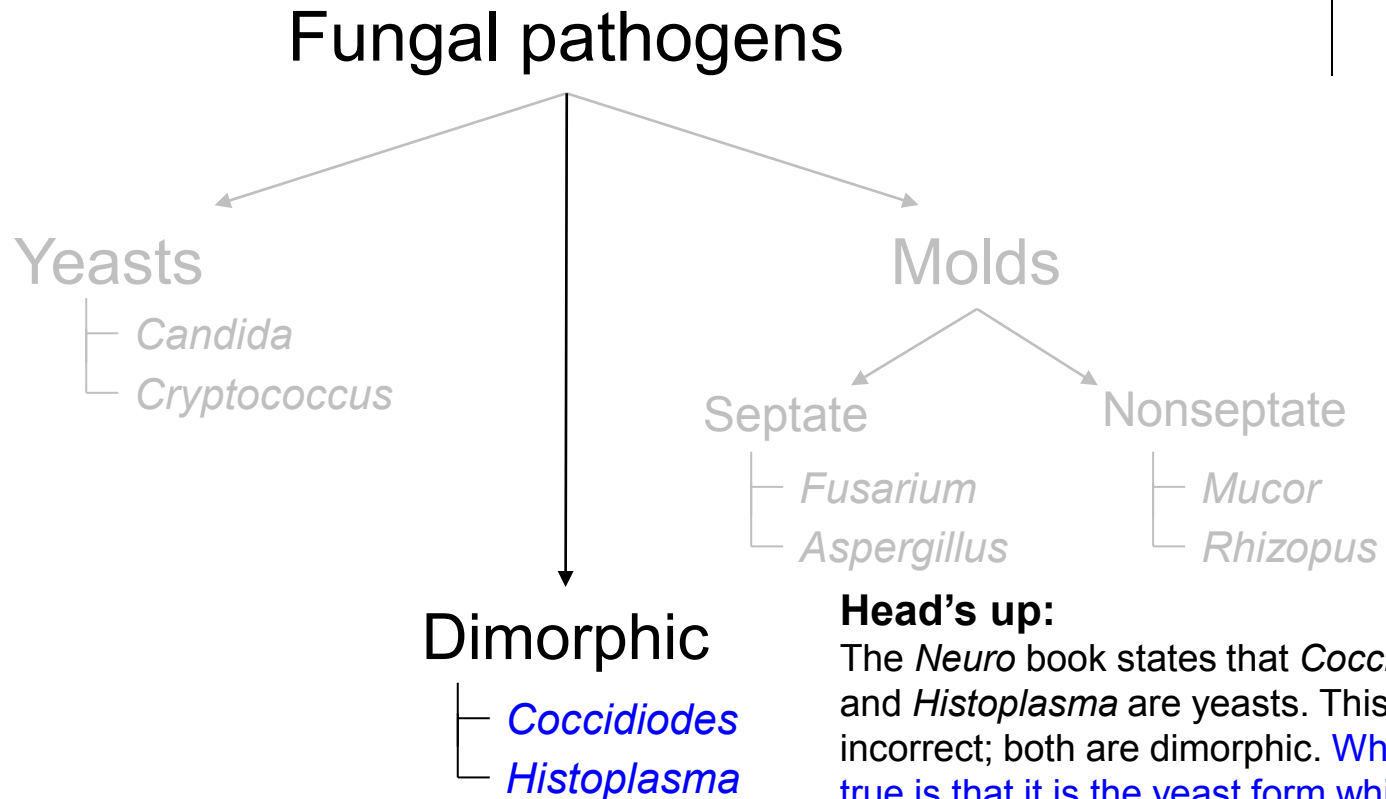
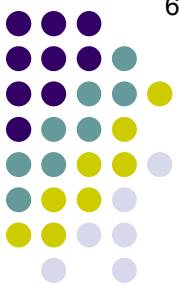


These eight species account for most of the fungal issues addressed in the BCSC

Common Ocular Fungal Pathogens



Common Ocular Fungal Pathogens

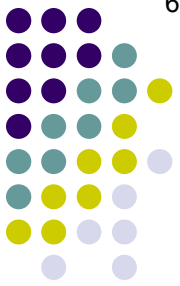


Head's up:

The *Neuro* book states that *Coccidioides* and *Histoplasma* are yeasts. This is incorrect; both are dimorphic. **What is true is that it is the yeast form which is infectious in humans.**

Common Ocular Fungal Pathogens

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Fungal pathogens

Yeasts

- Candida*
- Cryptococcus*

Head's up part deux:

The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast.

Molds

Septate

- Fusarium*
- Aspergillus*

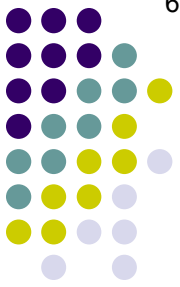
Nonseptate

- Mucor*
- Rhizopus*

Dimorphic

- Coccidioides*
- Histoplasma*

No question yet



Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts

- Candida*
- Cryptococcus*

Head's up part deux:

The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast.

What **is** true is that *Candida* can form [redacted], which give it the **appearance** of having a mold phase and thus being dimorphic.

Molds

Septate

- Fusarium*
- Aspergillus*

Nonseptate

- Mucor*
- Rhizopus*

Dimorphic

- Coccidioides*
- Histoplasma*



Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts

- Candida*
- Cryptococcus*

Head's up part deux:

The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast.

What **is** true is that *Candida* can form pseudohyphae, which give it the **appearance** of having a mold phase and thus being dimorphic.

Molds

Septate

- Fusarium*
- Aspergillus*

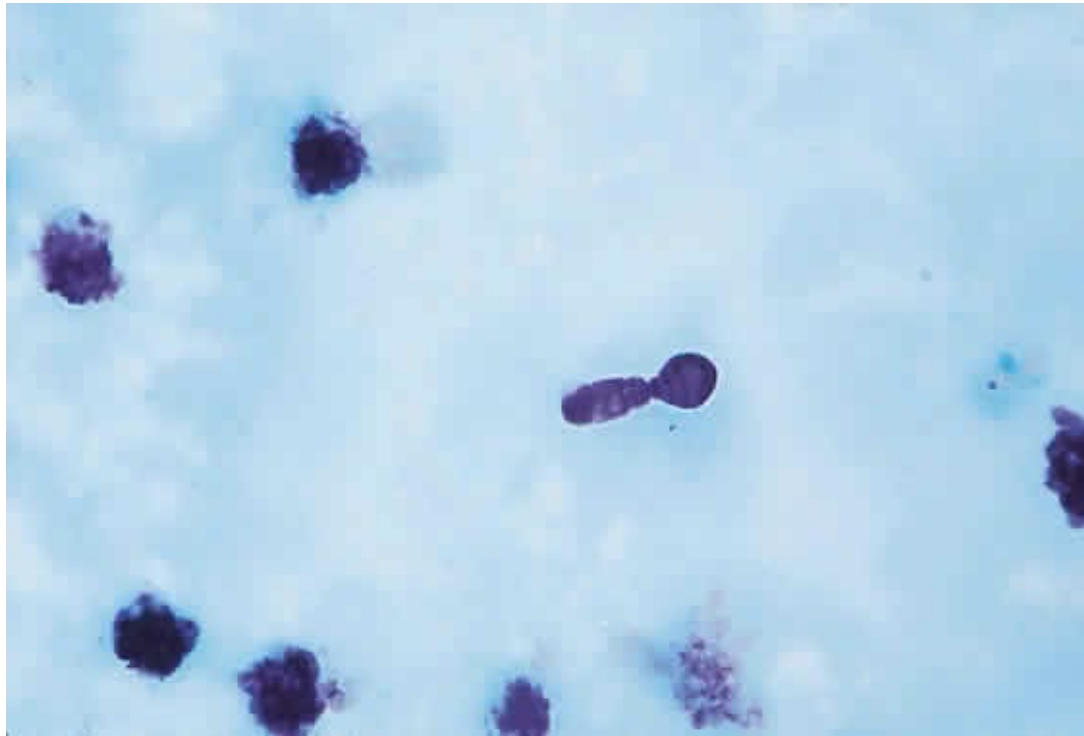
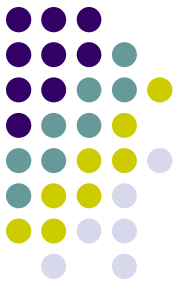
Nonseptate

- Mucor*
- Rhizopus*

Dimorphic

- Coccidioides*
- Histoplasma*

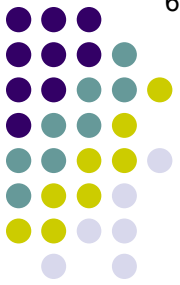
Common Ocular Fungal Pathogens



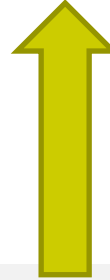
Candida. This pic was shown earlier in the set. The 'budding' structure that was remarked upon then is a pseudohyphae.

Candida

Common Ocular Fungal Pathogens

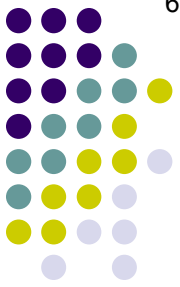


Fungal pathogenic**ic conditions**

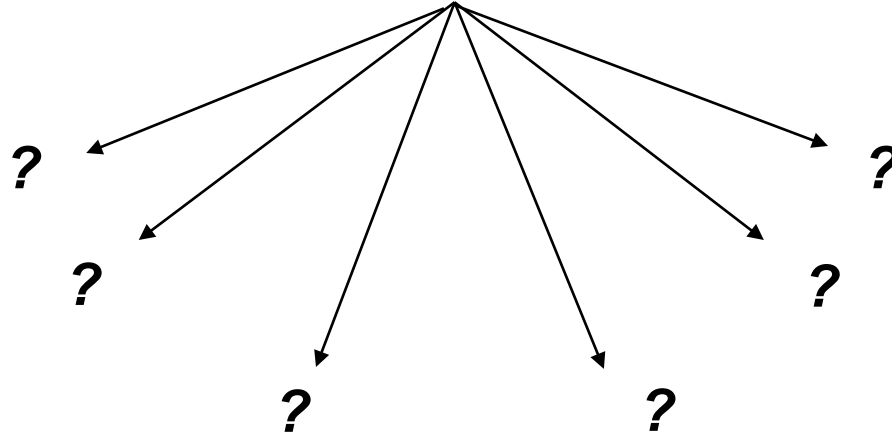


*Next we'll shift gears and talk about the **fungal conditions** you need to know in order to do well on the OKAP (oh sure, and to take care of pts too)*

Common Ocular Fungal Pathogens

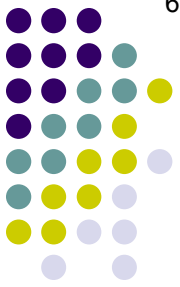


Fungal pathogenicic conditions

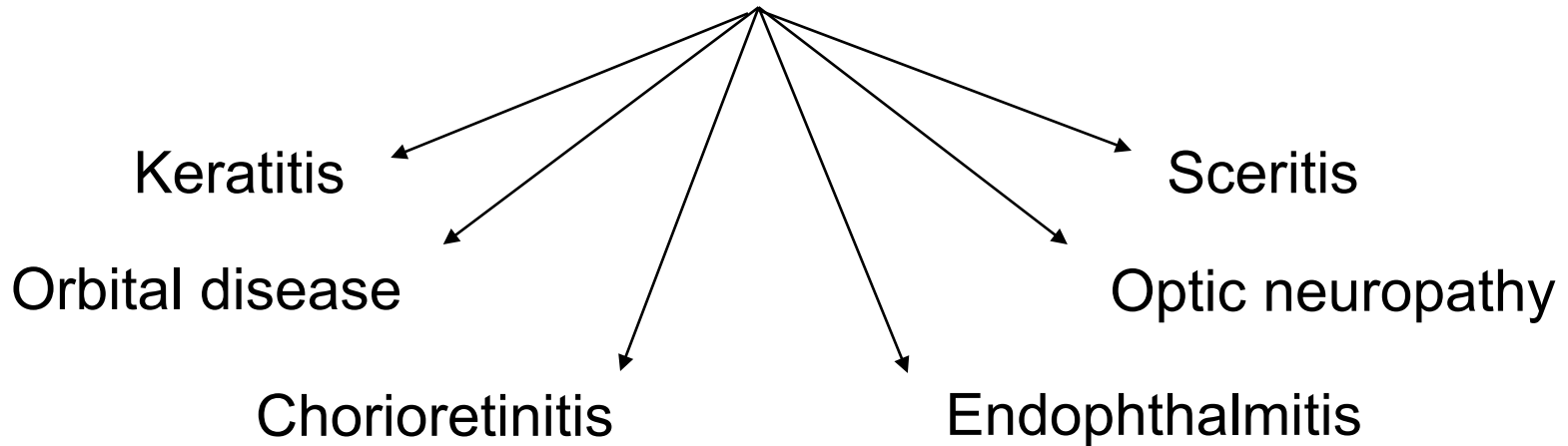


Fungal pathogens cause six general conditions—what are they?

Common Ocular Fungal Pathogens

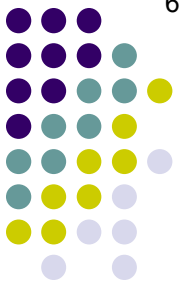


Fungal pathogenicic conditions

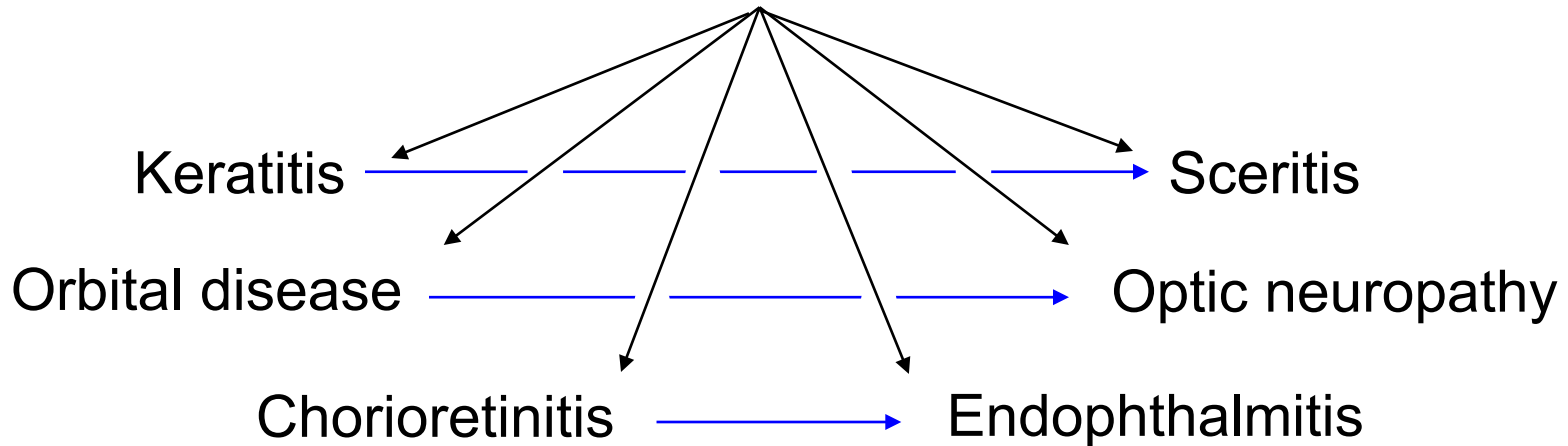


Fungal pathogens cause six general conditions—what are they?

Common Ocular Fungal Pathogens



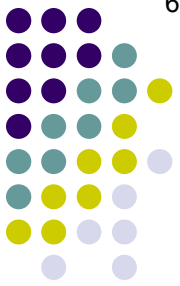
Fungal pathogenicic conditions



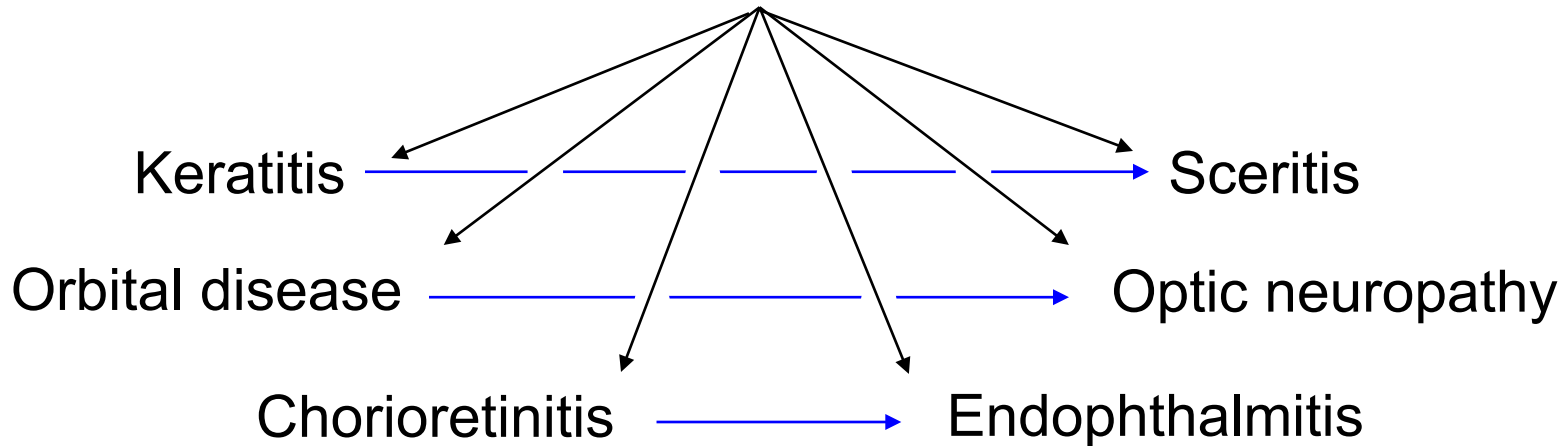
Important foreshadowing: These conditions are not thrown up here random. As we will see, the conditions on the right are often (in some cases **always**) caused by the condition on the left.

No question

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

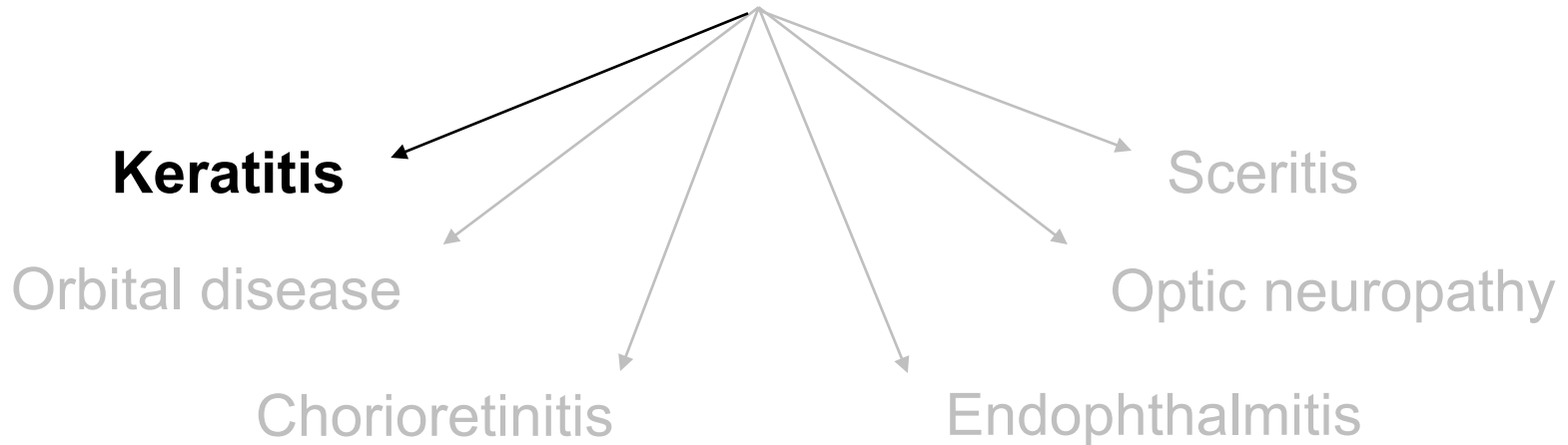


Important foreshadowing: These conditions are not thrown up here random. As we will see, the conditions on the right are often (in some cases **always**) caused by the condition on the left. **Committing the diagram to memory in the manner it's presented above will help you hang on to that key fact.**

Common Ocular Fungal Pathogens

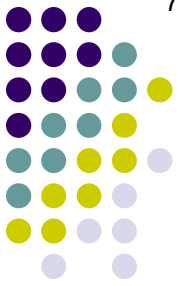


Fungal pathogenicic conditions

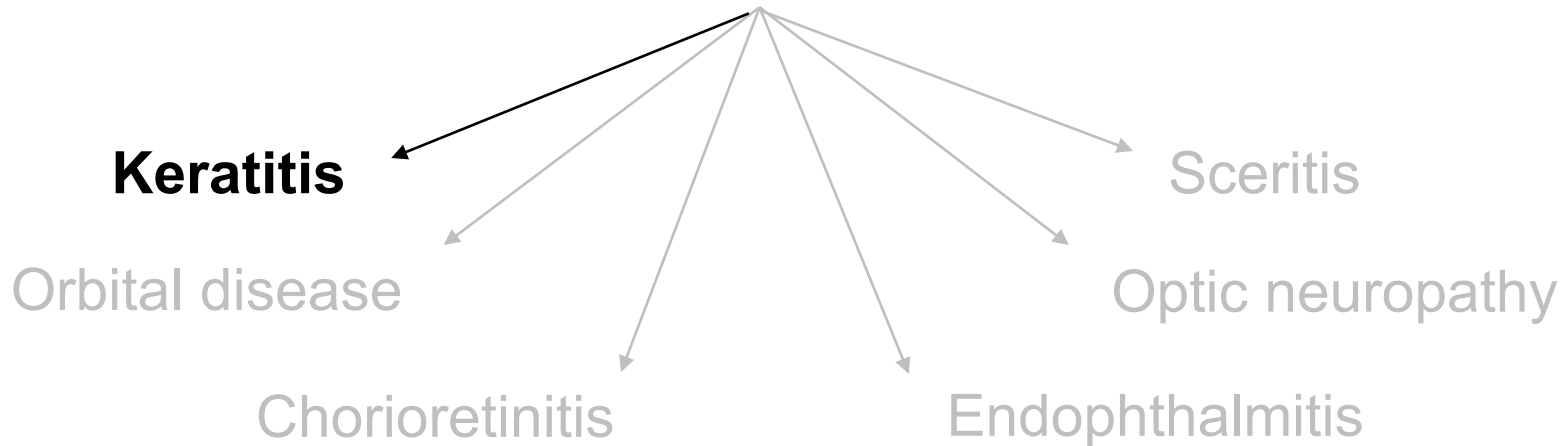


In terms of presentation, how does fungal keratitis differ from bacterial?

Common Ocular Fungal Pathogens



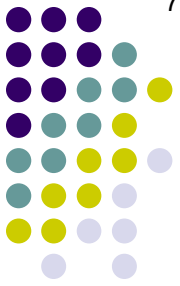
Fungal pathogenicic conditions



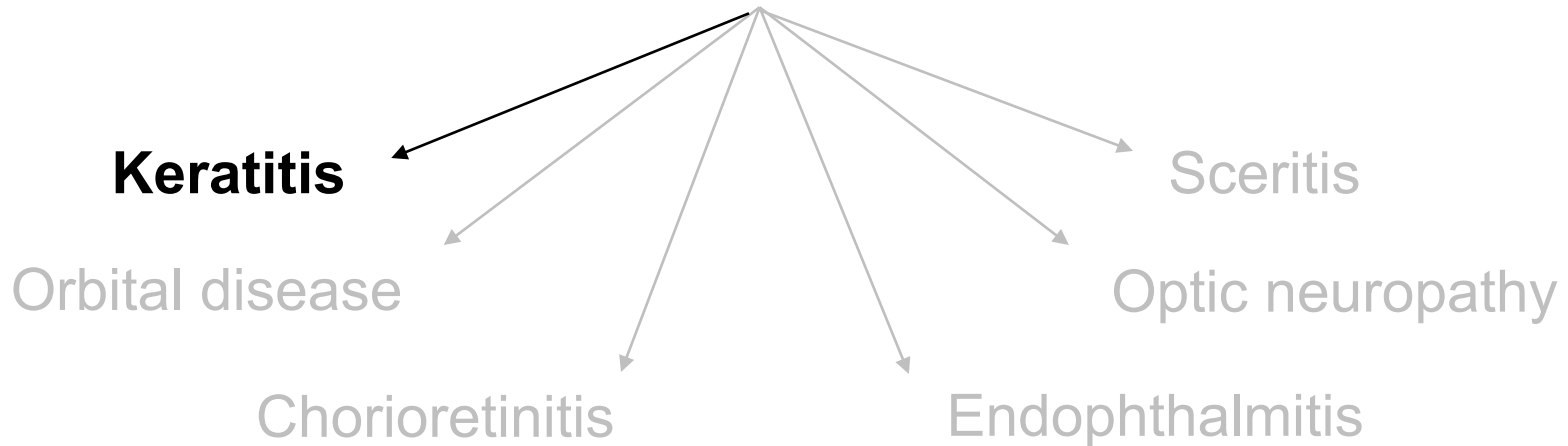
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Bacterial tends to be , whereas fungal tends to be

Common Ocular Fungal Pathogens



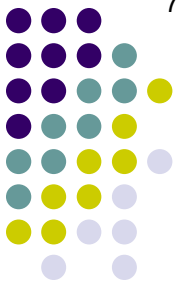
Fungal pathogenicic conditions



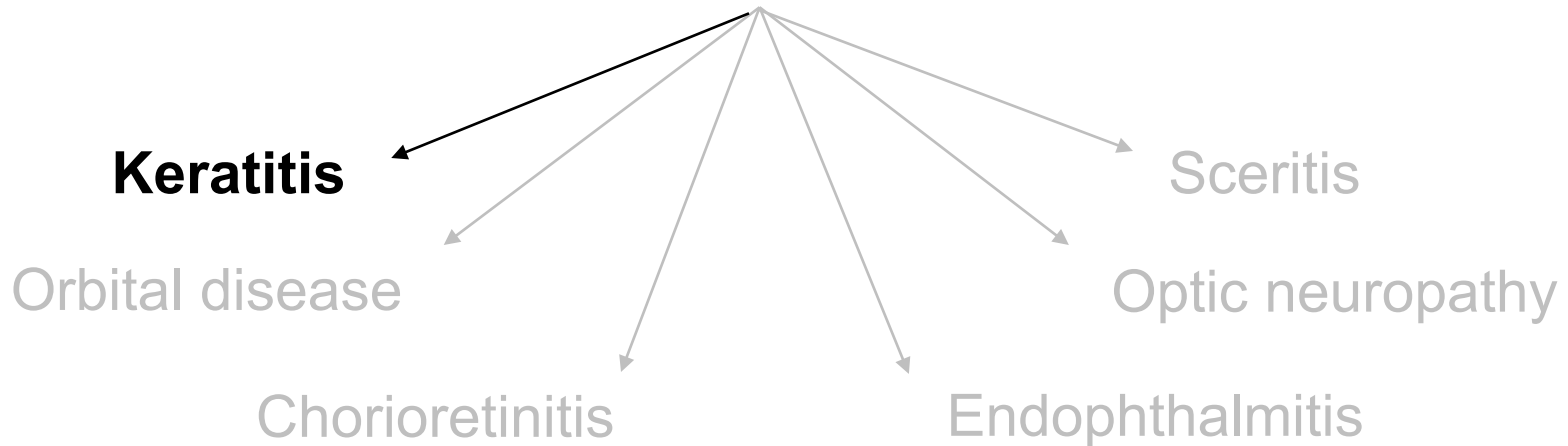
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Bacterial tends to be fulminant, whereas fungal tends to be insidious

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

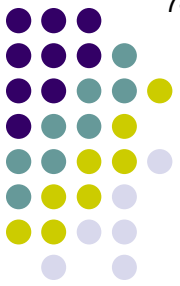


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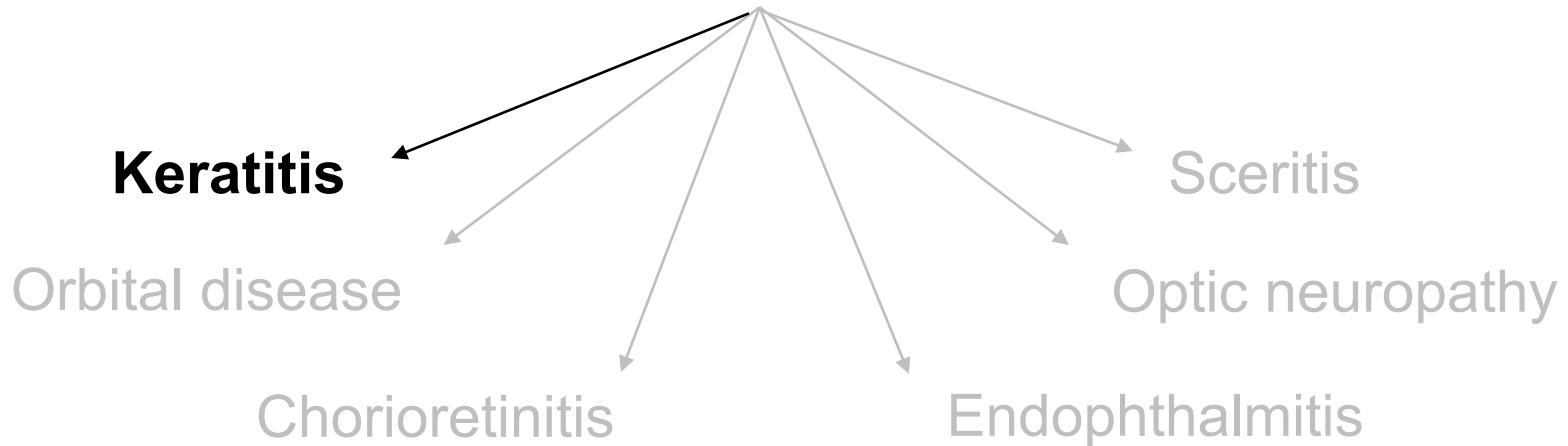
Bacterial tends to be fulminant, whereas fungal tends to be insidious

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

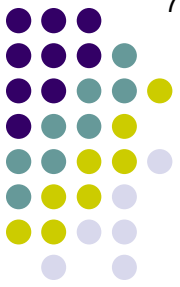


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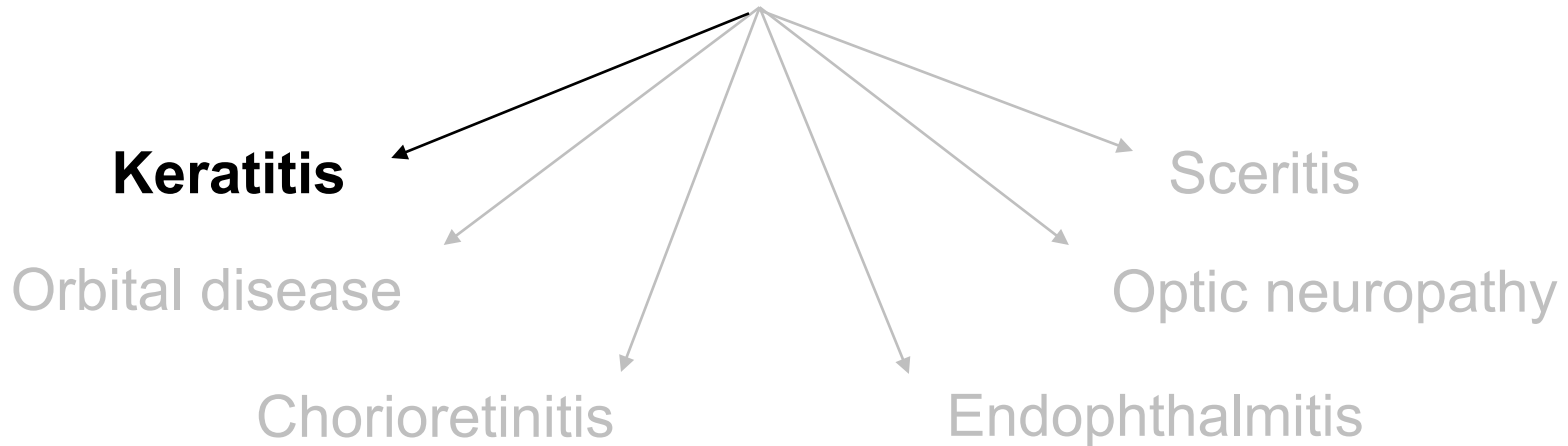
With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Unlike (most) bacteria, fungi can breach Descemet's to enter the AC



Common Ocular Fungal Pathogens

Fungal pathogenic conditions



There are three main risk factors for fungal keratitis—what are they?

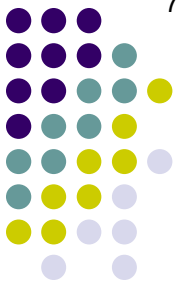
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Fungal keratitis differ from bacterial?

Fungal keratitis tends to be insidious

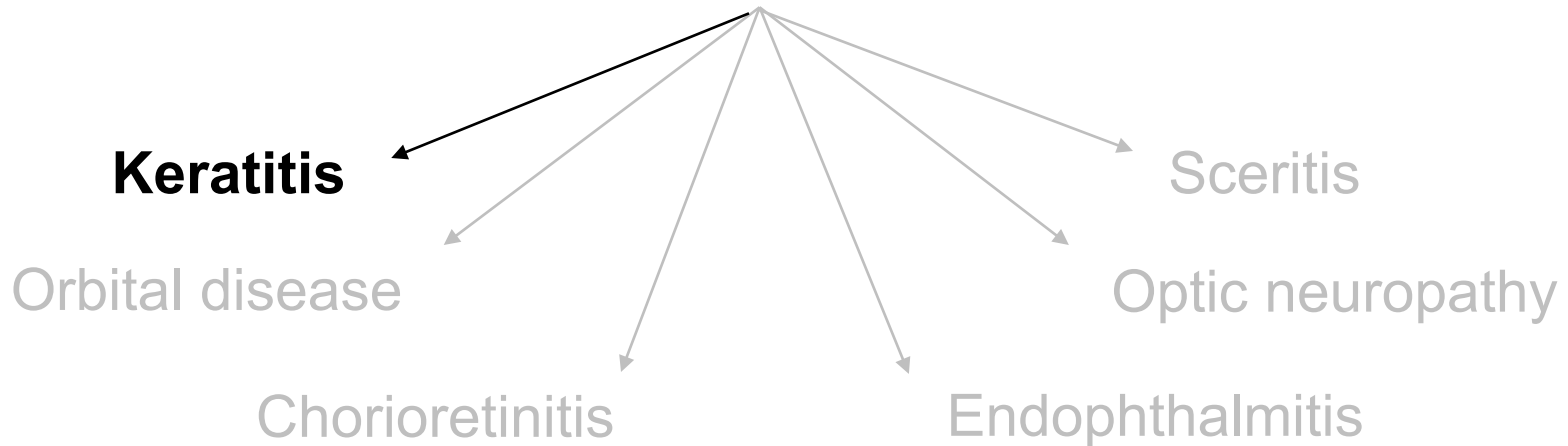
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



There are three main risk factors for fungal keratitis—what are they?

--Trauma, especially involving

two words

--?

--?

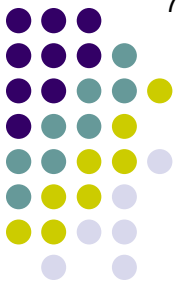
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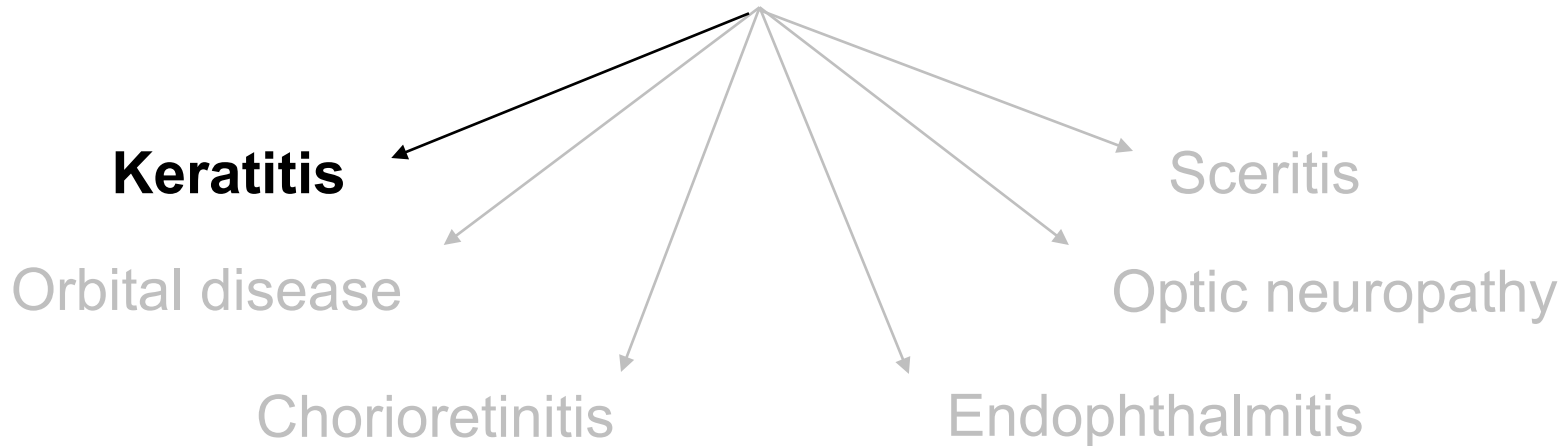
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Common Ocular Fungal Pathogens



Fungal pathogenic conditions



There are three main risk factors for fungal keratitis—what are they?

--Trauma, especially involving vegetative matter

--?

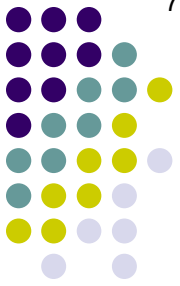
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How does fungal keratitis differ from bacterial?

Fungal tends to be insidious

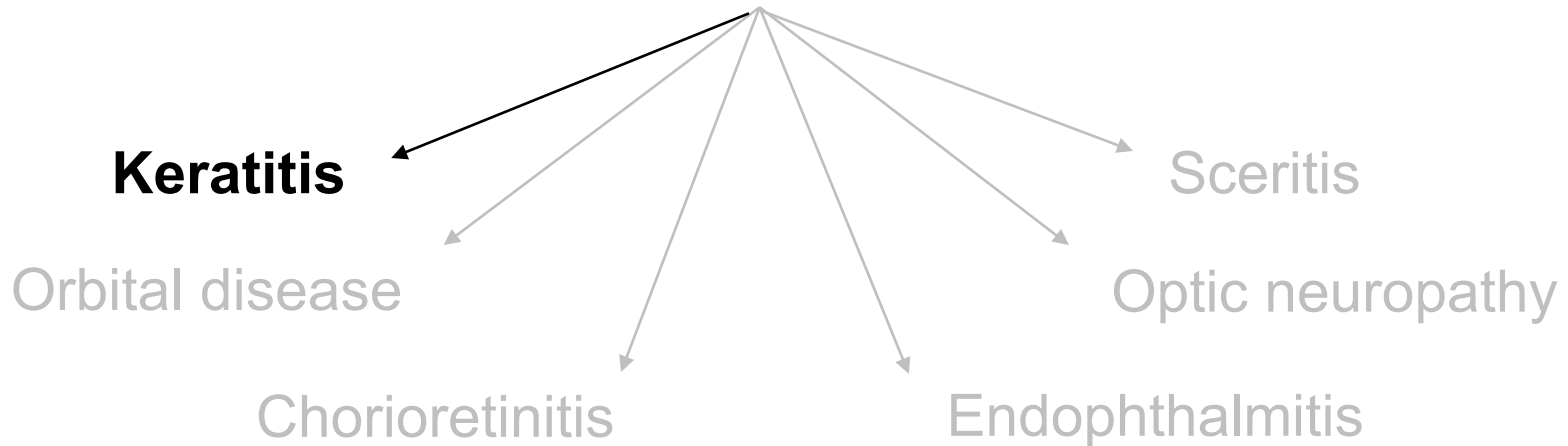
With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Unlike (most) bacteria, fungi can breach Descemet's to enter the AC



Common Ocular Fungal Pathogens

Fungal pathogenic conditions



There are three main risk factors for fungal keratitis—what are they?

--Trauma, especially involving vegetative matter

--Chronic eyedrop use

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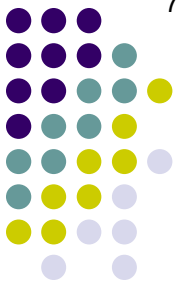
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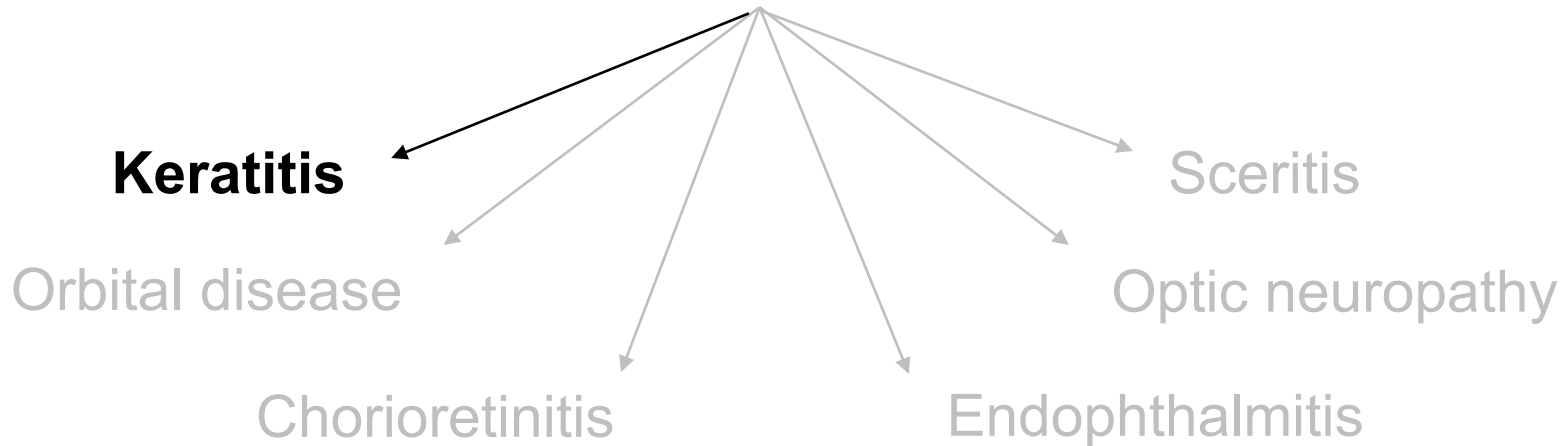
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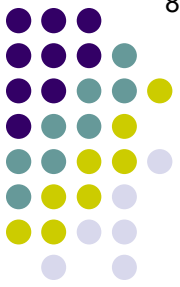
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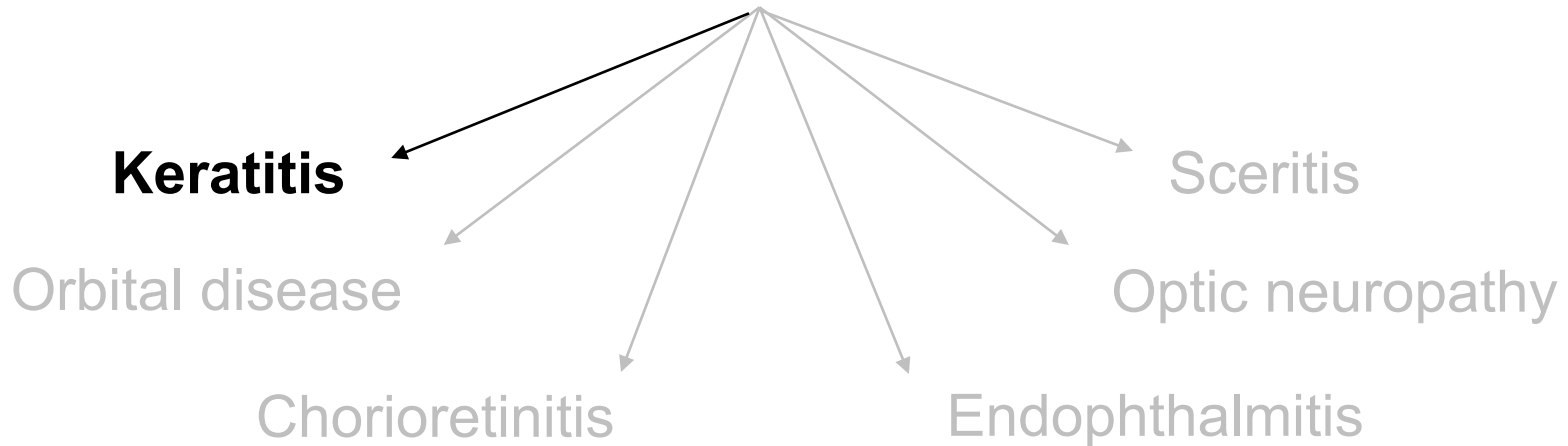
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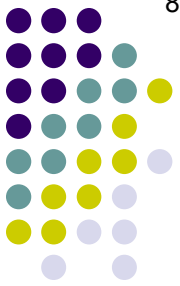
- Trauma, especially involving vegetative matter
- Chronic topical steroid use
- two words wear

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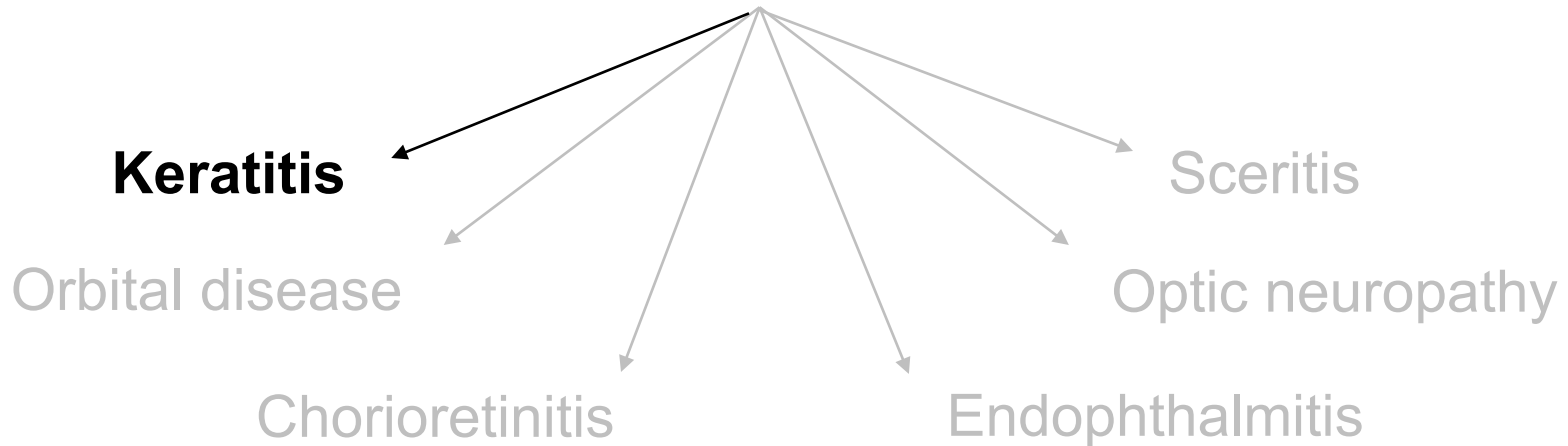
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



There are three main risk factors for fungal keratitis—what are they?

- Trauma, especially involving vegetative matter
- Chronic topical steroid use
- Contact lens wear

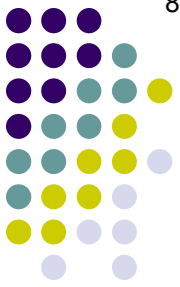
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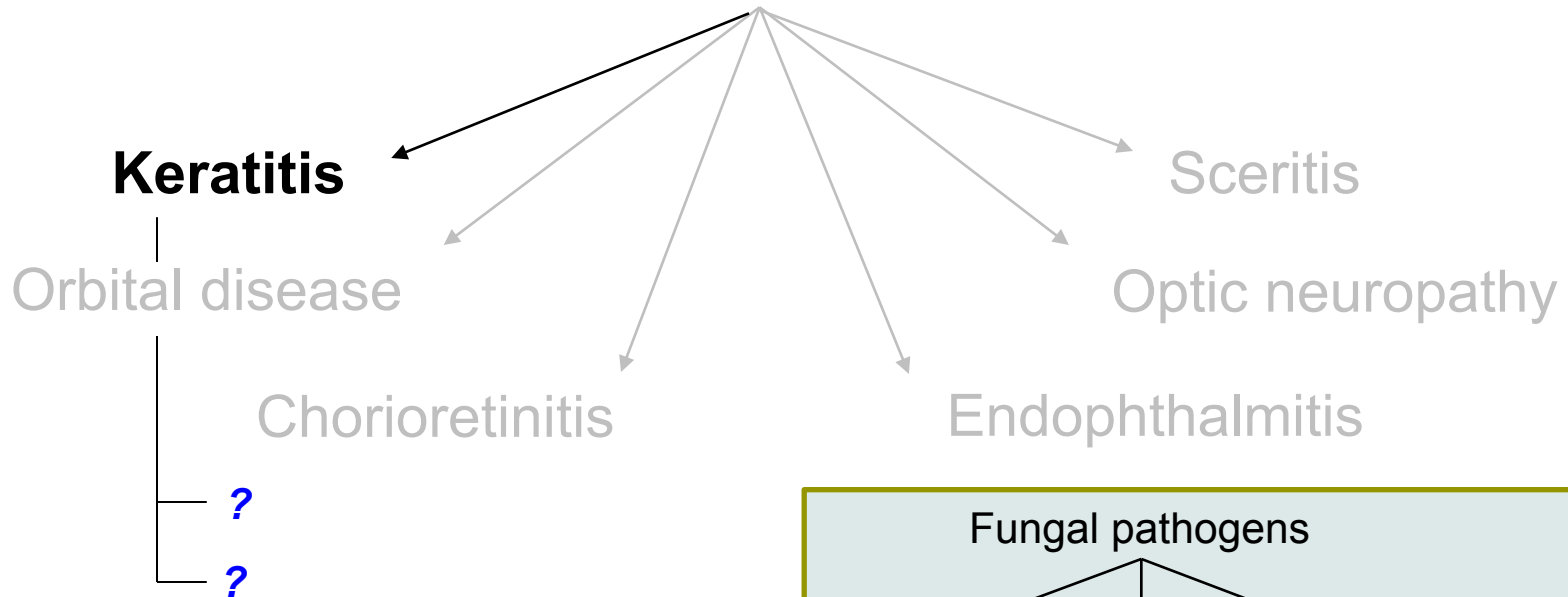
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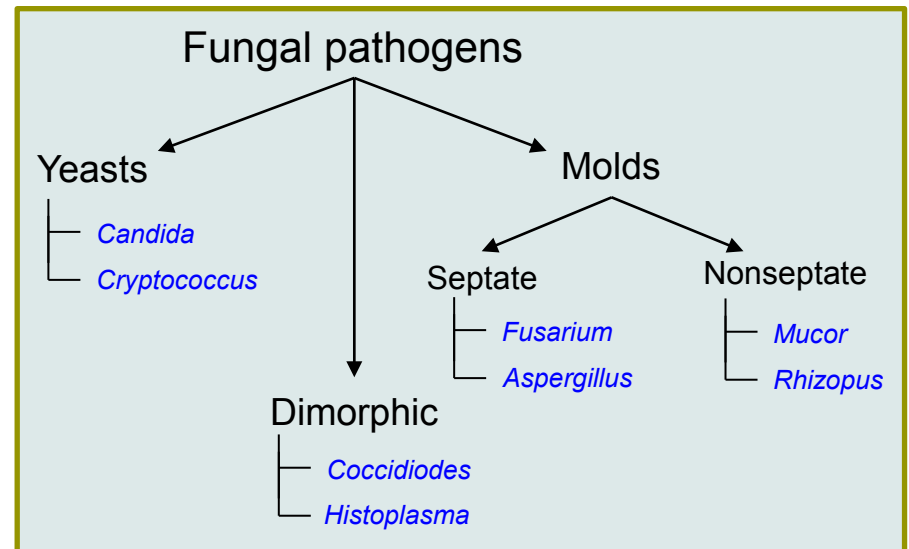
Common Ocular Fungal Pathogens



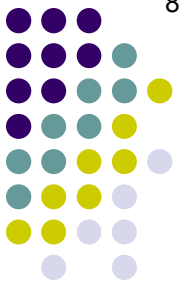
Fungal pathogenicic conditions



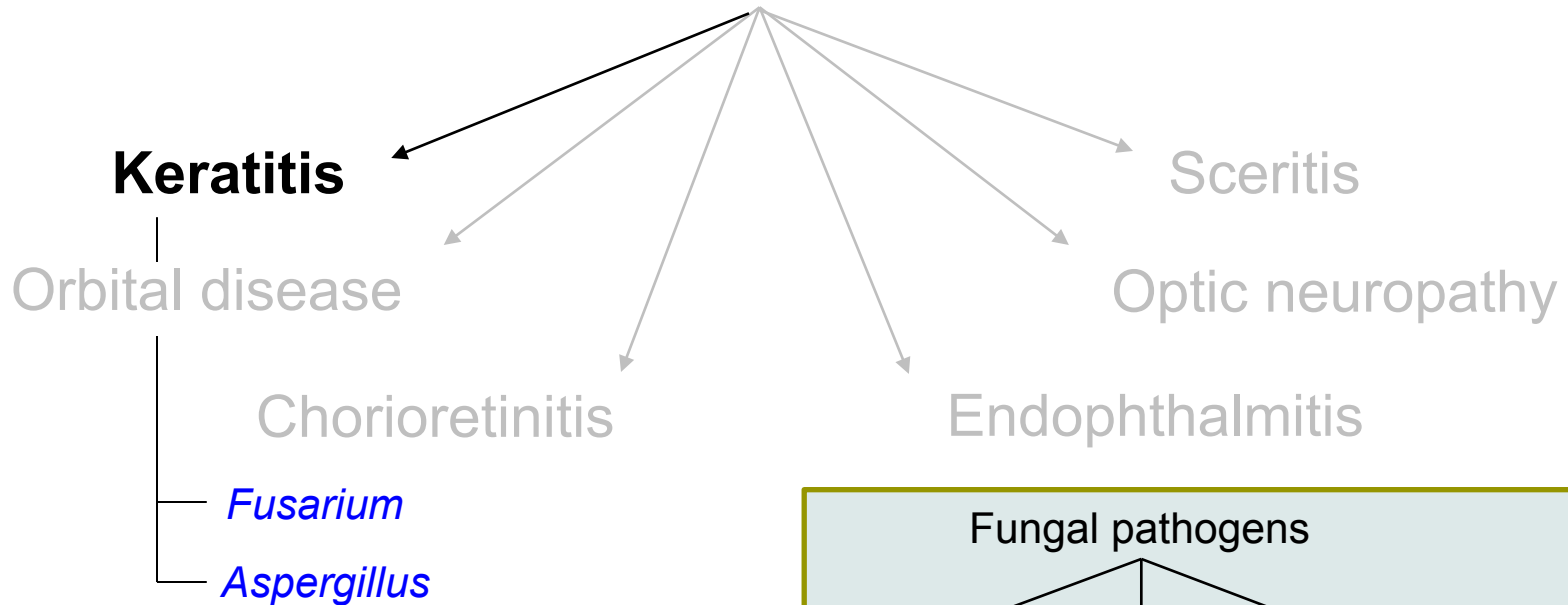
Which two species are responsible for the vast majority of fungal keratitis cases?



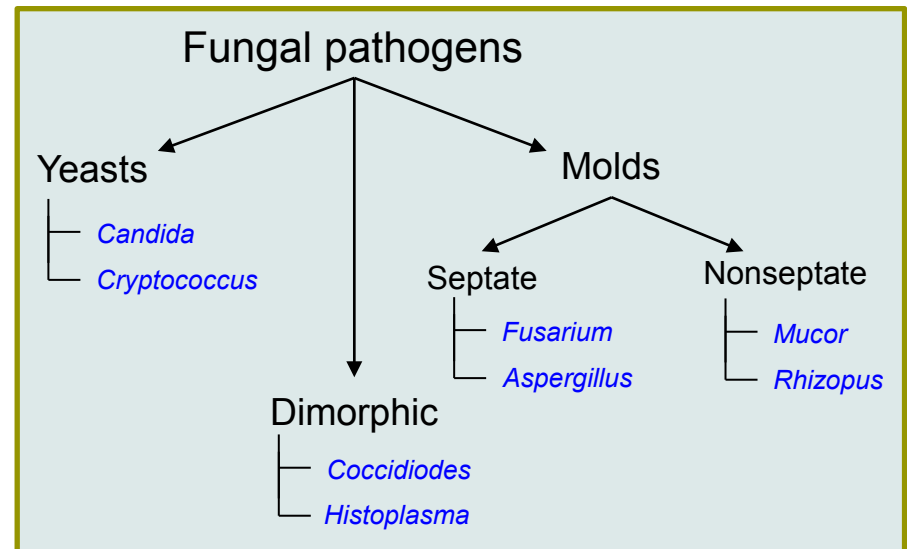
Common Ocular Fungal Pathogens

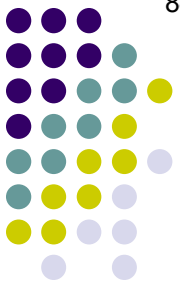


Fungal pathogenic conditions



Which two species are responsible for the vast majority of fungal keratitis cases?
The septated molds—*Aspergillus* and (especially) *Fusarium*

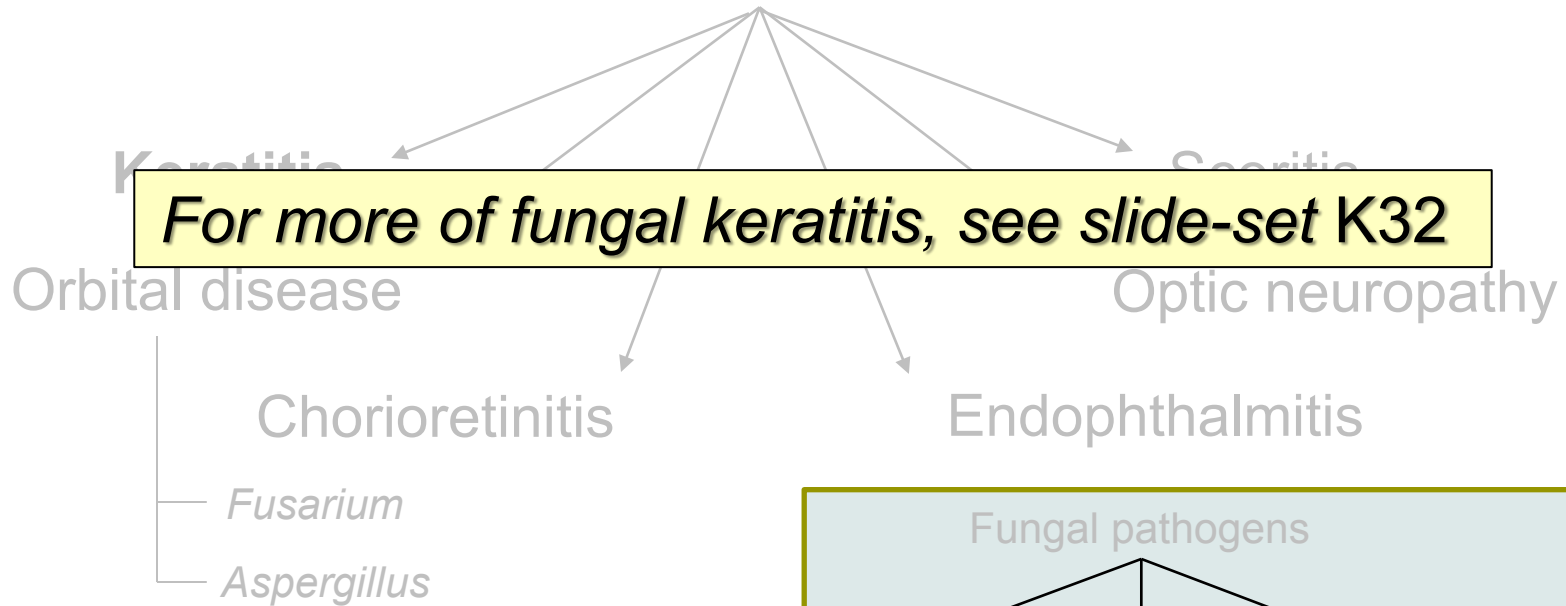




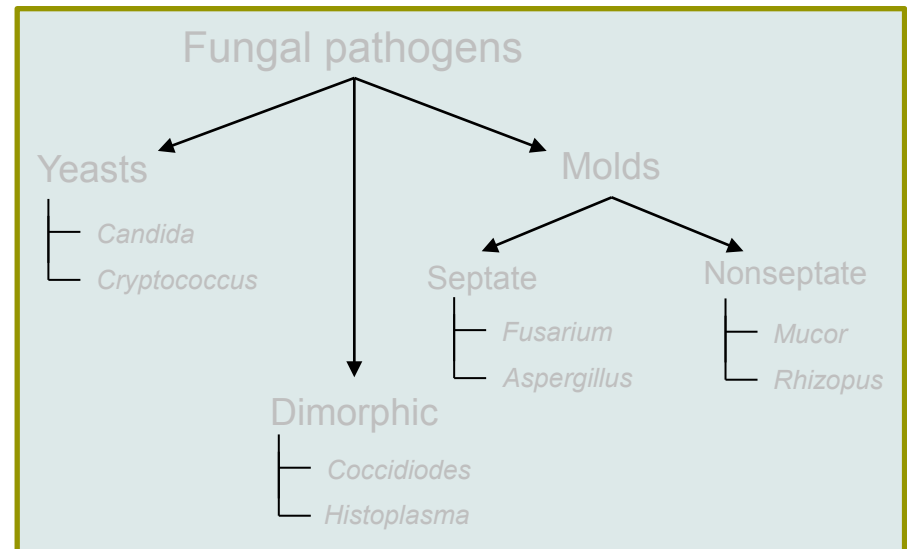
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

For more of fungal keratitis, see slide-set K32



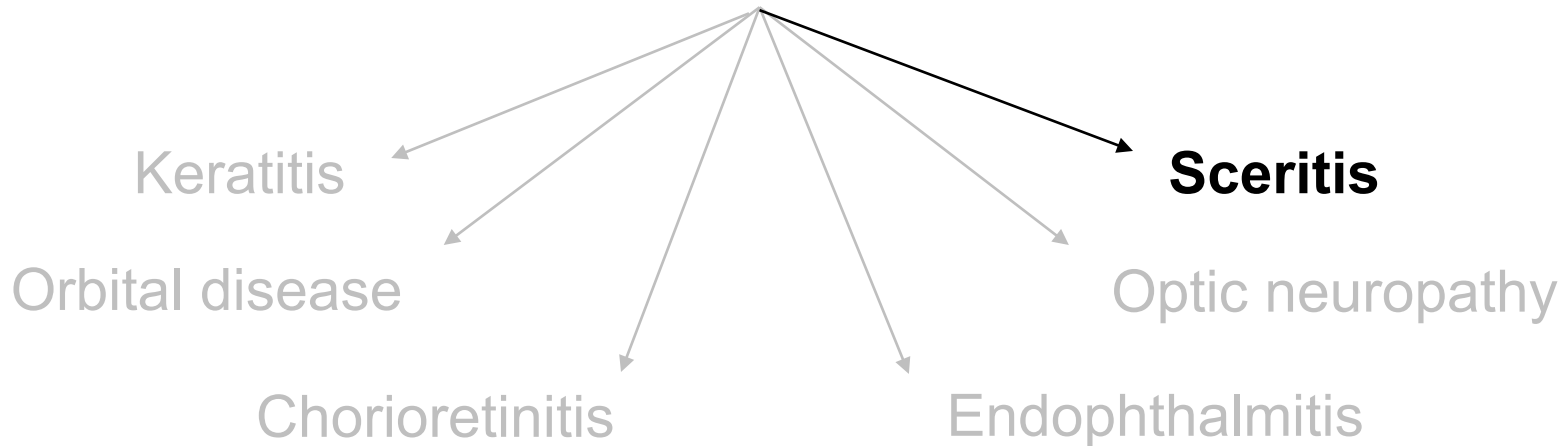
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Common Ocular Fungal Pathogens

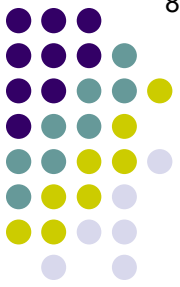


Fungal pathogenicic conditions

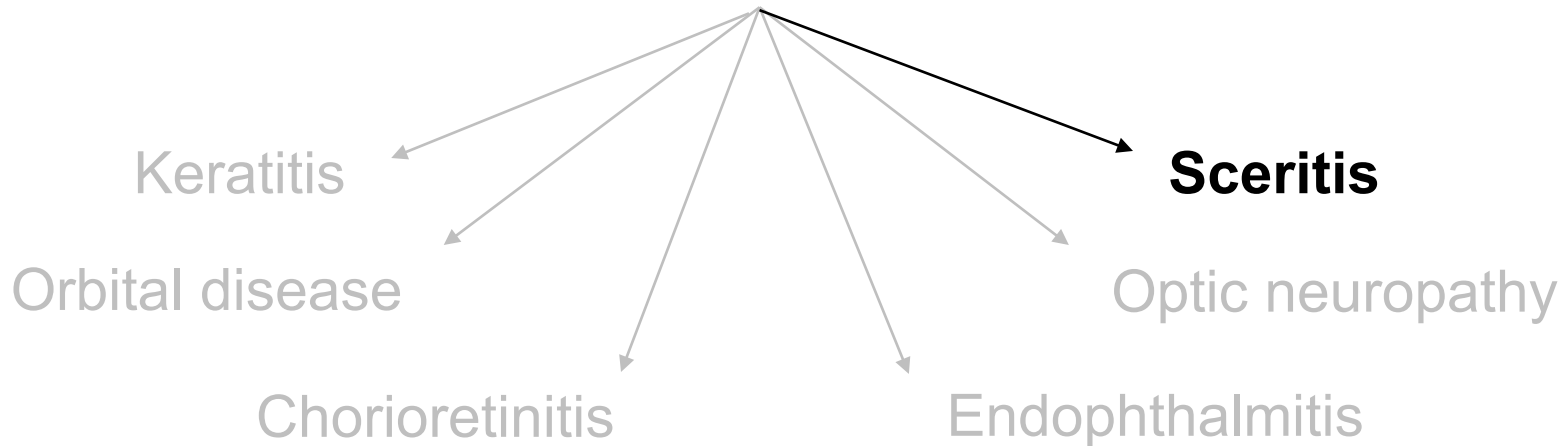


Is fungal scleritis common, or rare?

Common Ocular Fungal Pathogens

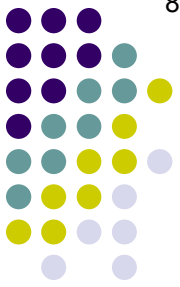


Fungal pathogenicic conditions

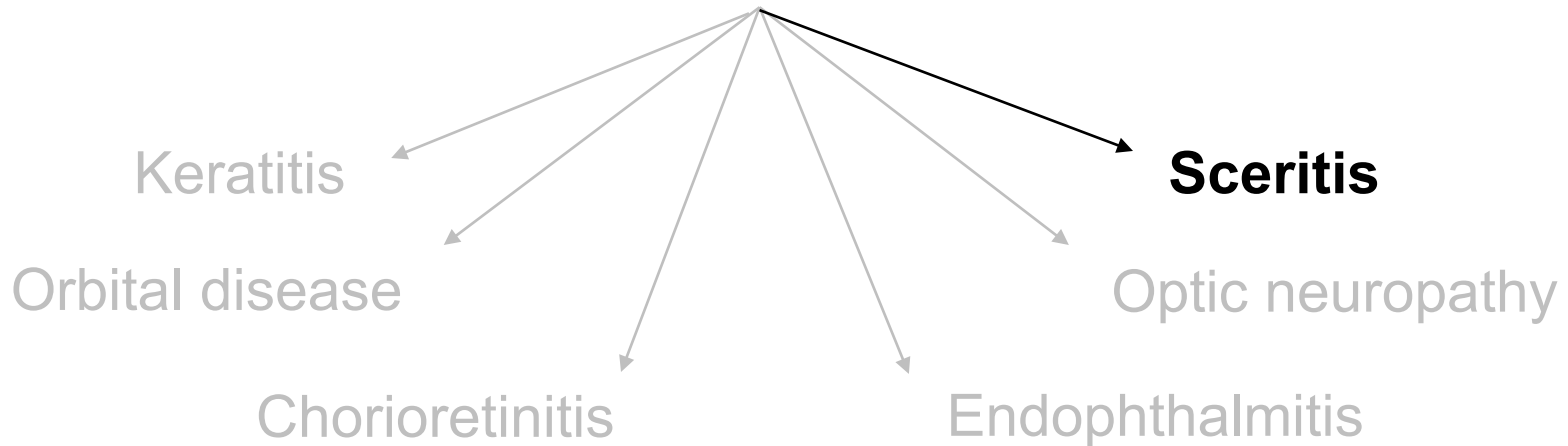


Is fungal scleritis common, or rare?
It is very rare

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

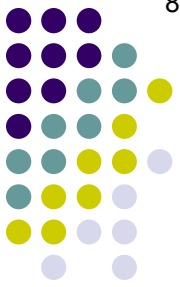


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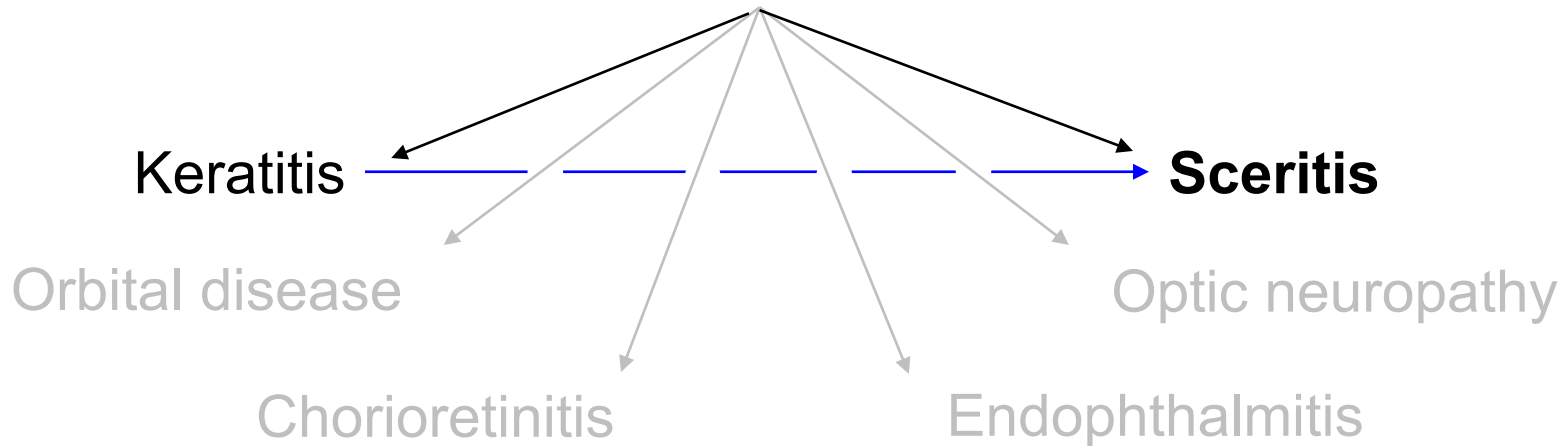
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How do most cases of fungal scleritis start?

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



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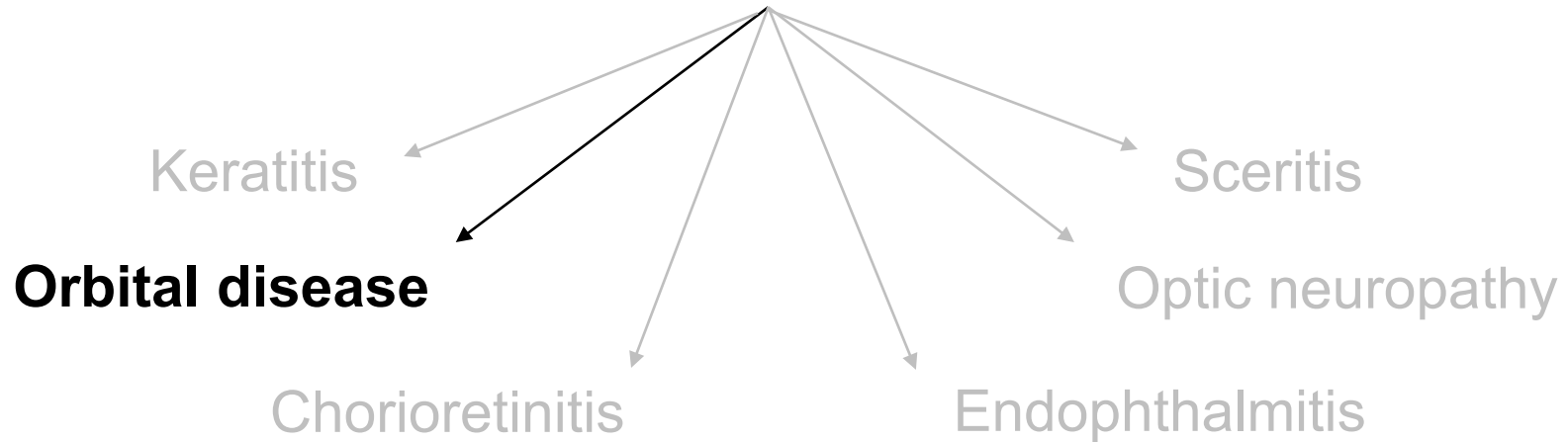
How do most cases of fungal scleritis start?

As a keratitis that crosses the limbus

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

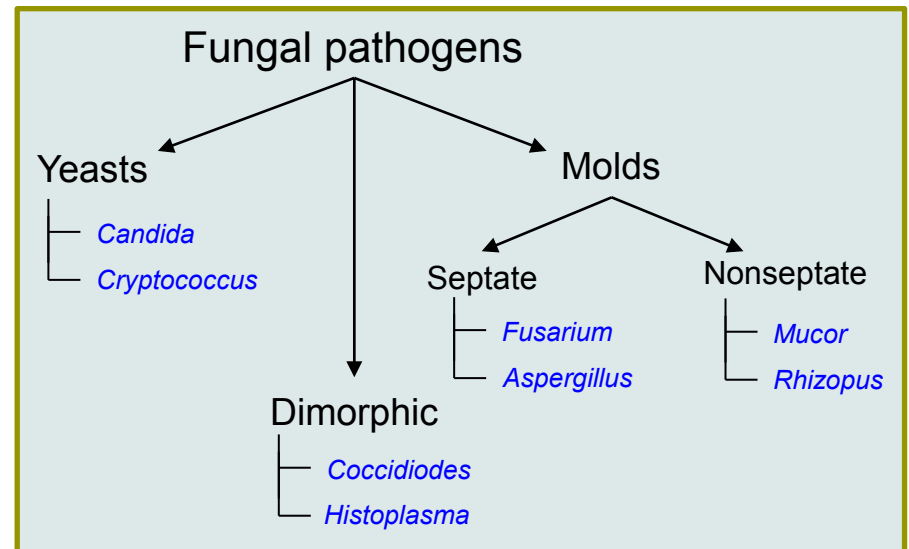


Three fungi cause orbital disease—
which ones?

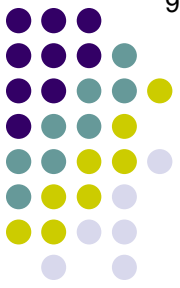
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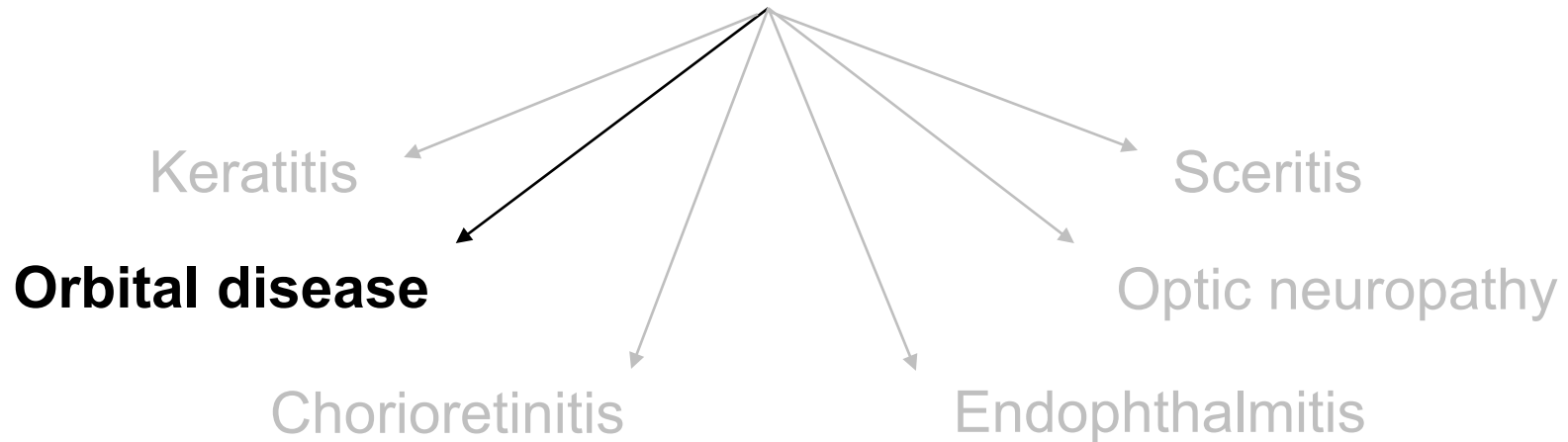
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Common Ocular Fungal Pathogens

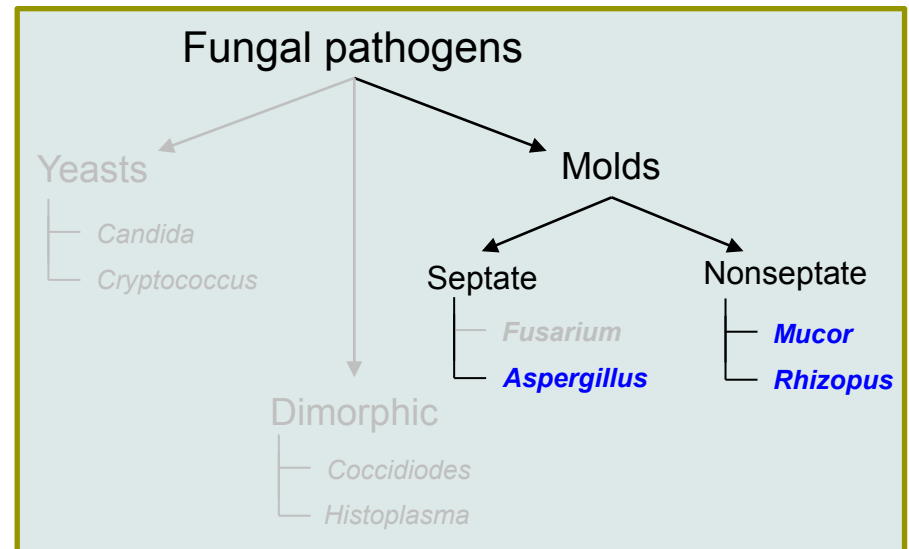


Fungal pathogenicic conditions



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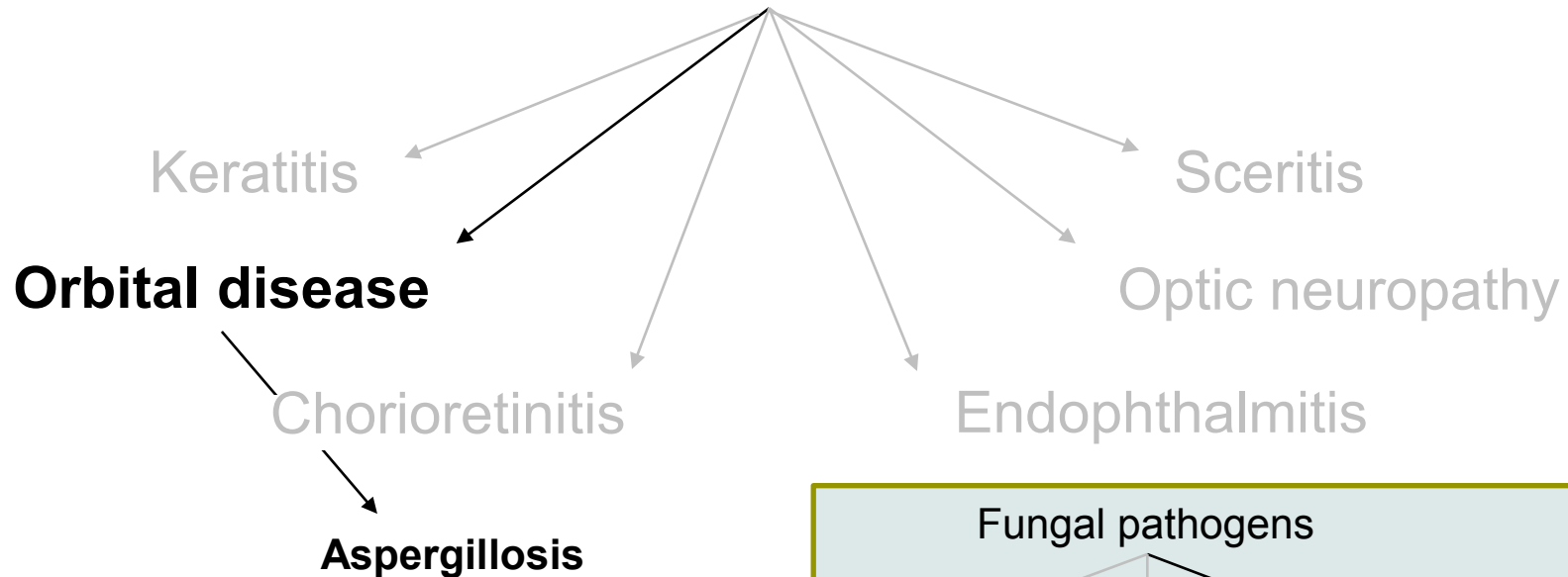
- Aspergillus*
- Mucor*
- Rhizopus*



Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



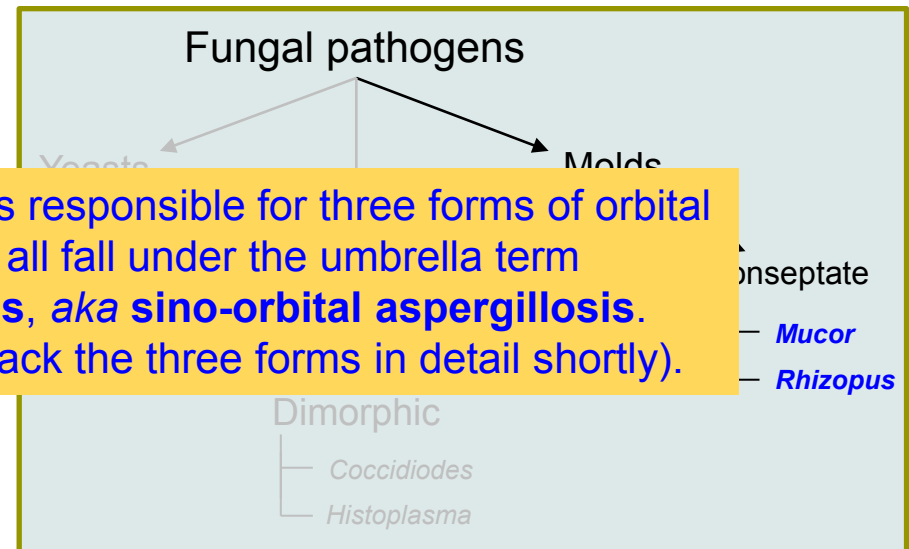
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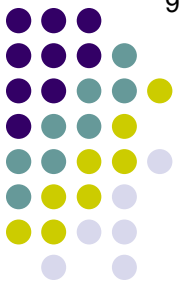
--**Aspergillus**

--*Mucor*

--*Rhizopus*

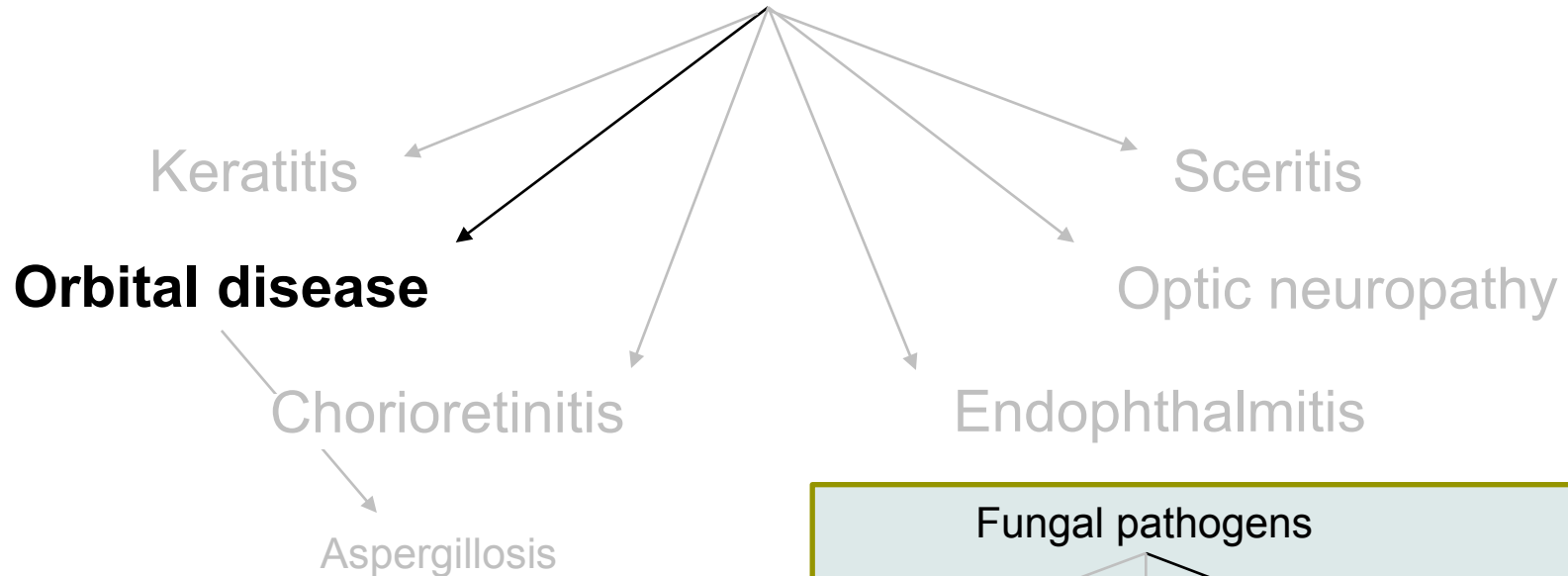
Aspergillus is responsible for three forms of orbital disease that all fall under the umbrella term **aspergillosis, aka sino-orbital aspergillosis**. (We will unpack the three forms in detail shortly).





Common Ocular Fungal Pathogens

Fungal pathogenic conditions



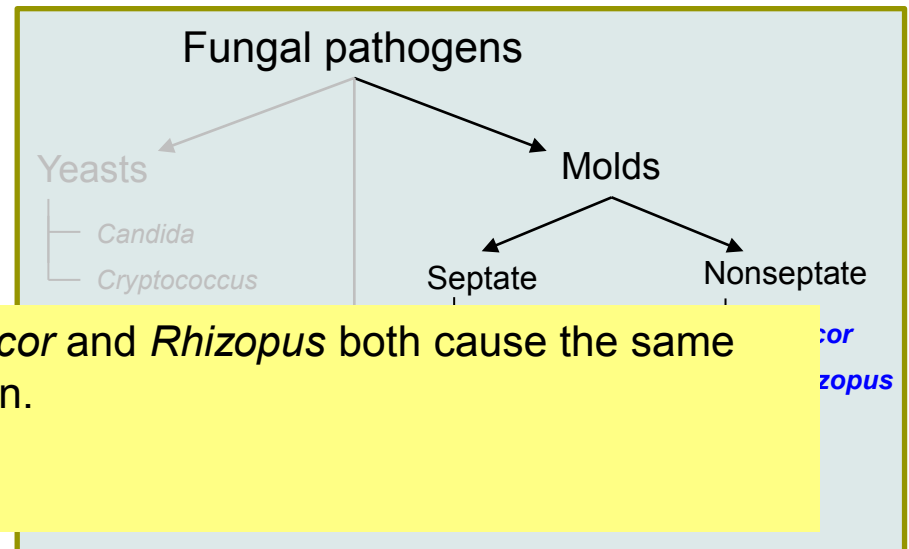
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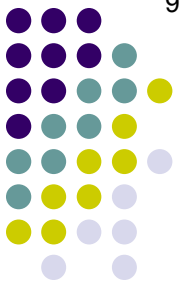
--***Mucor***

--***Rhizopus***

In contrast, *Mucor* and *Rhizopus* both cause the same clinical condition.



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Keratitis

Scleritis

Optic neuropathy

Endophthalmitis

Orbital disease

Chorioretinitis

Zygomycosis

Aspergillosis

Three fungi cause orbital disease—
which ones?

--*Aspergillus*

--*Mucor*

--*Rhizopus*

Zygomycetes

Fungal pathogens

Yeasts

Candida

Cryptococcus

Molds

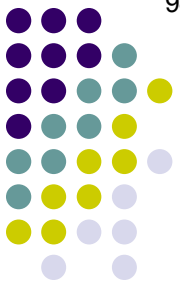
Septate

Nonseptate

In contrast, *Mucor* and *Rhizopus* both cause the same clinical condition. Because of this, the condition is named after the class of organism (Zygomycetes) to which both species belong.

Mucor
Rhizopus

Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Keratitis

Scleritis

Optic neuropathy

Endophthalmitis

Orbital disease

Chorioretinitis

Zygomycosis

Aspergillosis

You may be more familiar with the older (but still acceptable) name for this condition: **Mucormycosis**

--*Aspergillus*

--***Mucor***

--***Rhizopus***

Zygomycetes

Fungal pathogens

Molds

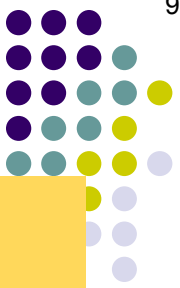
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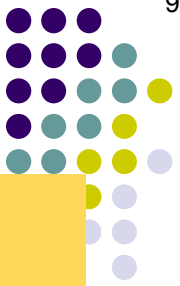
Common Ocular Fungal Pathogens



Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?

Zygomycosis

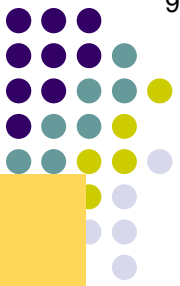
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It is the most common

Zygomycosis

Common Ocular Fungal Pathogens



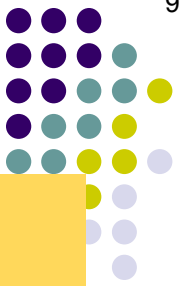
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Zygomycosis

Common Ocular Fungal Pathogens



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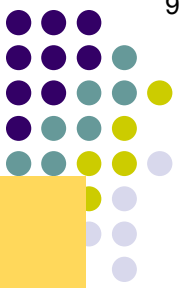
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Zygomycosis

Common Ocular Fungal Pathogens



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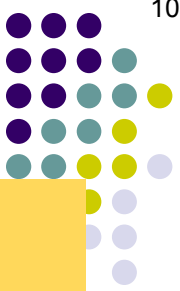
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Zygomycosis

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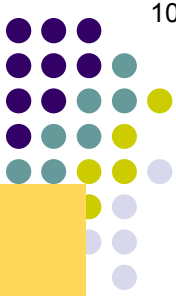
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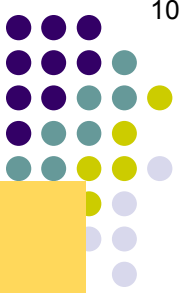
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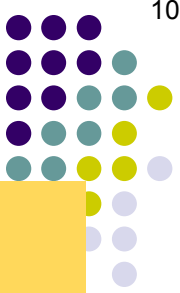
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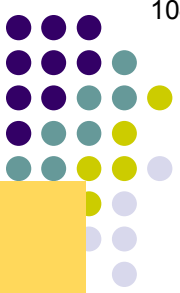
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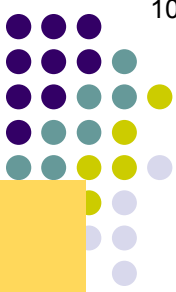
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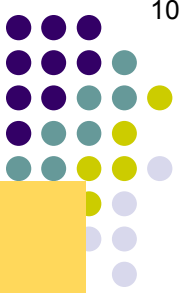
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Zygomycosis



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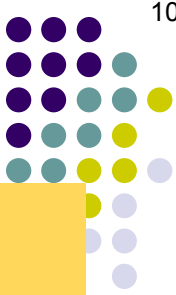
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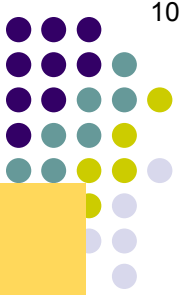
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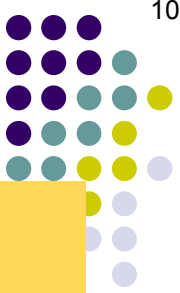
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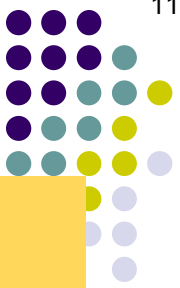
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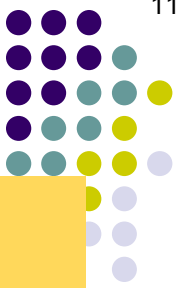
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Zygomycosis

Common Ocular Fungal Pathogens



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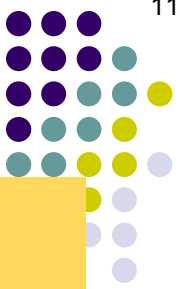
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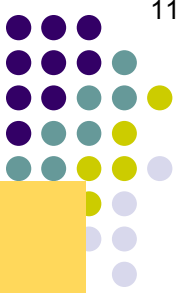
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How does the organism get into the sinus?

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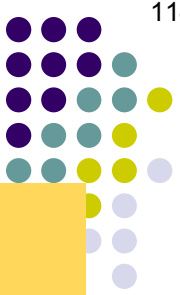
How does the organism get into orbit?

Via direct extension of infection from an adjacent **sinus**

How does the organism get into the sinus?

Via fungemia

Zygomycosis



Common Ocular Fungal Pathogens

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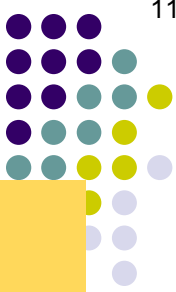
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How does the organism get into the body in the first place?

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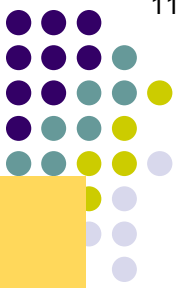
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The lungs, ie, inhalation

Zygomycosis

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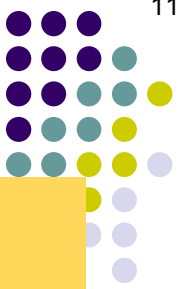
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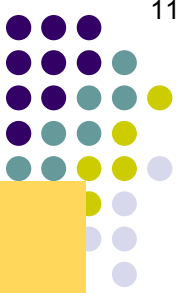
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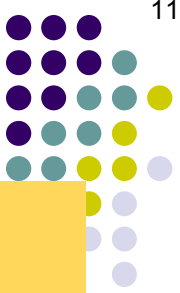
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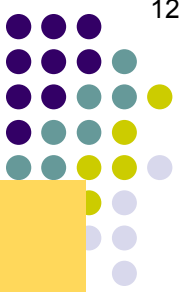
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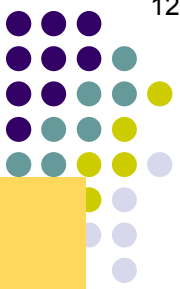
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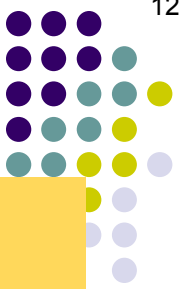
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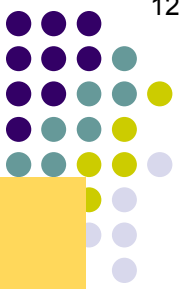
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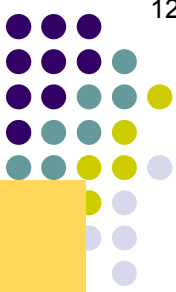
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two words

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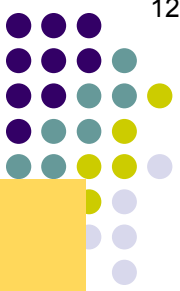
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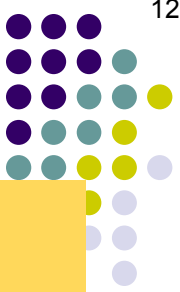
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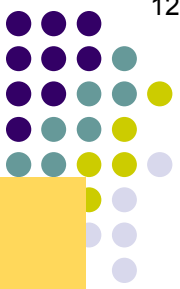
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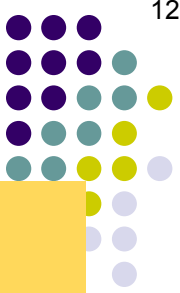
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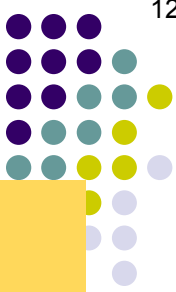
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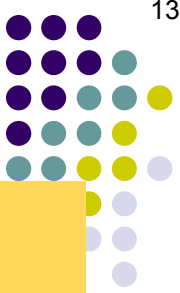
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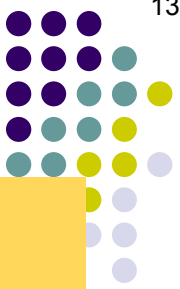
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If the 'right' vessels become thrombosed, the eye and orbit will be deceptively quiet in appearance, giving the impression that the process is milder than it actually is

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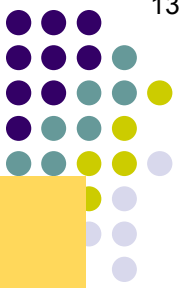
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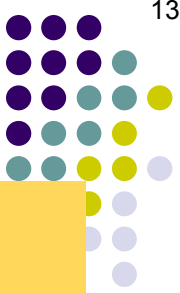
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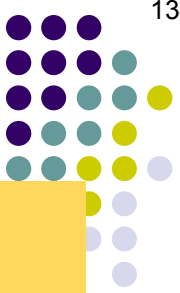
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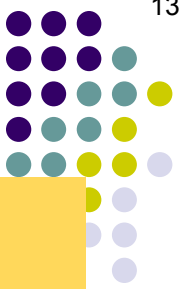
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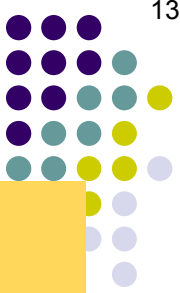
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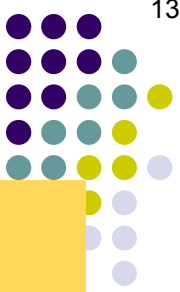
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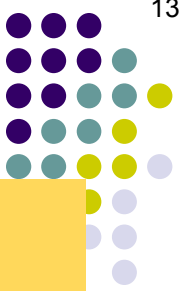
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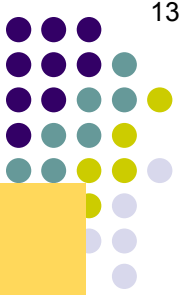
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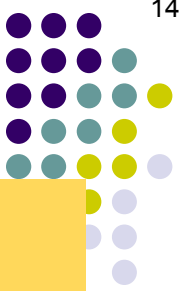
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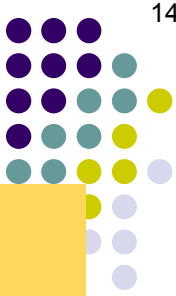
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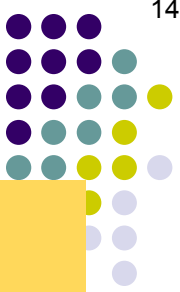
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Paralysis of the extraocular muscles. **Paralysis of the muscles inside the eye, ie, the pupillary and ciliary muscles.**

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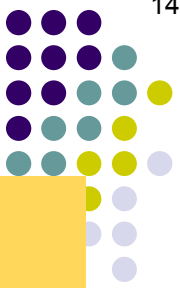
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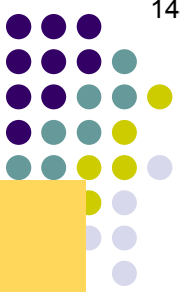
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Common Ocular Fungal Pathogens



Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?

It is the most common

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?

It is the most virulent

How does the organism get into orbit?

Via direct extension of infection from an adjacent sinus

The organism has a strong predilection for a particular sort of anatomic structure—what is it?

Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present?

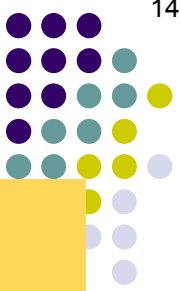
With proptosis and **orbital apex syndrome**

Zygomycosis

What are the exam findings in orbital apex syndrome?

- Complete ptosis
- Ophthalmoplegia (both internal and external)
- Corneal sensation is decreased
- Vision is affected vs unaffected

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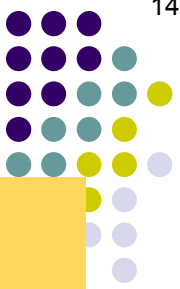
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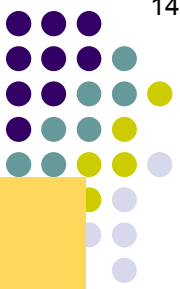
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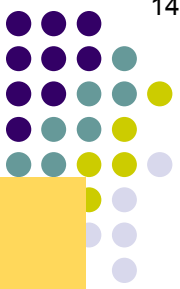
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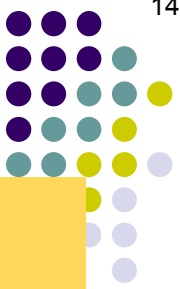
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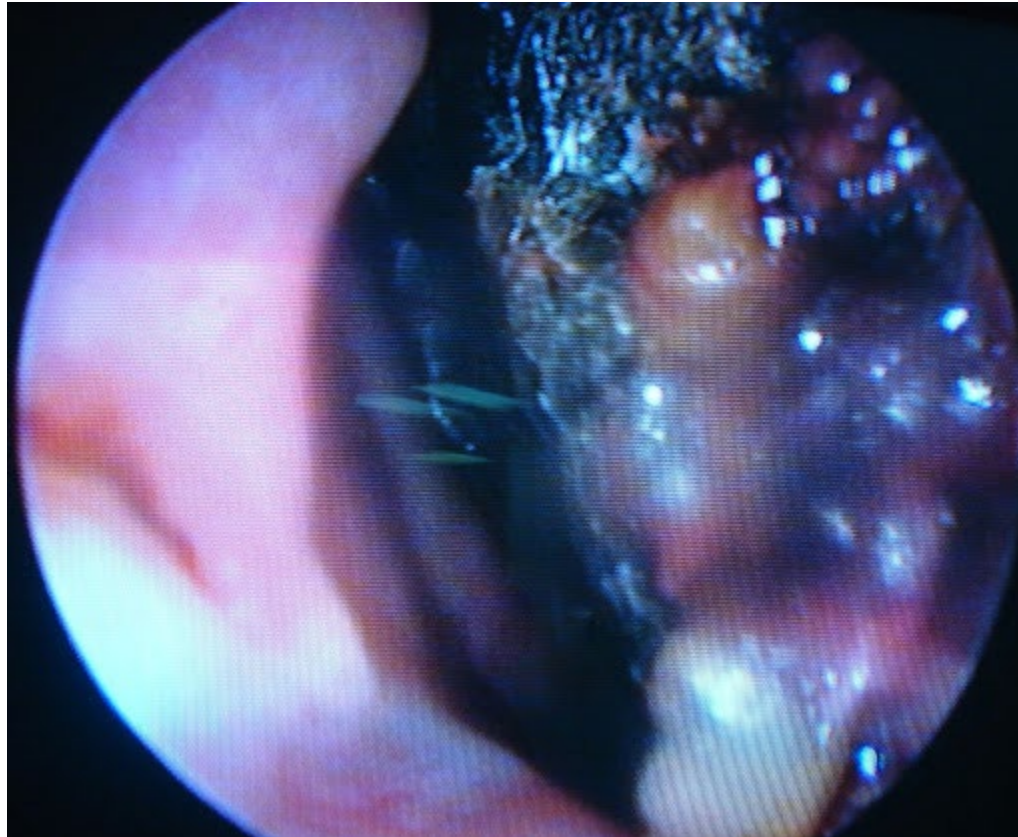
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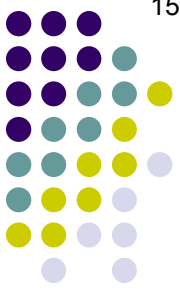
Common Ocular Fungal Pathogens



Zygomycosis: Necrotic sinus tissue with eschar

Common Ocular Fungal Pathogens

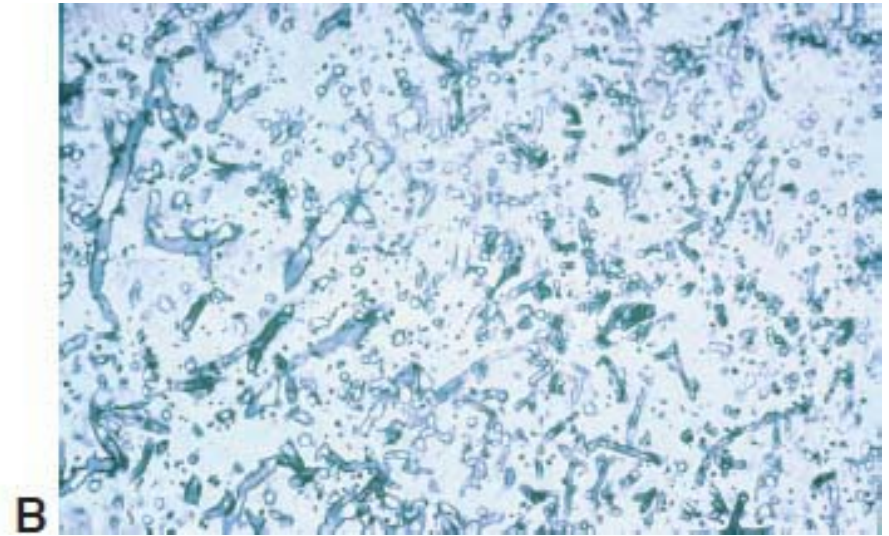
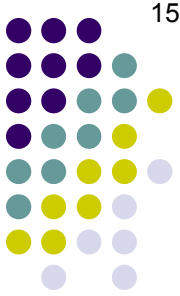
151



A, A patient with zygomycosis eroding the hard palate

Zygomycosis

Common Ocular Fungal Pathogens

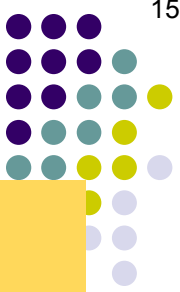


A, A patient with zygomyces eroding the hard palate

B, Biopsy specimen demonstrates typical nonseptate hyphae

Zygomycosis

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How is zygomycosis managed?

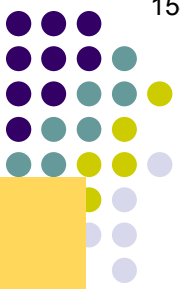
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Three things have to happen...

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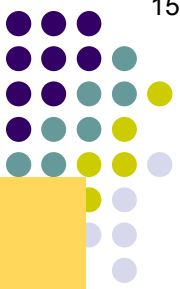
How is zygomycosis managed?

--? [what got the pt in this mess in the first place]

--?

--?

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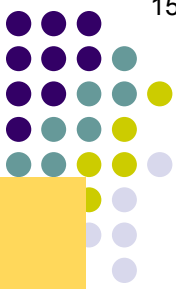
How is zygomycosis managed?

--The underlying debilitating condition **must** be reversed—get IM to resolve the DKA

--? [this surgical goal is pretty obvious]

--?

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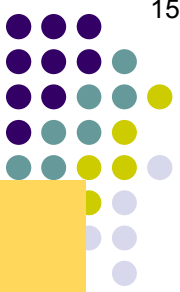
How is zygomycosis managed?

--The underlying debilitating condition **must** be reversed—get IM to resolve the DKA

--The infected tissue must be debrided—get ENT and Oculoplastics involved

--? [this medical step is pretty obvious too]

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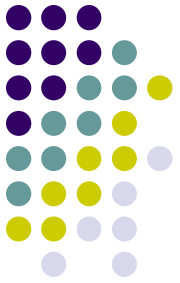
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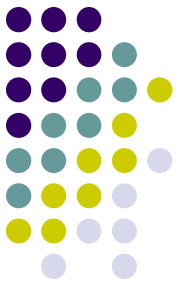
- The underlying debilitating condition **must** be reversed—get IM to resolve the DKA
- The infected tissue must be debrided—get ENT and Oculoplastics involved
- Get Ampho B on board

Common Ocular Fungal Pathogens



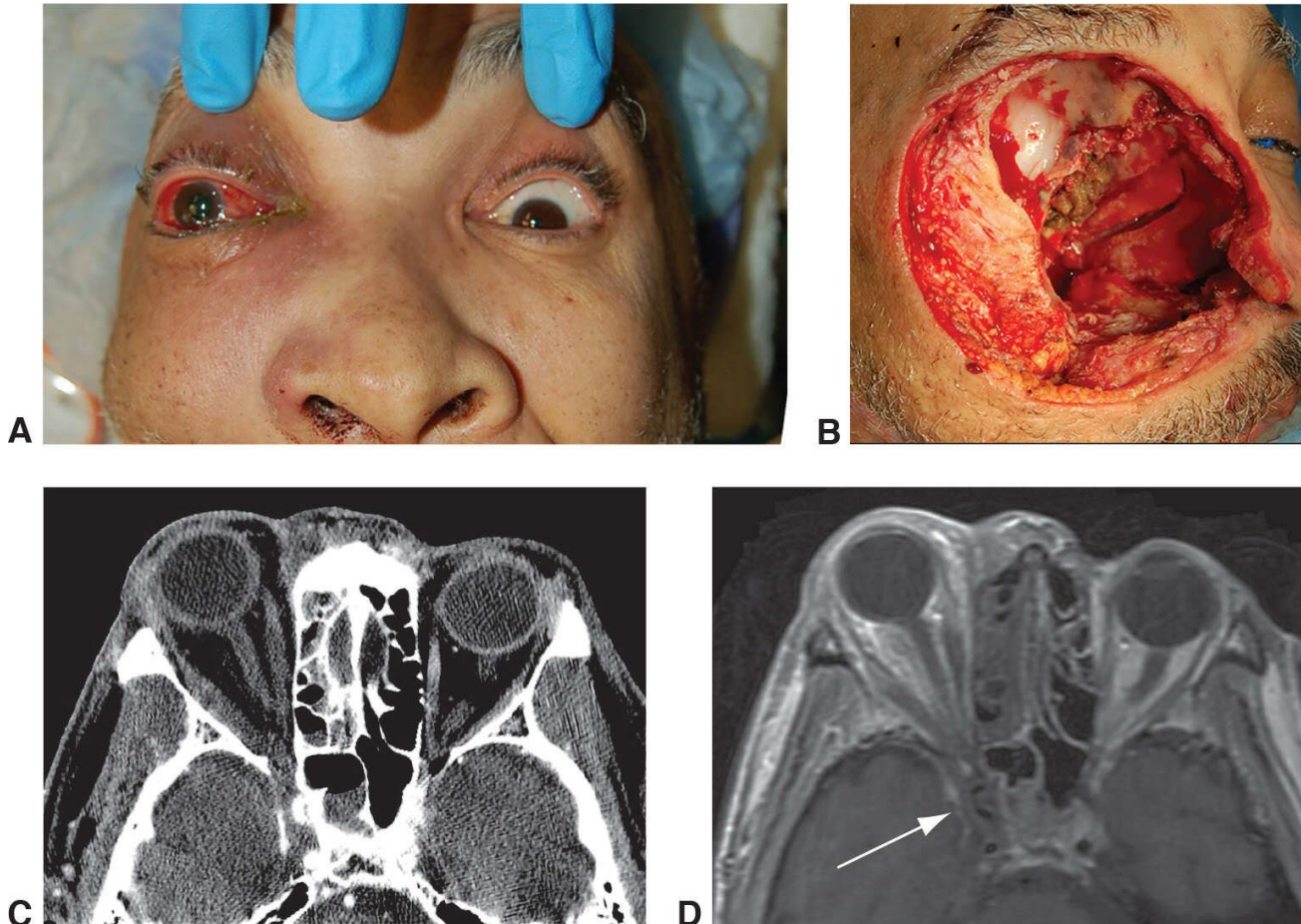
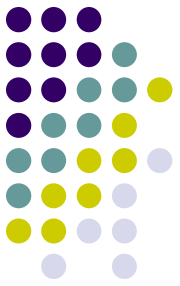
Zygomycosis in a patient with DKA. A, Complete right upper eyelid ptosis and ophthalmoplegia are present.

Common Ocular Fungal Pathogens



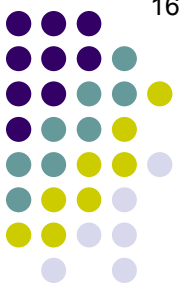
Zygomycosis in a patient with DKA. *A*, Complete right upper eyelid ptosis and ophthalmoplegia are present. *B*, Wide surgical debridement consisting of orbital exenteration and sinus surgery was life-saving.

Common Ocular Fungal Pathogens

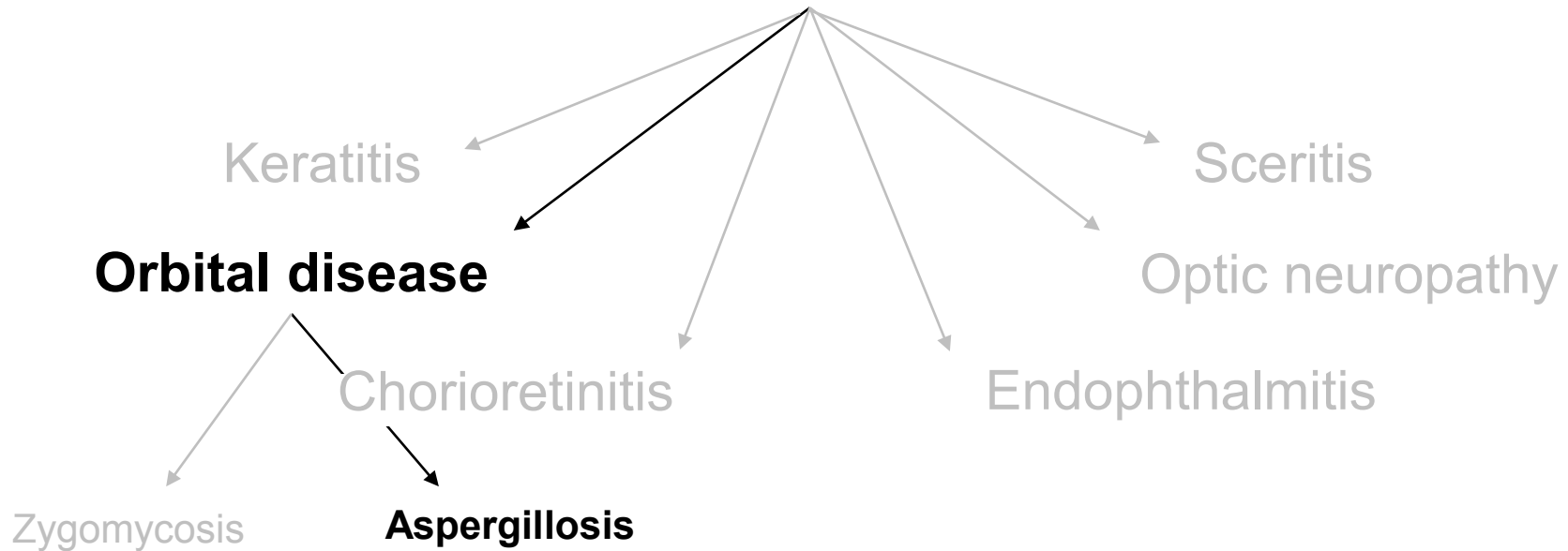


Zygomycosis in a patient with DKA. *A*, Complete right upper eyelid ptosis and ophthalmoplegia are present. *B*, Wide surgical debridement consisting of orbital exenteration and sinus surgery was life-saving. CT (*C*) and MRI (*D*) axial scans show orbital and sinus involvement as well as cavernous sinus thrombosis (*arrow*).

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



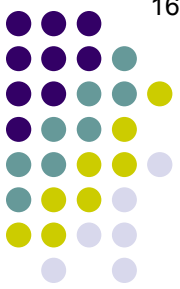
Aspergillosis can produce orbital dz via three distinct mechanisms:

--?

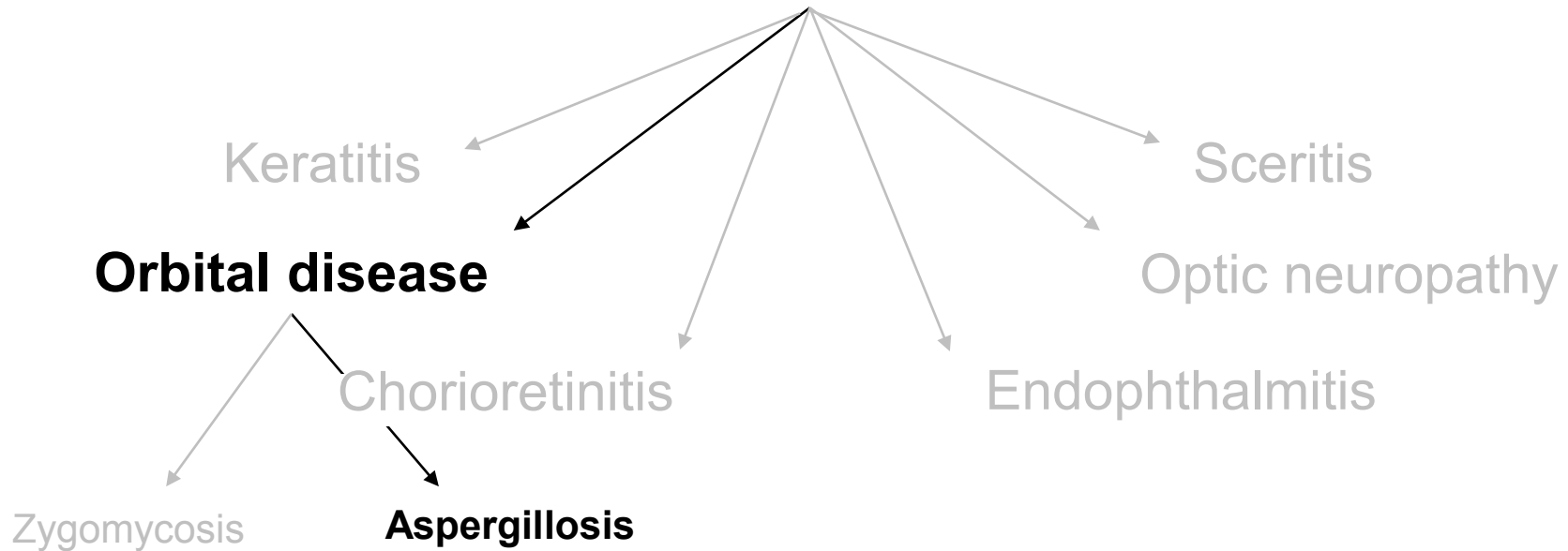
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Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



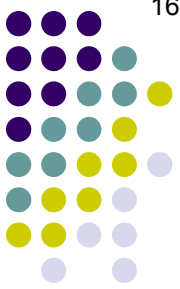
Aspergillosis can produce orbital dz via three distinct mechanisms:

--By orbital tissue

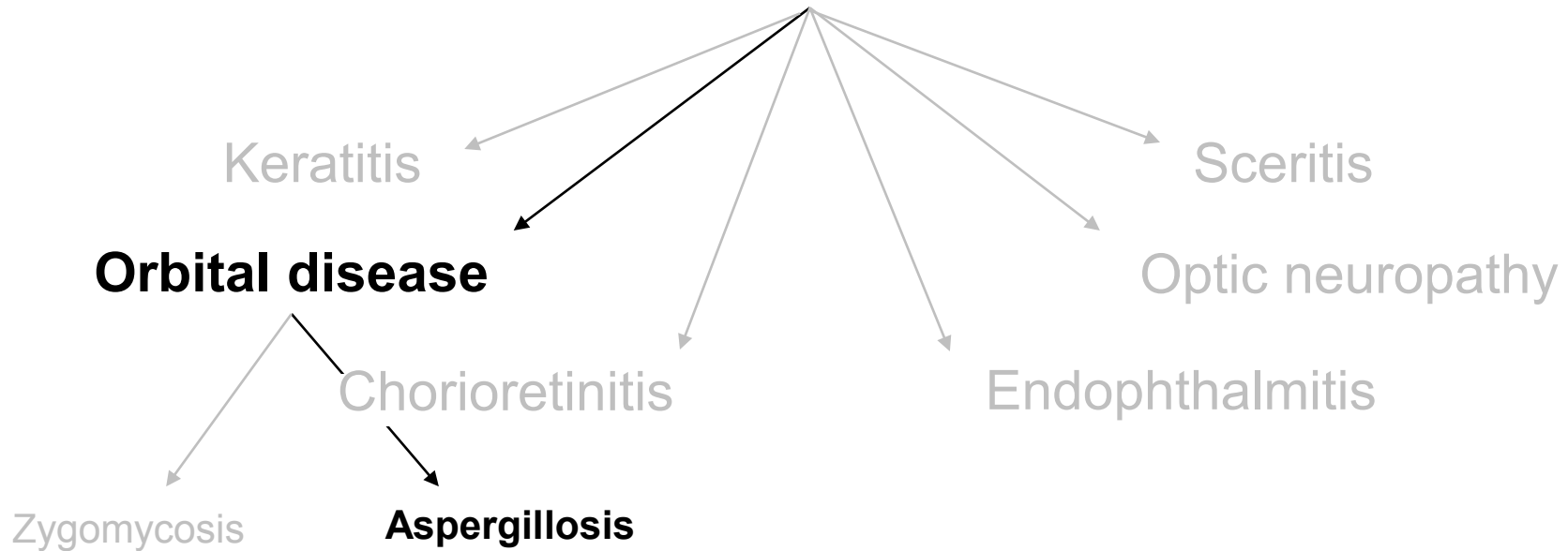
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Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



Aspergillosis can produce orbital dz via three distinct mechanisms:

--By infecting orbital tissue

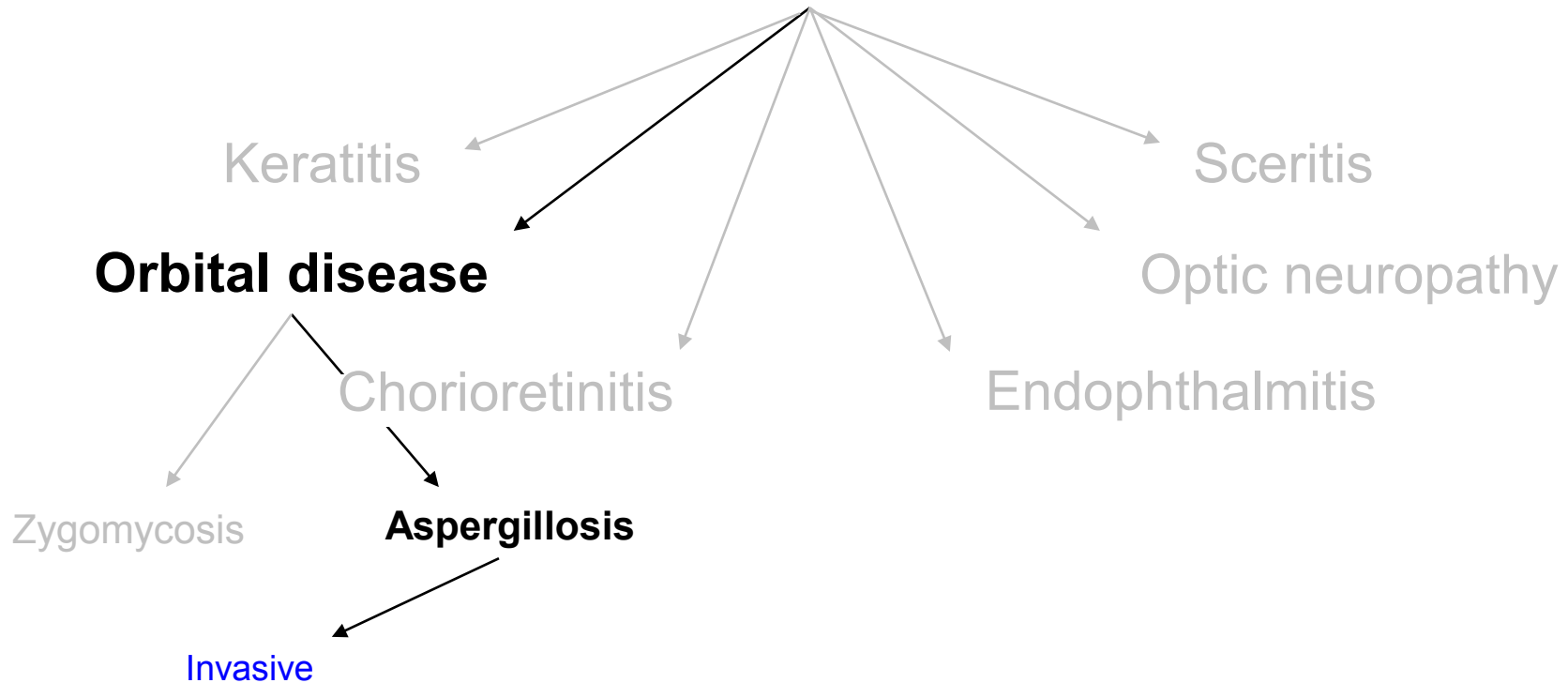
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Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



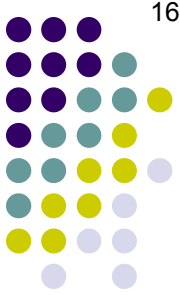
Aspergillosis can produce orbital dz via three distinct mechanisms:

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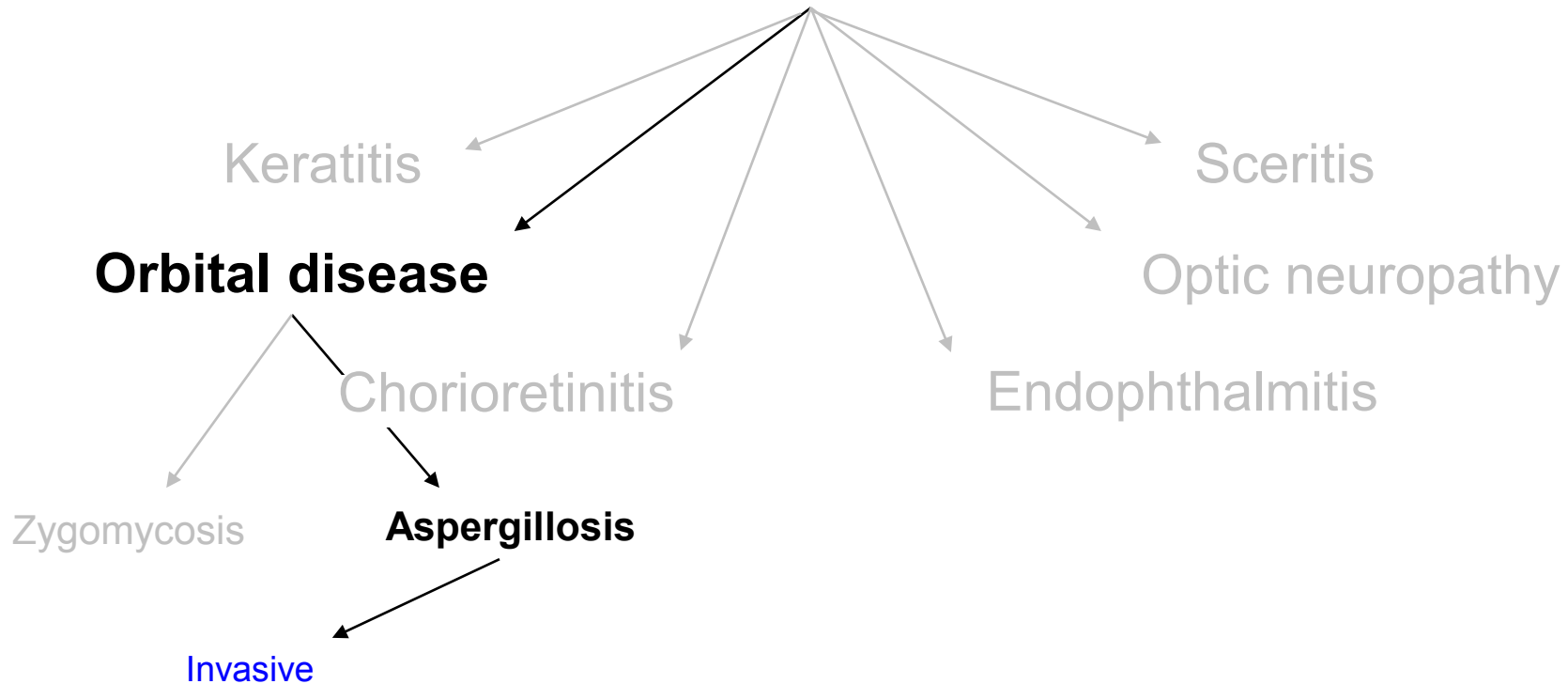
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Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



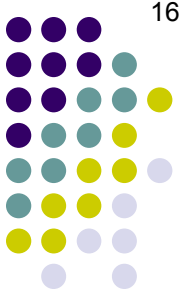
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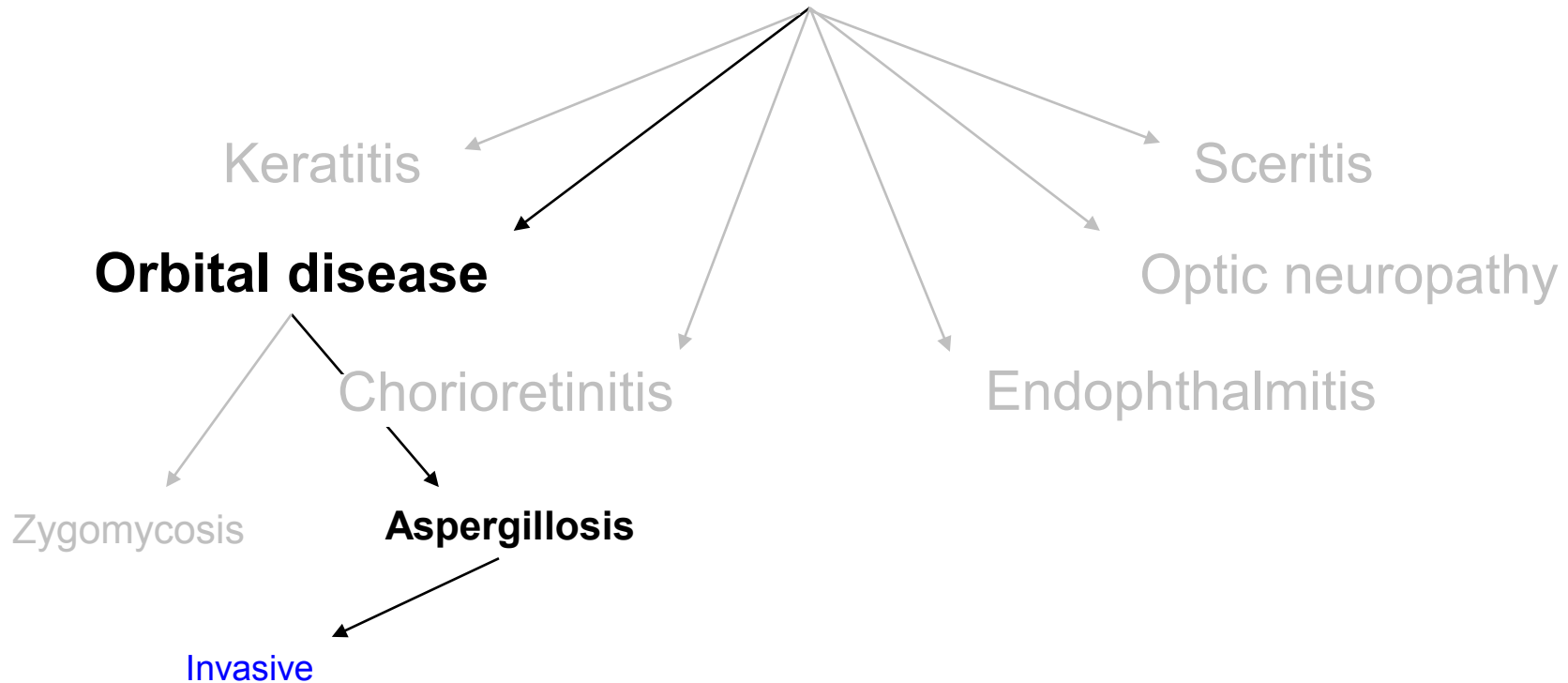
--By eliciting an two words in orbital tissue

--?

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



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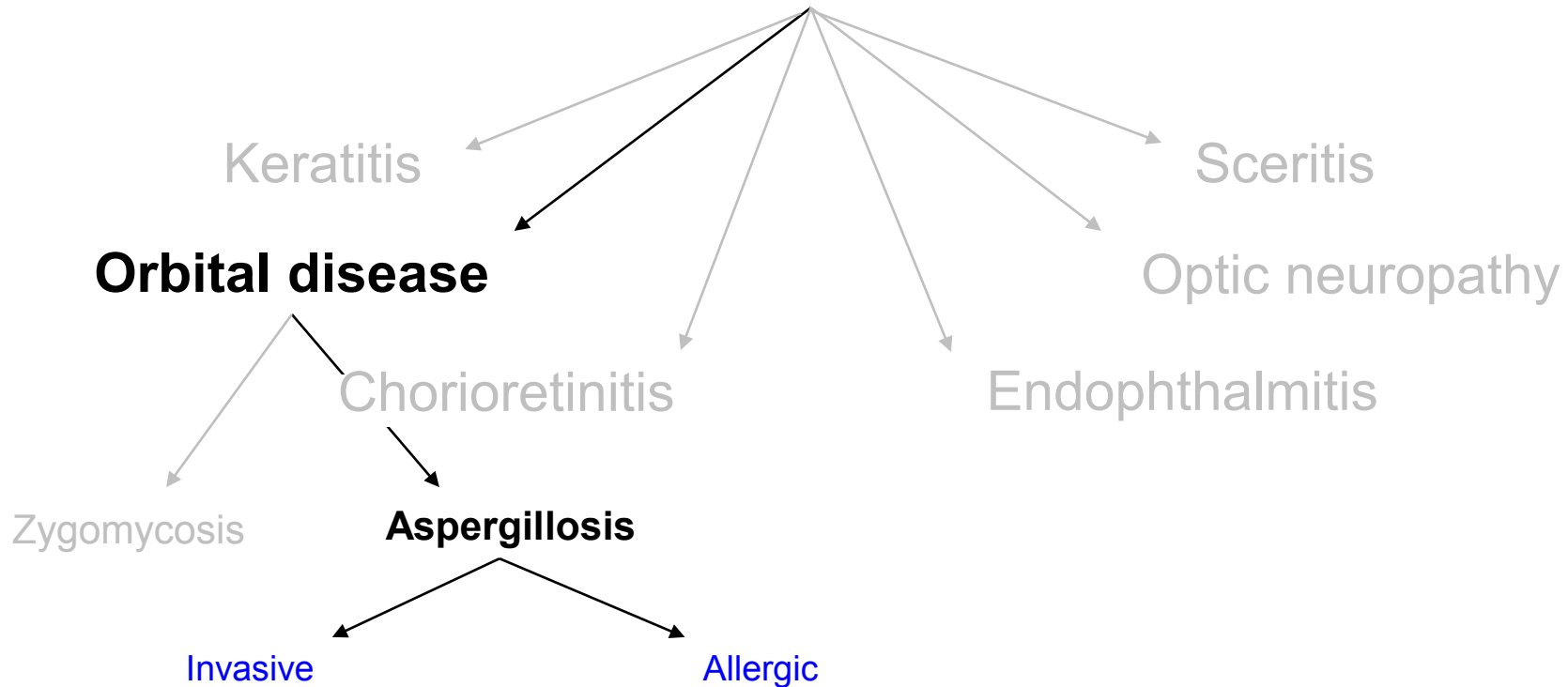
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--?

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



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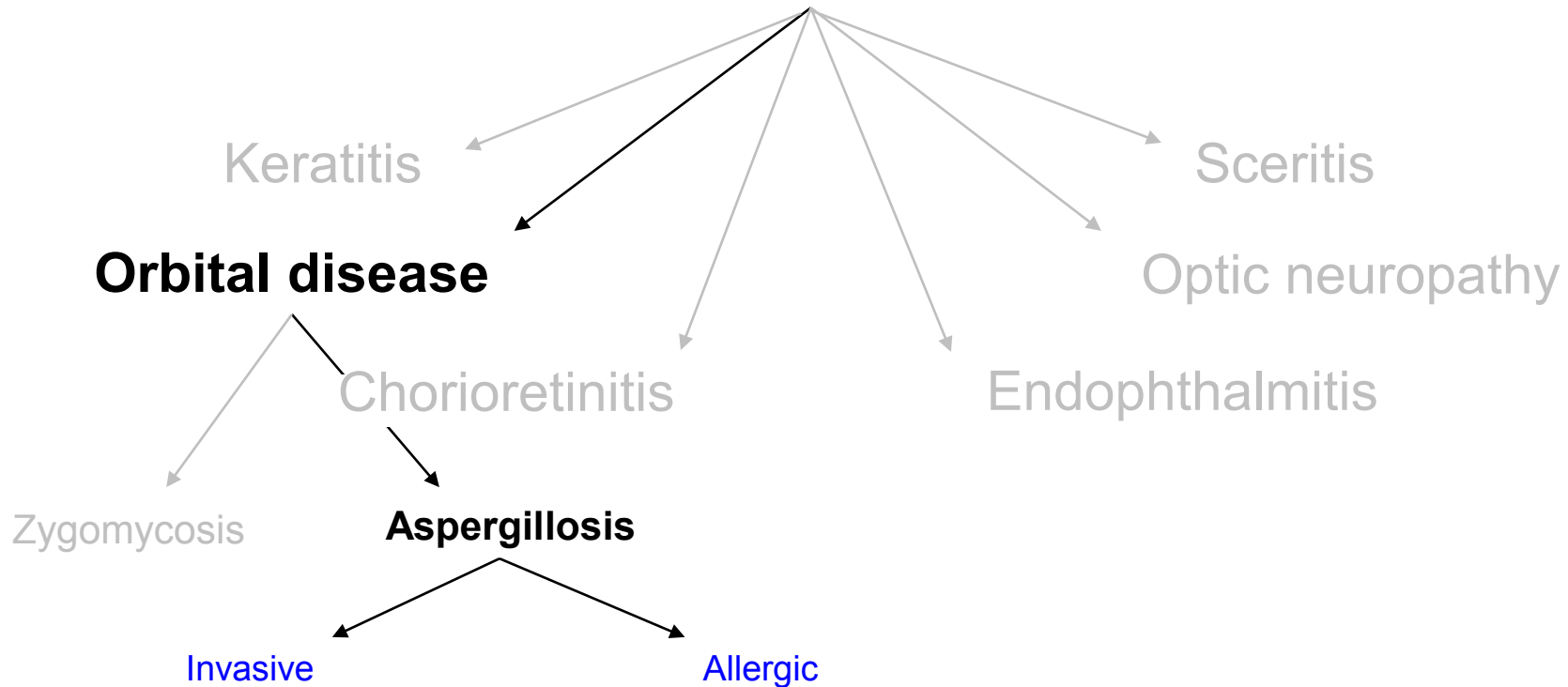
--By eliciting an allergic reaction in orbital tissue. *This is called **allergic aspergillosis**.*

--?

Common Ocular Fungal Pathogens



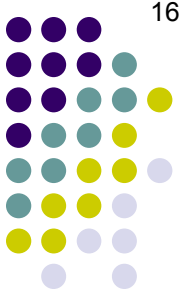
Fungal pathogenicic conditions



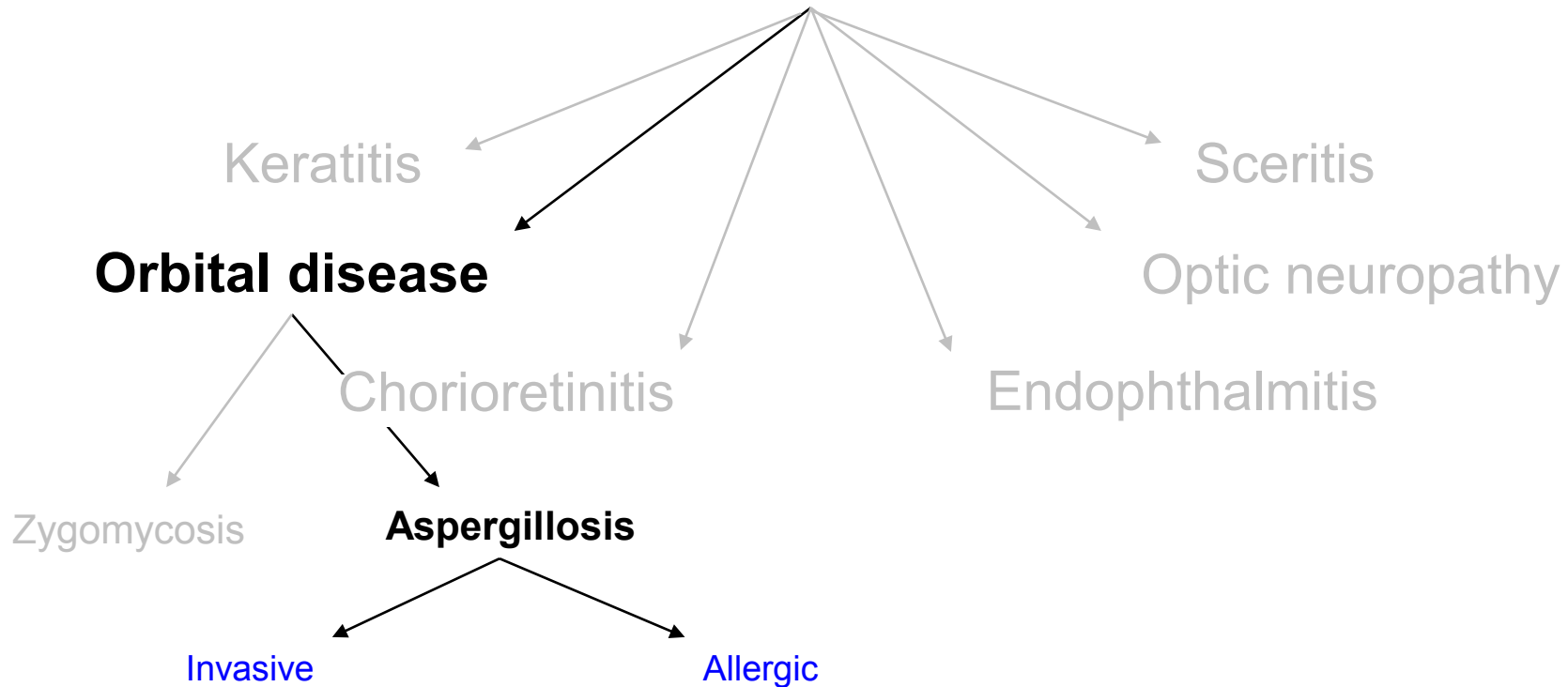
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- By forming a three words in the orbit

Common Ocular Fungal Pathogens



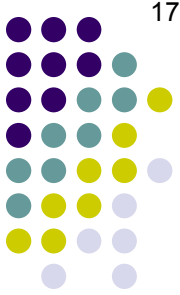
Fungal pathogenicic conditions



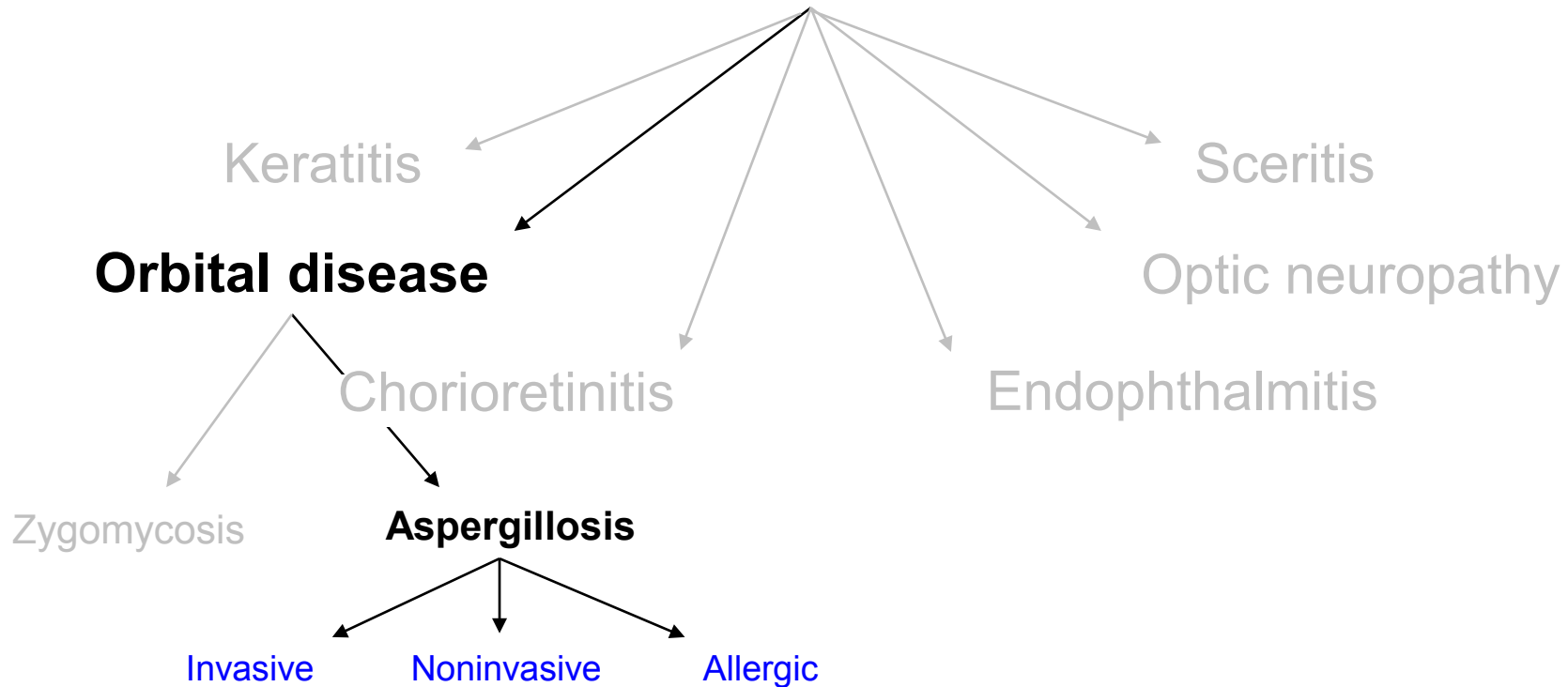
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- By forming a space-occupying mass in the orbit

Common Ocular Fungal Pathogens



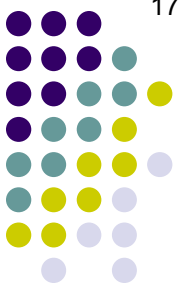
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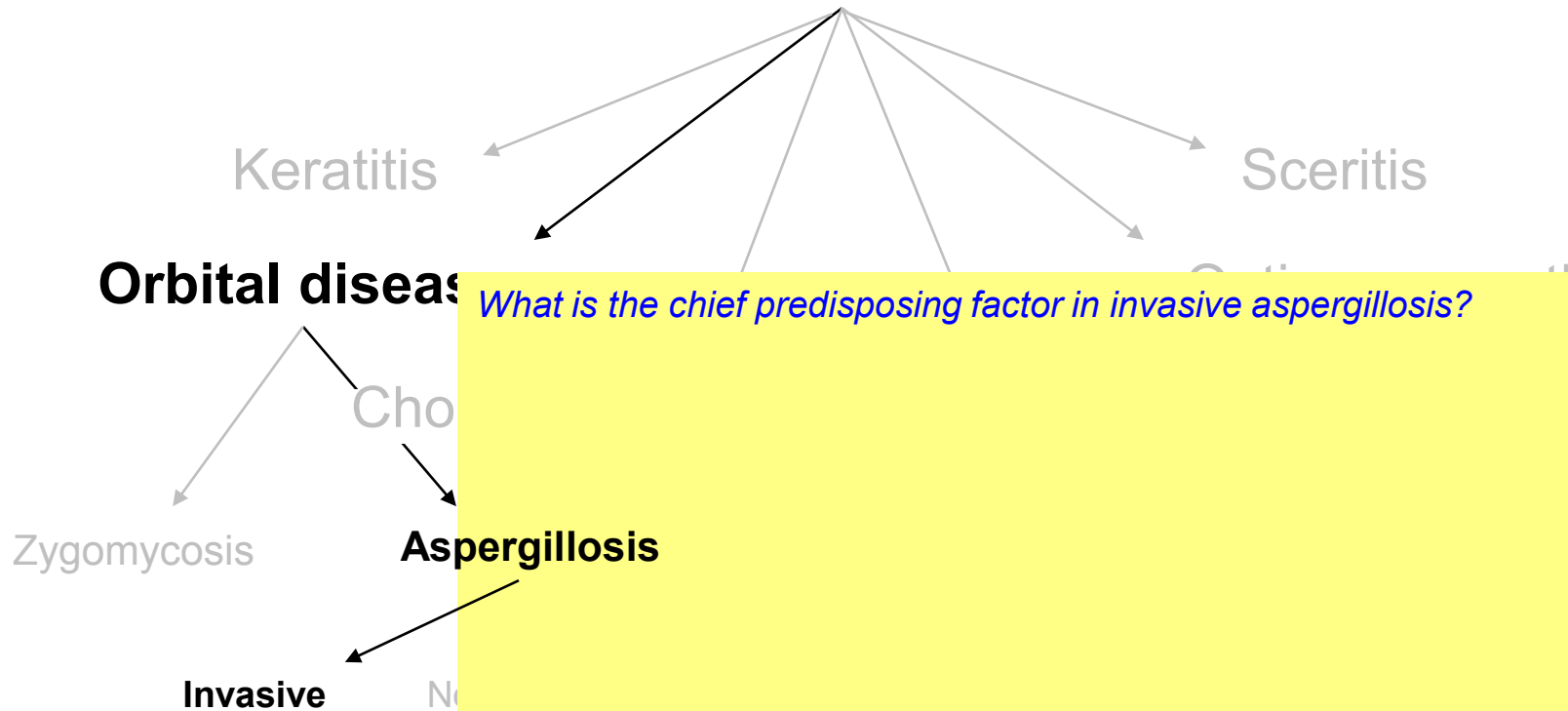
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- By forming a space-occupying mass in the orbit. *This is **noninvasive aspergillosis**.*

Common Ocular Fungal Pathogens

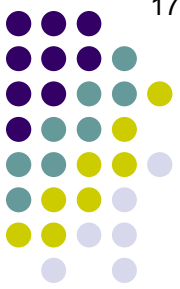


Fungal pathogenicic conditions

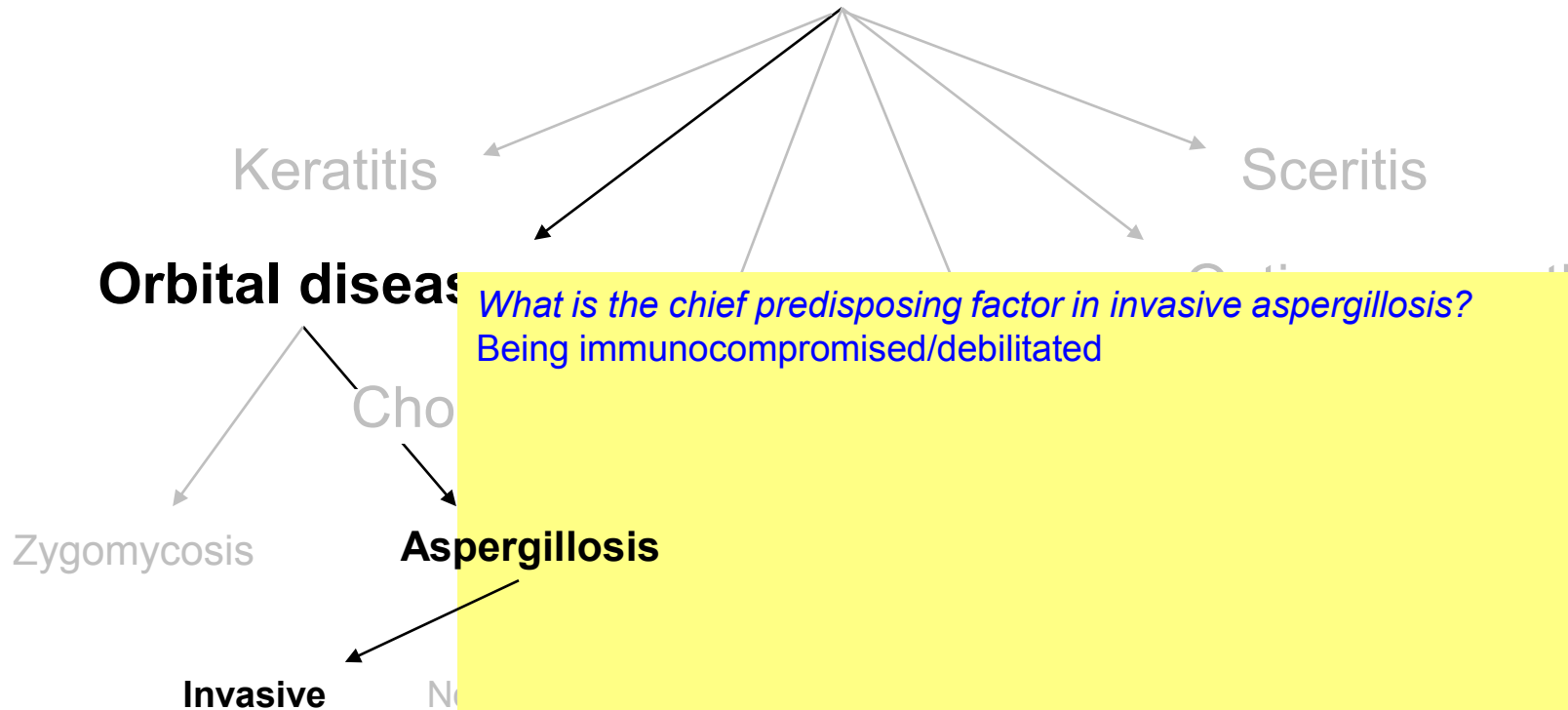


What is the chief predisposing factor in invasive aspergillosis?

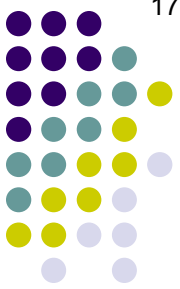
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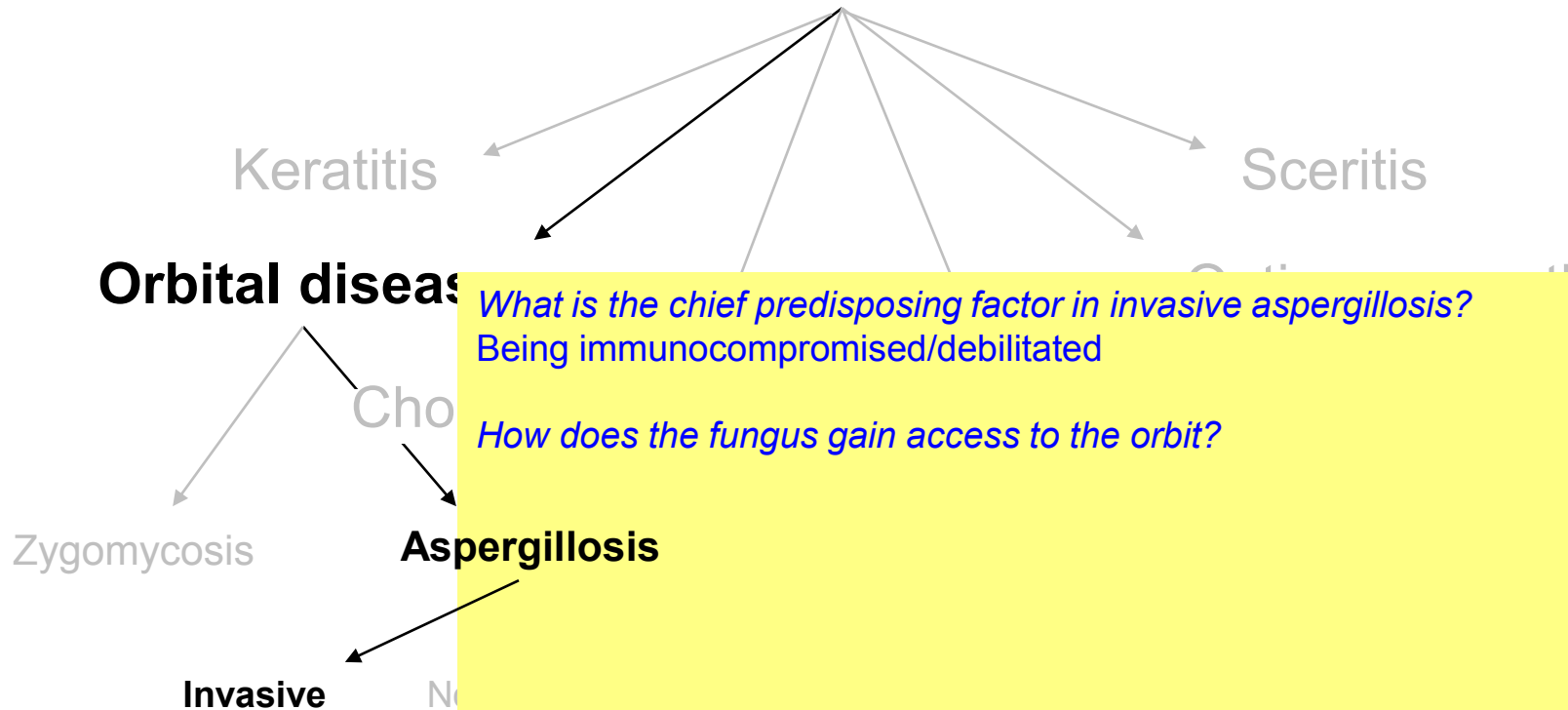
Fungal pathogenicic conditions



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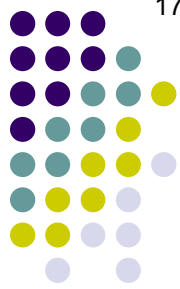
Fungal pathogenicic conditions



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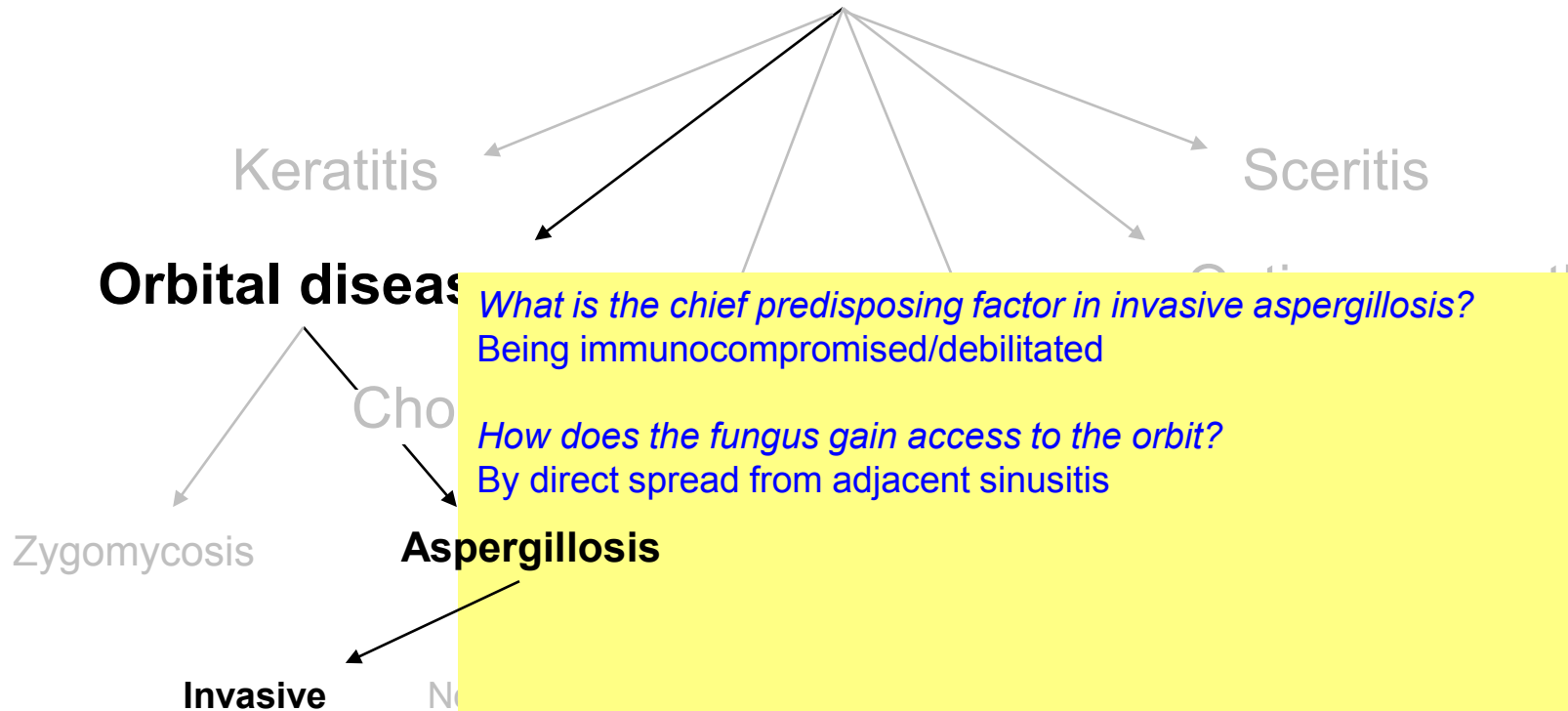
Being immunocompromised/debilitated

How does the fungus gain access to the orbit?



Common Ocular Fungal Pathogens

Fungal pathogenicic conditions



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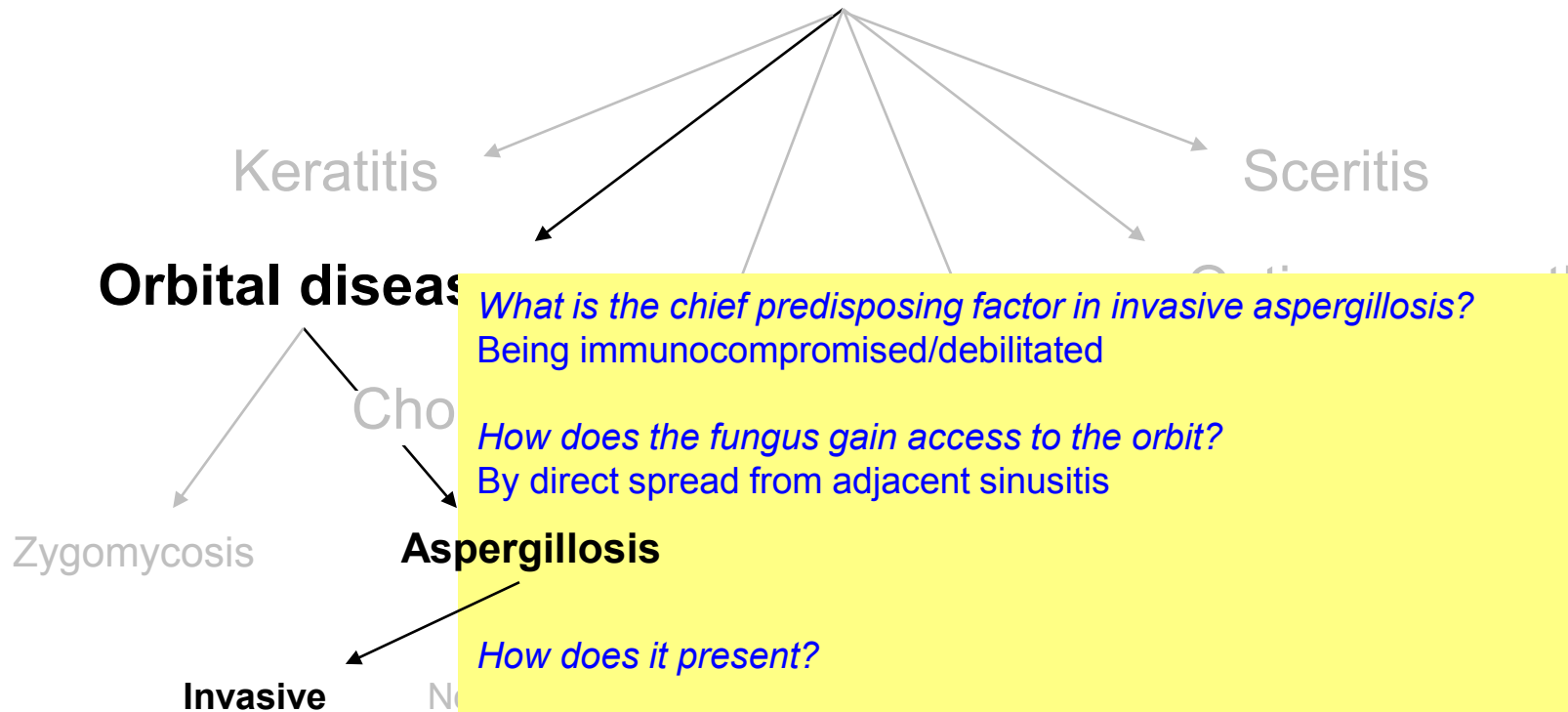
How does the fungus gain access to the orbit?

By direct spread from adjacent sinusitis



Common Ocular Fungal Pathogens

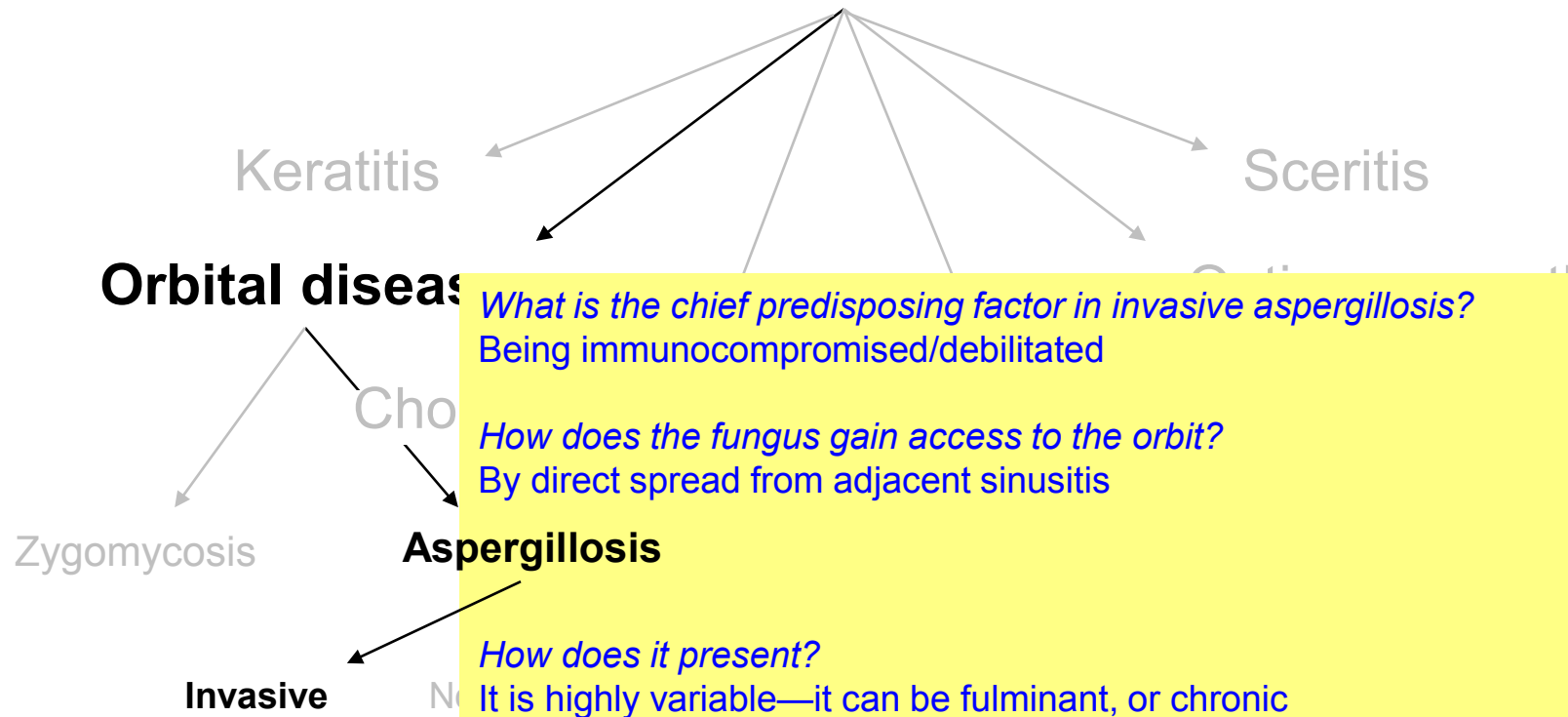
Fungal pathogenic conditions





Common Ocular Fungal Pathogens

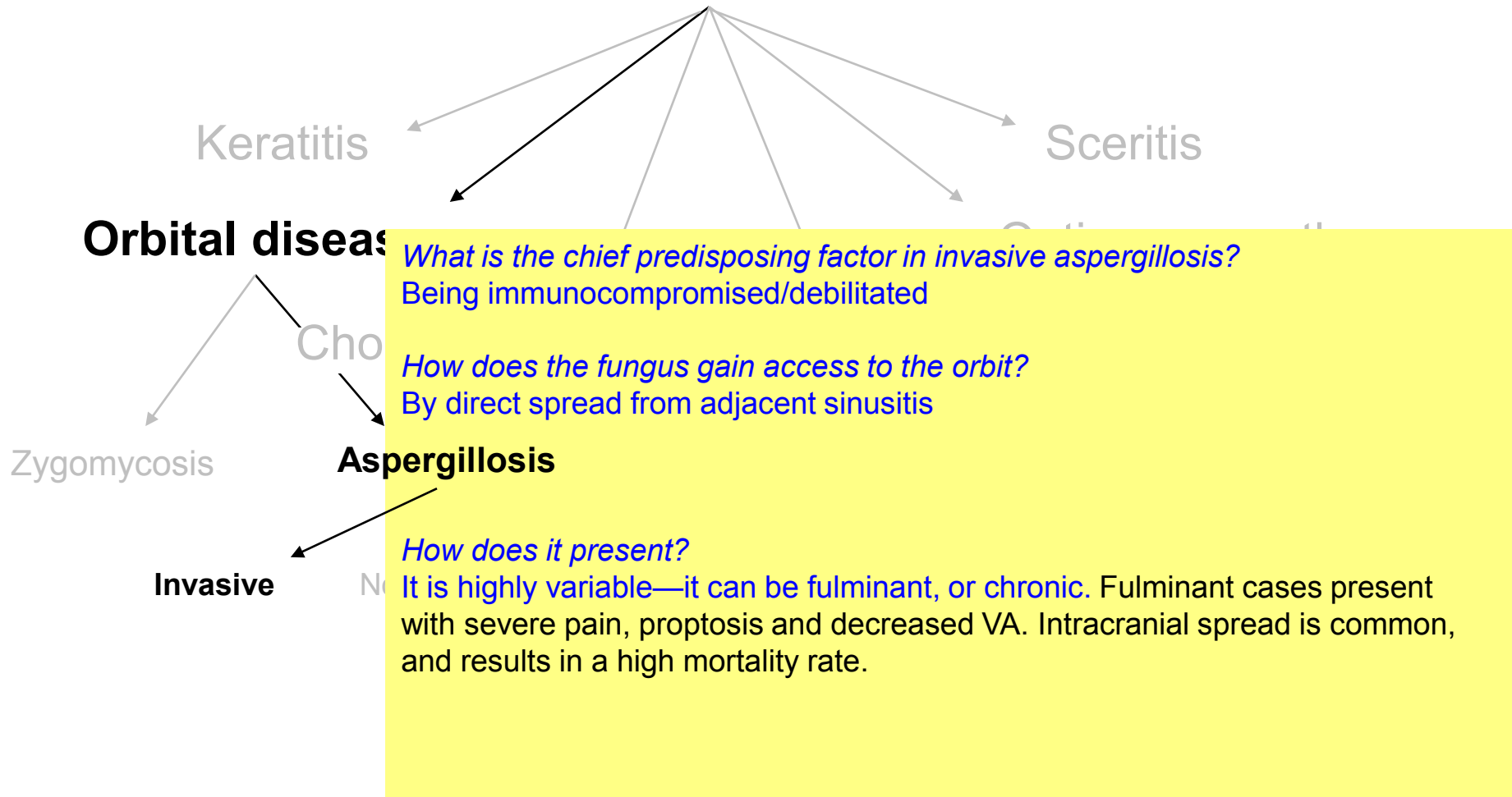
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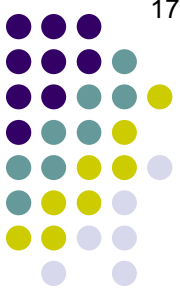
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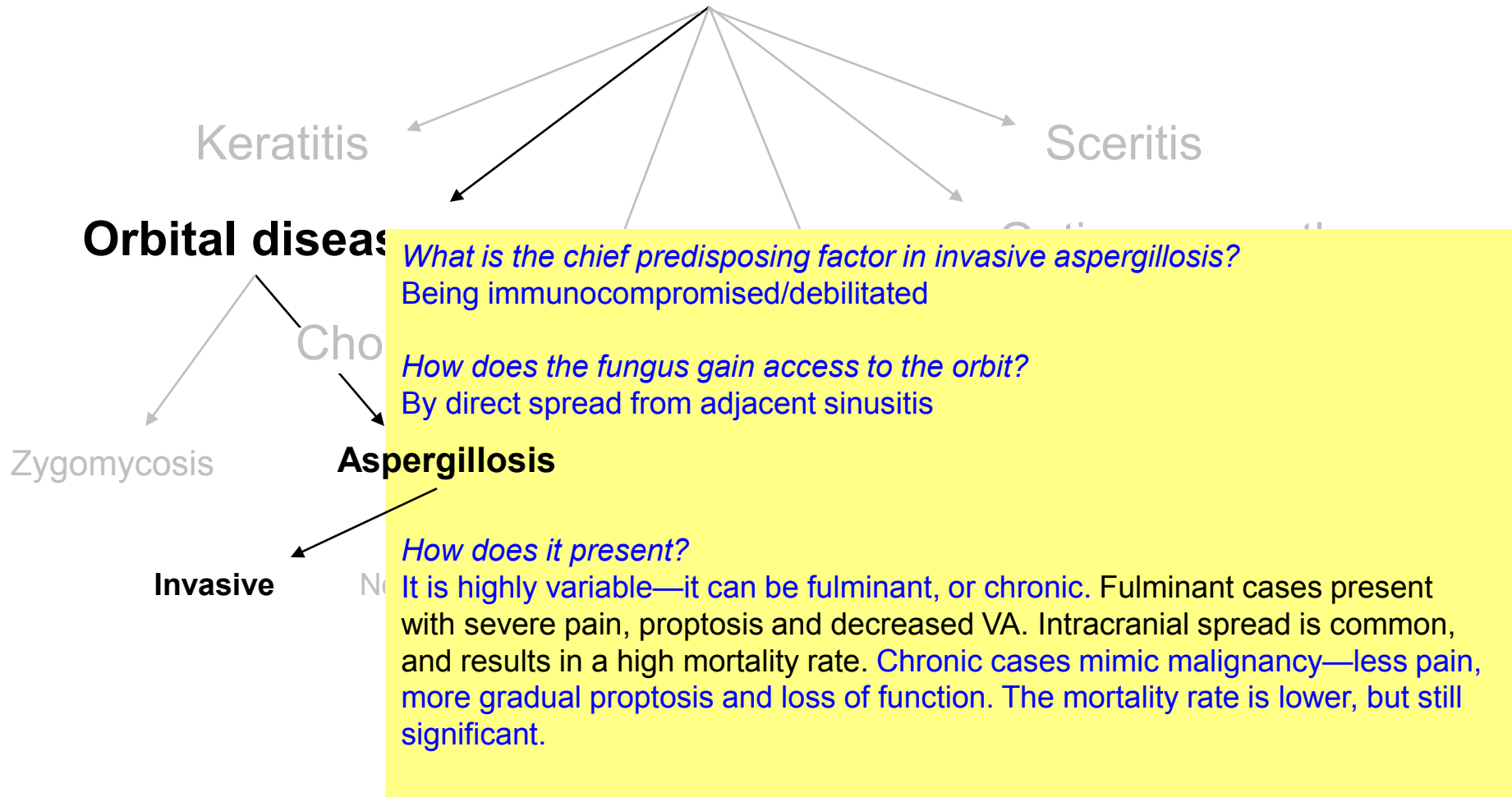
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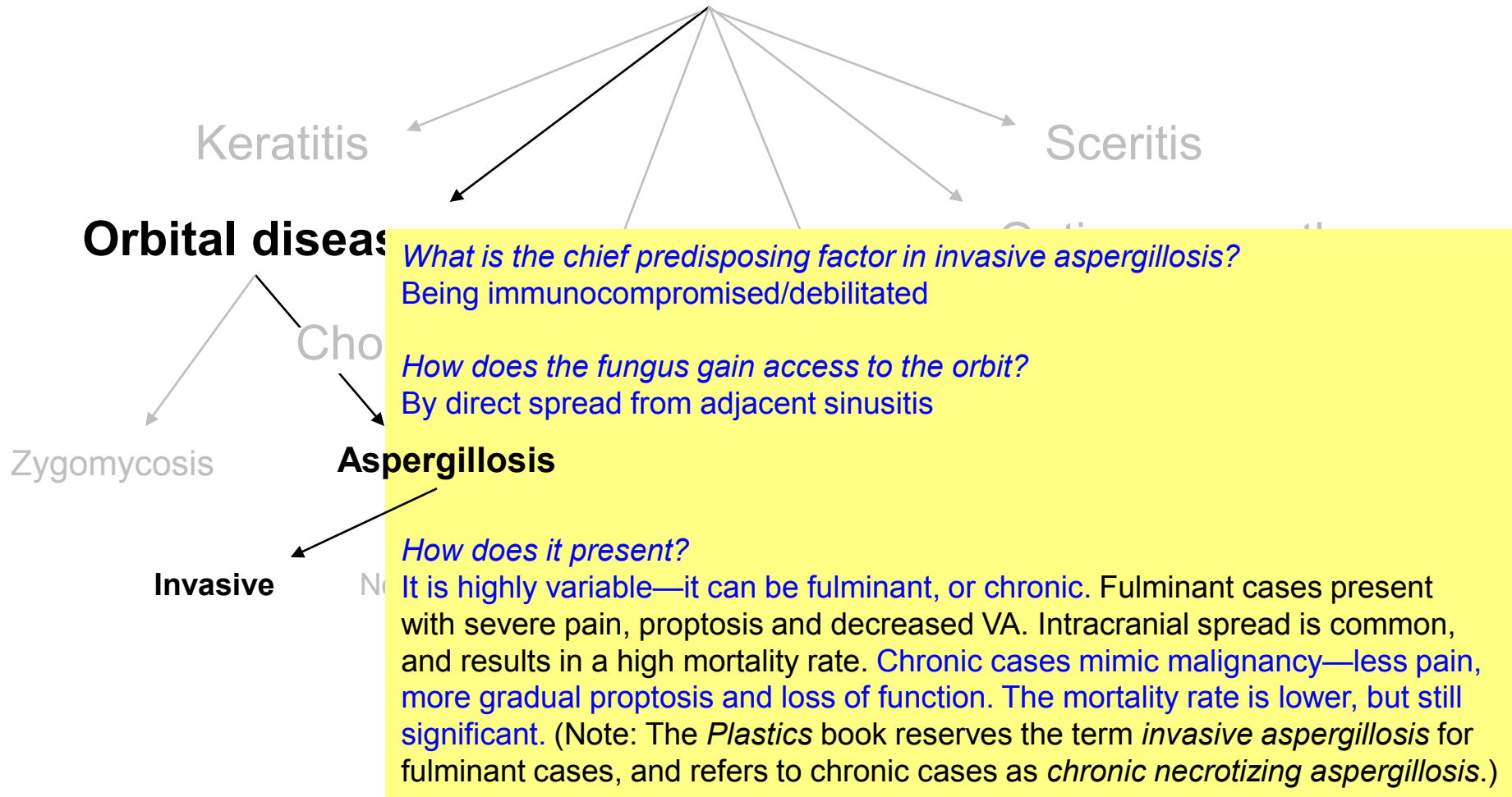
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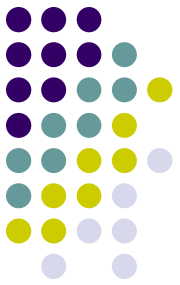
Common Ocular Fungal Pathogens



Fungal pathogenic conditions

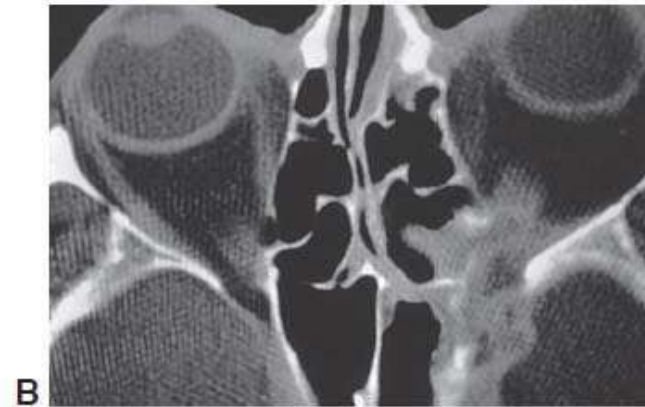
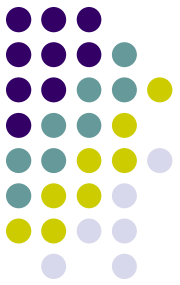


Common Ocular Fungal Pathogens



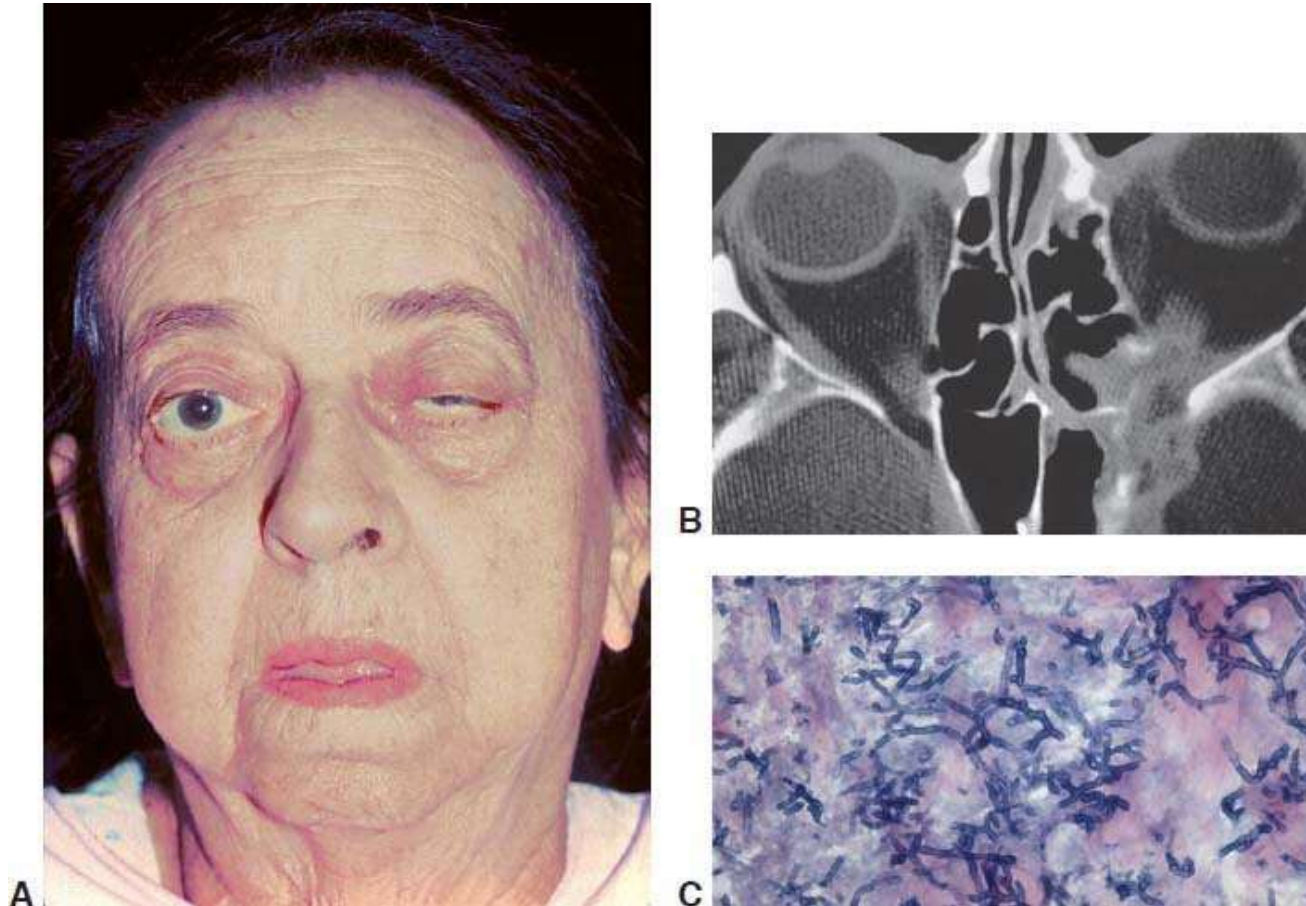
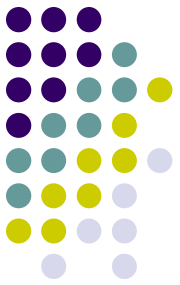
This 82-year-old woman presented with a 6-week history of left brow and orbital pain. **A**, 4 weeks before evaluation, she suddenly lost vision in her left eye, and ptosis and proptosis developed 1 week later.

Common Ocular Fungal Pathogens



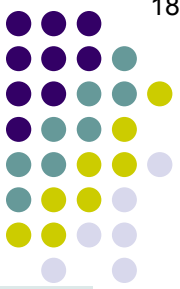
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Common Ocular Fungal Pathogens



This 82-year-old woman presented with a 6-week history of left brow and orbital pain. **A**, 4 weeks before evaluation, she suddenly lost vision in her left eye, and ptosis and proptosis developed 1 week later. **B**, CT scan revealed a destructive lesion at the orbital apex. **C**, Biopsy of the lesion showed septate hyphae consistent with aspergillosis.

Common Ocular Fungal Pathogens

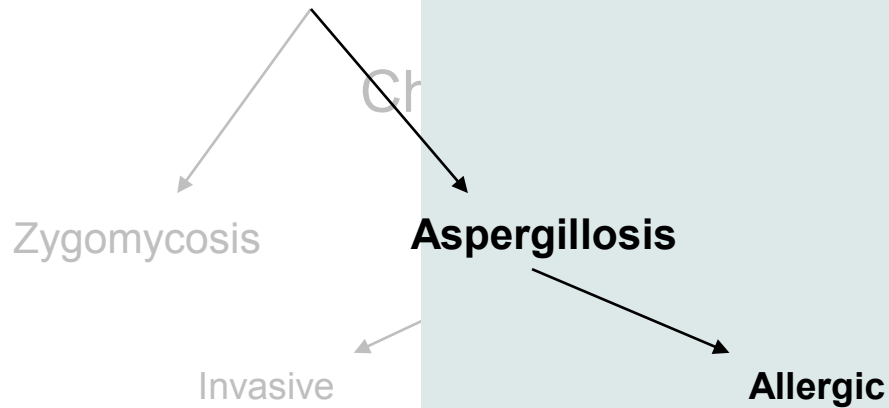


Fungal pathogenic conditions

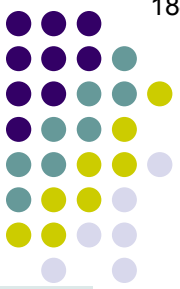
Who is the typical allergic aspergillosis pt?

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



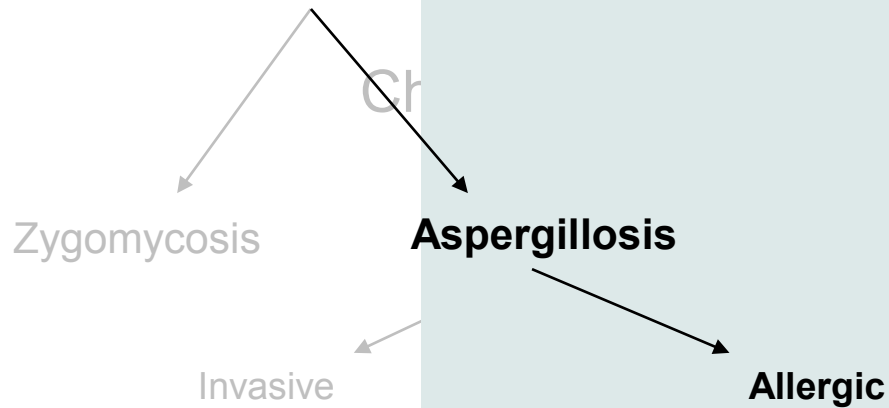
Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of [redacted], chronic [redacted], and nasal [redacted]

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



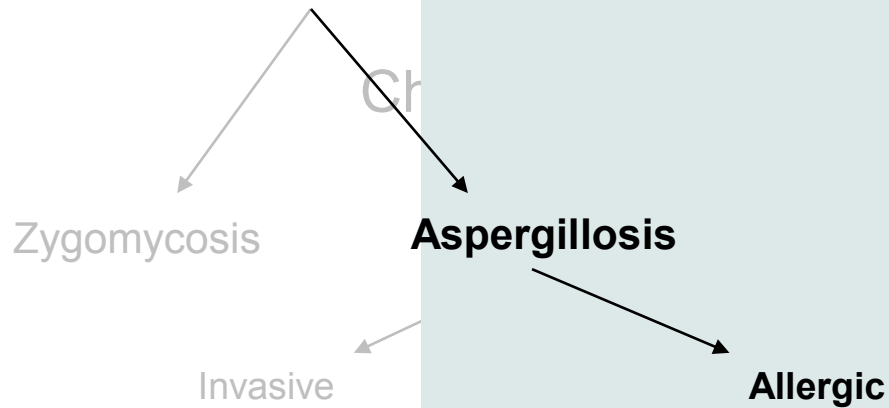
Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

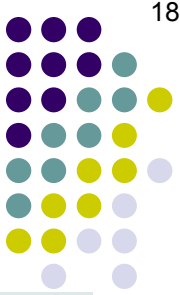
An individual with a PMHx of atopy , chronic sinusitis , and nasal polyposis

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

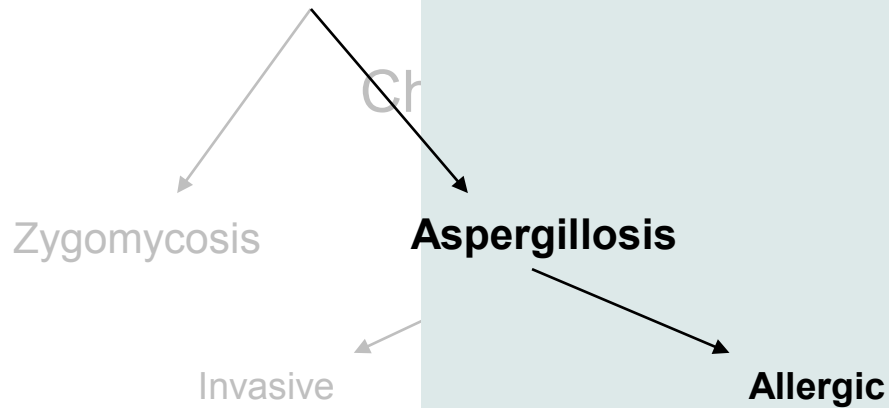
Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy , chronic sinusitis , and nasal polyposis

Do they tend to be immunocompromised, like invasive aspergillosis pts?

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

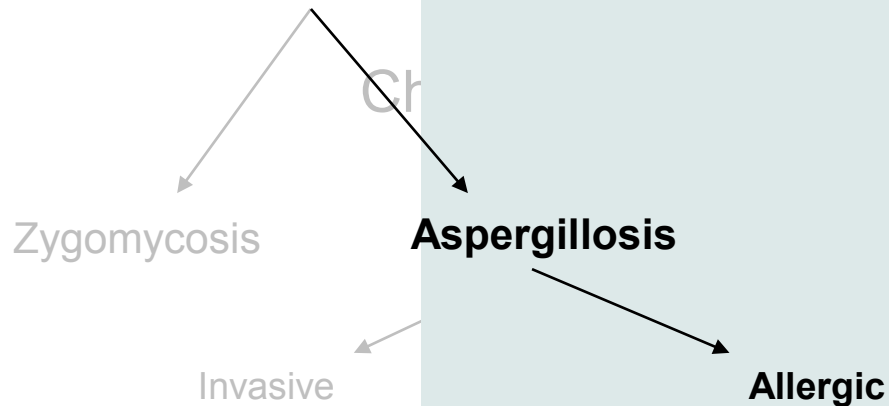
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

Do they tend to be immunocompromised, like invasive aspergillosis pts?

No, just the opposite—these pts are almost always immunocompetent (the condition requires the mounting of a robust immune response)

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

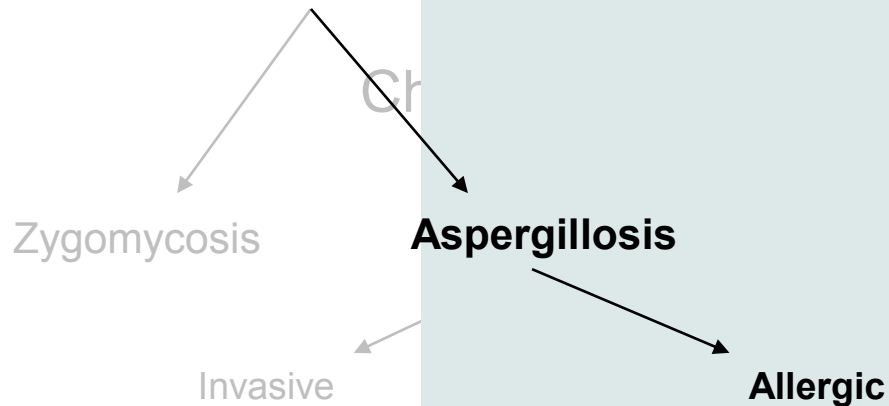
Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy , chronic sinusitis , and nasal polyposis

What would a blood draw reveal?

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

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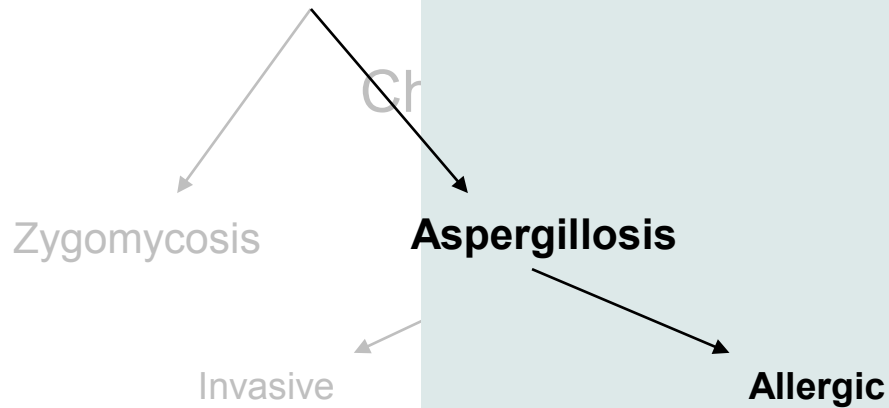
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

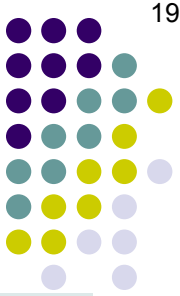
The usual atopic/allergic findings: Lots of **cell type** and high levels of **Ig type**

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

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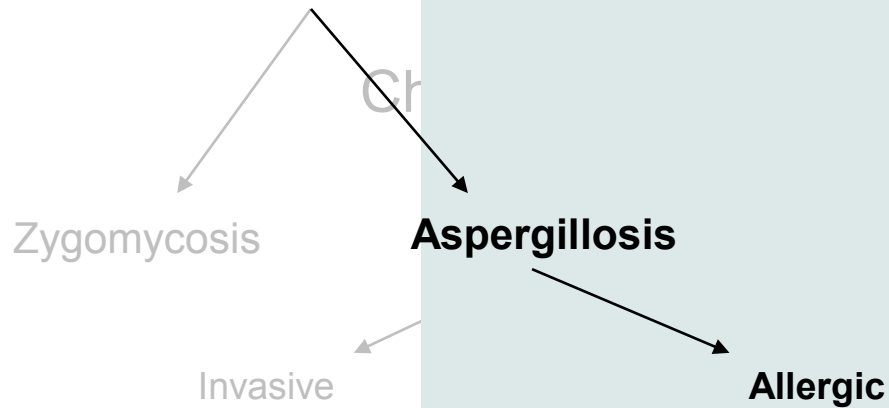
An individual with a PMHx of atopy , chronic sinusitis , and nasal polyposis

What would a blood draw reveal?

The usual atopic/allergic findings: Lots of eos and high levels of IgE .

Keratitis

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

Keratitis

Orbital disease

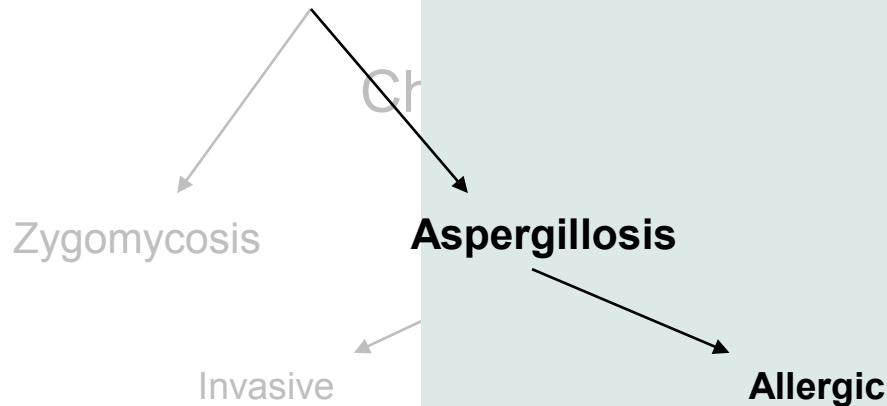
Ch

Zygomycosis

Aspergillosis

Invasive

Allergic



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

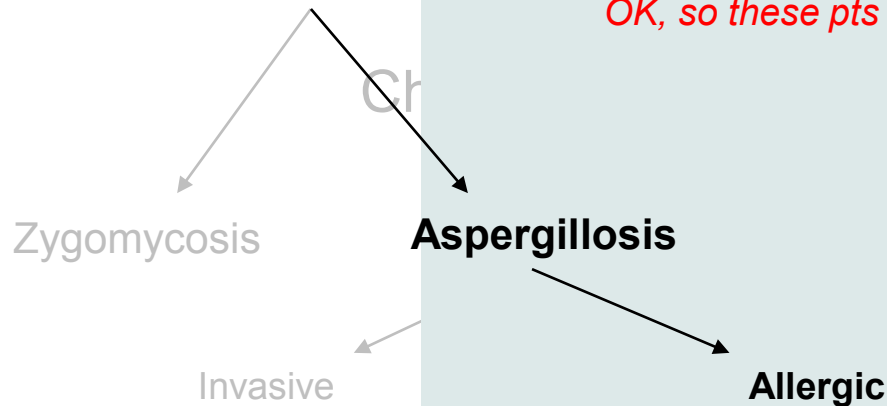
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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OK, so these pts have a stuffy nose. Why is this worth talking about?

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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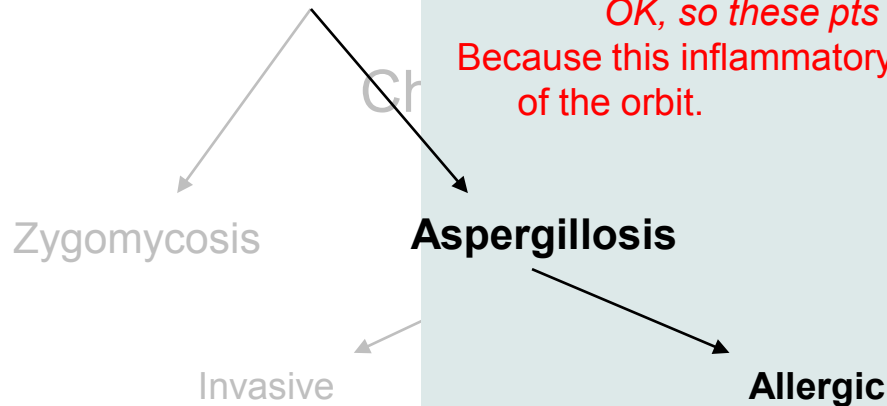
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OK, so these pts have a stuffy nose. Why is this worth talking about?

Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit.

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

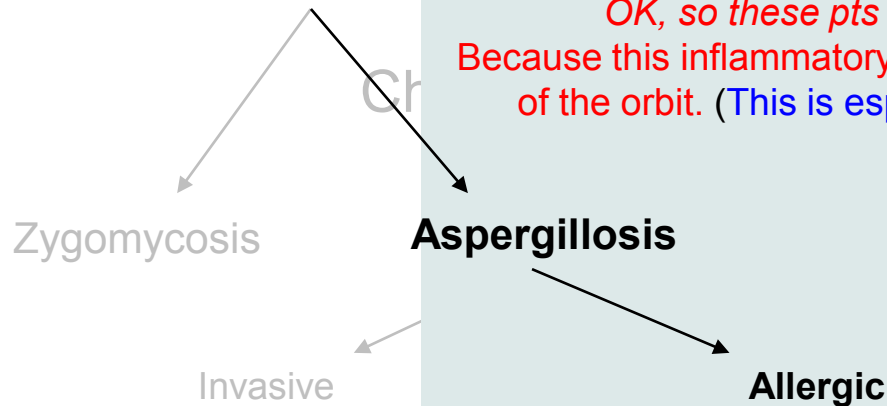
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Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

OK, so these pts have a stuffy nose. Why is this worth talking about?

Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the maxillary sinus is involved.)

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

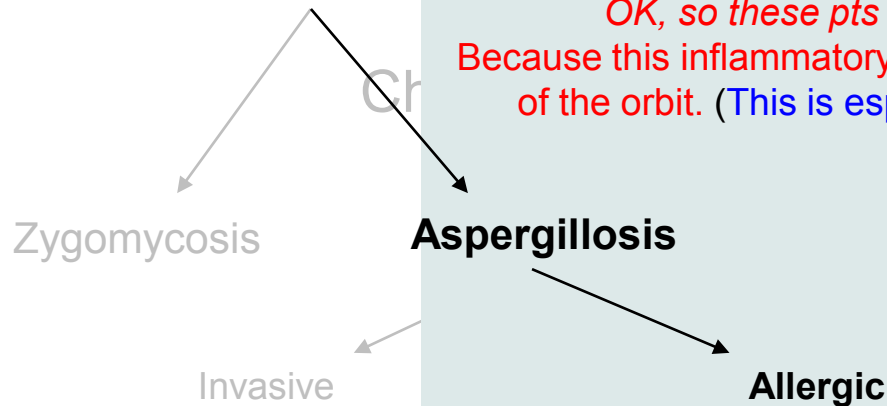
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Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)

Orbital disease



Common Ocular Fungal Pathogens



CT demonstrating allergic aspergillosis involving the left posterior ethmoid and sphenoid sinus with bony expansion and compression of the left optic nerve



Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

Keratitis

Orbital disease

OK, the typical allergic aspergillosis pt. What is this? What is this?

Because this **inflammatory sinus-mucosa response can spread to the mucosa of the orbit.** (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?

Zygomycosis

Invasive

Allergic

Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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Keratitis

Orbital disease

OK, the typical allergic aspergillosis pt. What is this? What is this?

Because this **inflammatory sinus-mucosa response can spread to the mucosa of the orbit.** (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?

In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of , , and

two words

Zygomycosis

Invasive

Allergic

Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy , chronic sinusitis , and nasal polyposis

What would a blood draw reveal?

The usual atopic/allergic findings: Lots of eos and high levels of IgE .
Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

Keratitis

Orbital disease

OK, the patient has nasal stuffiness. What is this? What is this?

Because this **inflammatory sinus-mucosa response can spread to the mucosa of the orbit.** (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?

In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis , ophthalmoplegia , and optic neuropathy

Zygomycosis

Invasive

Allergic

Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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Keratitis

Orbital disease

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Because this **inflammatory sinus-mucosa response can spread to the mucosa of the orbit.** (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?

In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis, ophthalmoplegia, and optic neuropathy, as well as **localizing to the retrobulbar region**

Zygomycosis

Invasive

Allergic

Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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Keratitis

Orbital disease

OK, the patient has nasal stuffiness. What is this? What is this?

Because this **inflammatory sinus-mucosa response can spread to the mucosa of the orbit.** (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?

In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis, ophthalmoplegia, and optic neuropathy, as well as **pain localizing to the retrobulbar region**

Zygomycosis

Invasive

Allergic

Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

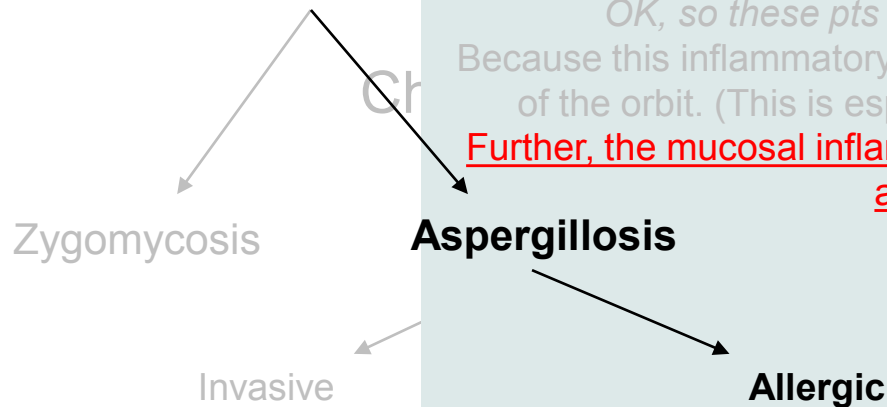
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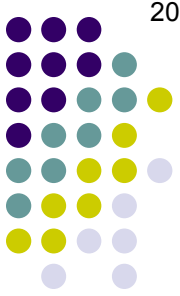
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)

Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

Orbital disease



Common Ocular Fungal Pathogens



Allergic aspergillosis: Bony destruction

Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

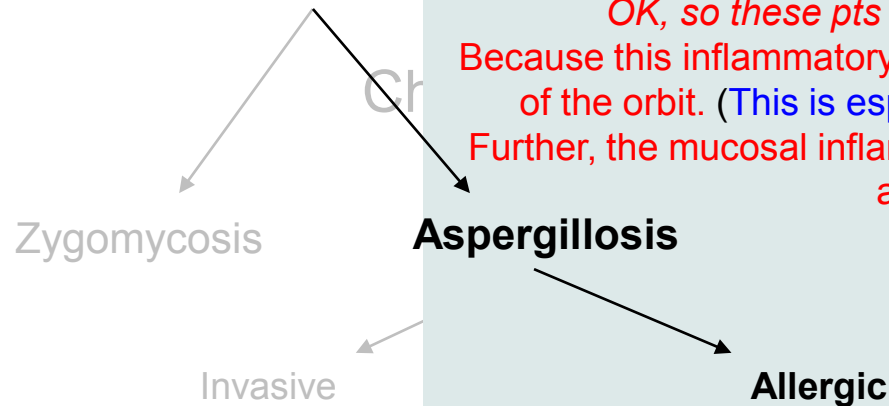
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Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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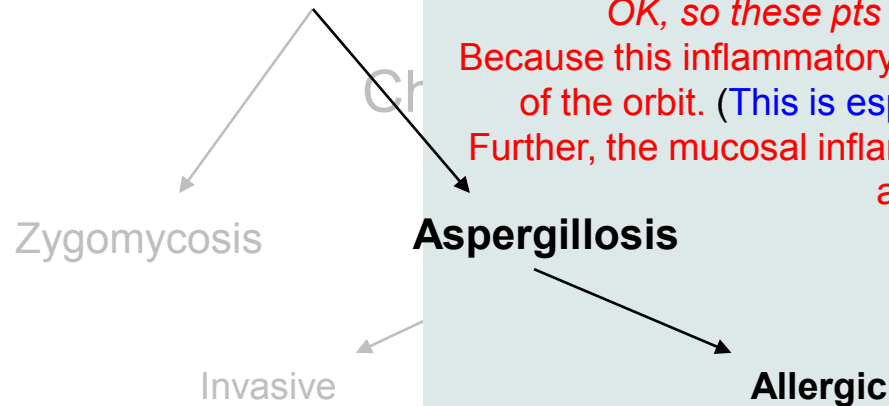
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)

Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

Via sinus biopsy

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

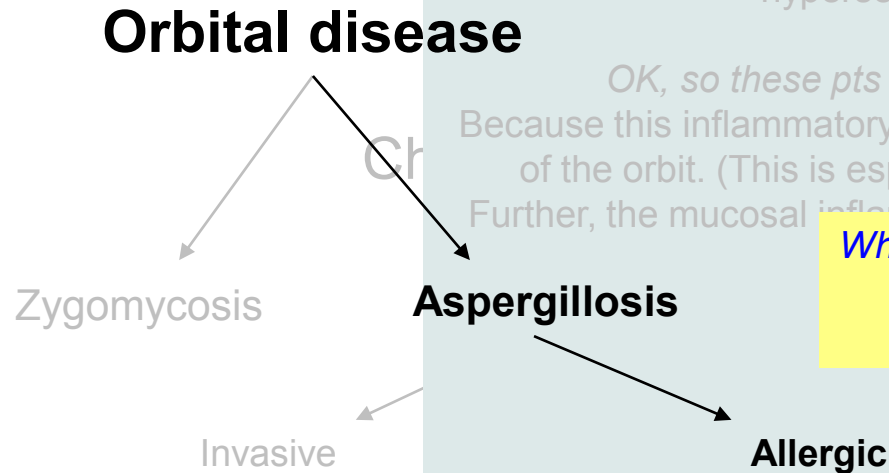
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Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.) Further, the mucosal inflammatory response is severe enough to erode bone.

What does the biopsy reveal?



Via **sinus biopsy**

Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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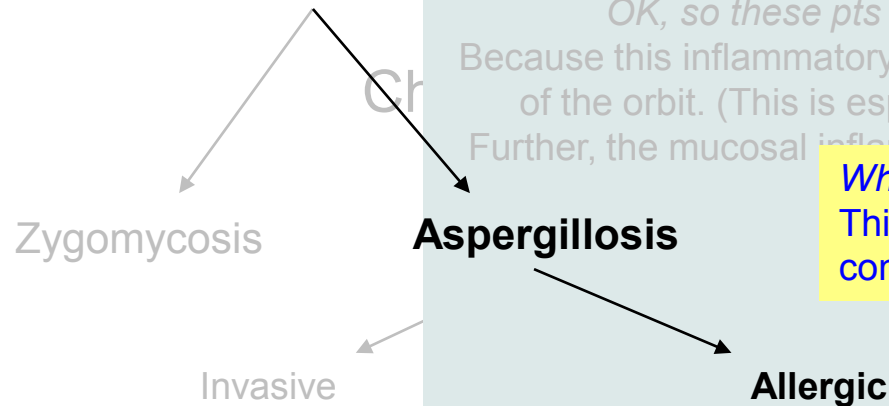
Further, the mucosal inflammatory response is severe enough to erode bone

What does the biopsy reveal?

Thick mucus (the classic description is eww like' containing fungal hyphae

Via **sinus biopsy**

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

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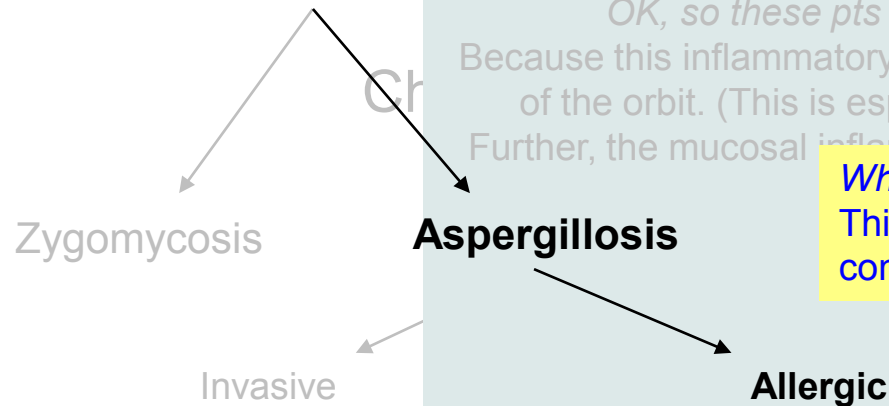
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.) Further, the mucosal inflammatory response is severe enough to erode bone.

What does the biopsy reveal?

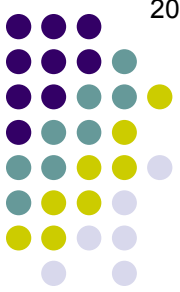
Thick mucus (the classic description is 'peanut-butter like') containing fungal hyphae

Via **sinus biopsy**

Orbital disease



Common Ocular Fungal Pathogens



Allergic aspergillosis: Biopsy specimen plated on whole-wheat agar

Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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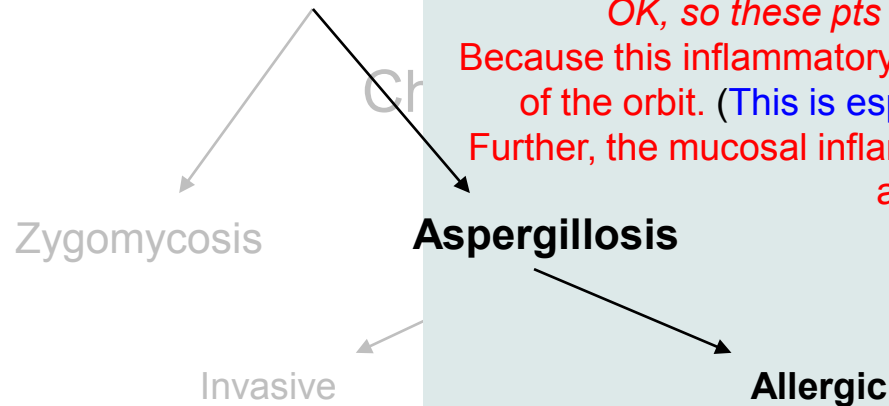
Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

Via sinus biopsy

How is it treated?

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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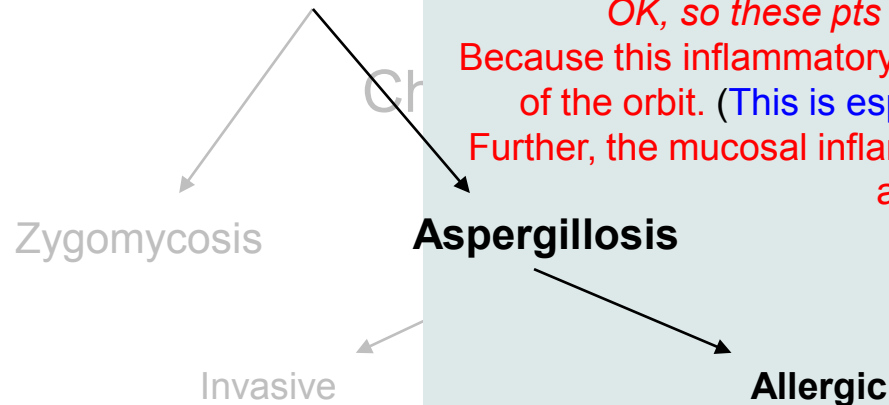
How is allergic aspergillosis diagnosed?

Via sinus biopsy

How is it treated?

Via surgical debridement of the sinuses, and steroids

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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How is allergic aspergillosis diagnosed?

Via sinus biopsy

How is it treated?

Via surgical debridement of the sinuses, and steroids

You forgot to say 'antifungals.' And antifungals, right?

Keratitis

Orbital disease

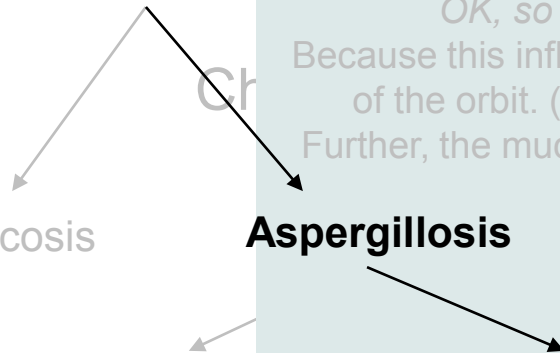
Ch

Aspergillosis

Allergic

Zygomycosis

Invasive



Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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How is allergic aspergillosis diagnosed?

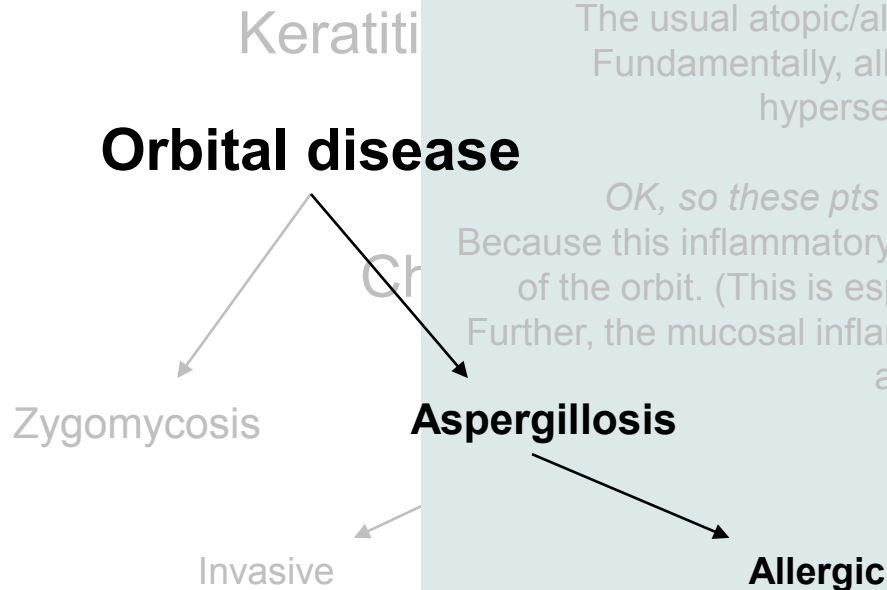
Via sinus biopsy

How is it treated?

Via surgical debridement of the sinuses, and steroids

You forgot to say 'antifungals.' And antifungals, right?

Nope—antifungals are **not** indicated (unless this is a very unusual case of allergic aspergillosis in an pt)



Common Ocular Fungal Pathogens



Fungal pathogenesis conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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Ch

Aspergillosis

How is allergic aspergillosis diagnosed?

Via sinus biopsy

How is it treated?

Via surgical debridement of the sinuses, and steroids

Zygomycosis

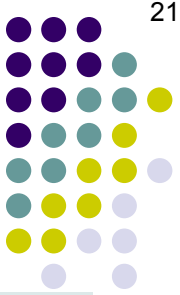
Invasive

Allergic

You forgot to say 'antifungals.' And antifungals, right?

Nope—antifungals are **not** indicated (unless this is a very unusual case of allergic aspergillosis in an immunocompromised pt)

Common Ocular Fungal Pathogens



Fungal pathogenic conditions

Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?

The usual atopic/allergic findings: Lots of eos and high levels of IgE. Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

OK, so these pts have a stuffy nose. Why is this worth talking about?

Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.) Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

Via sinus biopsy

How is it treated?

Via surgical debridement of the sinuses, and steroids

Keratitis

Orbital disease

Ch

Aspergillosis

Allergic

Zygomycosis

Invasive

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Common Ocular Fungal Pathogens



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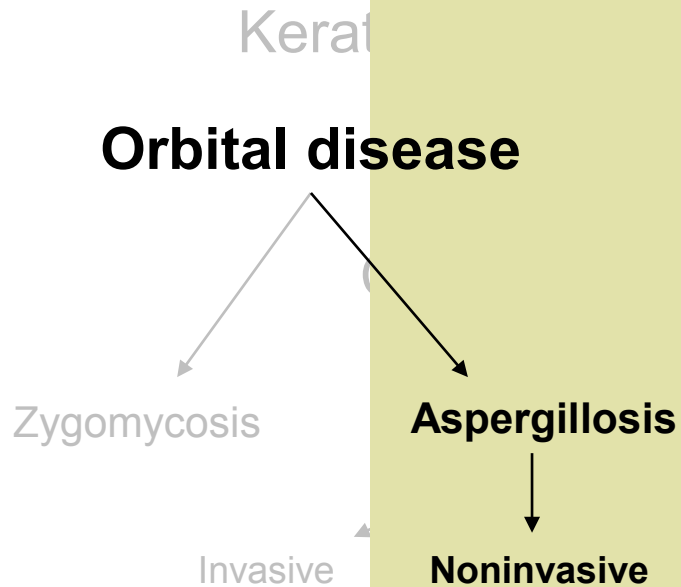
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Common Ocular Fungal Pathogens



Fungal pathogenic conditions

In a nutshell, what is the pathologic process in noninvasive aspergillosis?



Common Ocular Fungal Pathogens



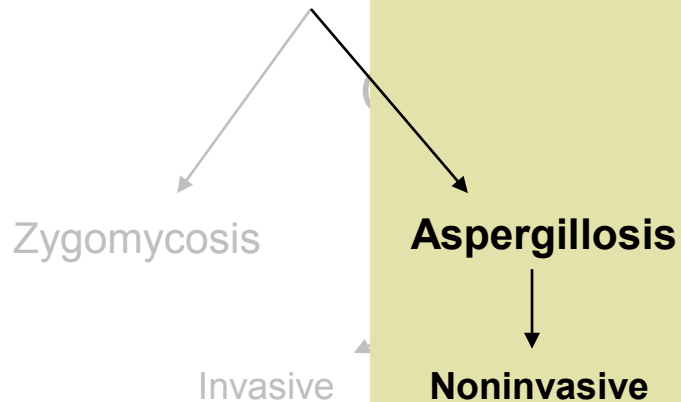
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The fungus proliferates within the air space of the sinus—ie, not *within* the mucosa so much as *upon* it. This extramucosal proliferation eventually fills the air space and forms a 'fungal ball' that acts as a space-occupying lesion.

Kerat

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

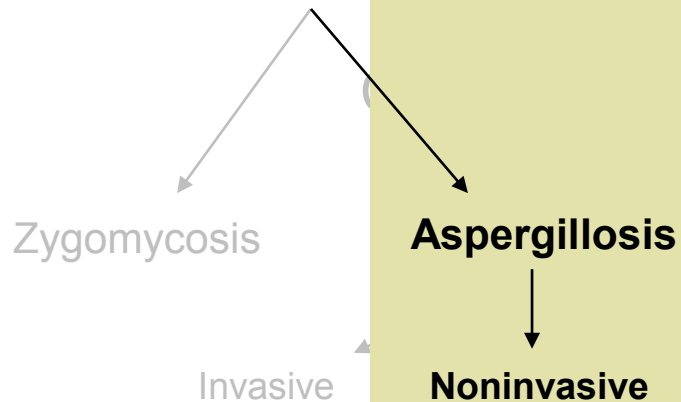
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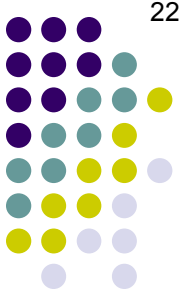
What is the formal name for an Aspergillus fungal ball?

Kerat

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

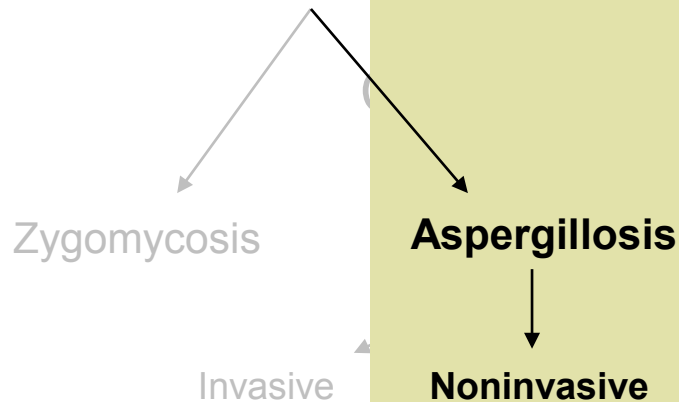
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The fungus proliferates within the air space of the sinus—ie, not *within* the mucosa so much as *upon* it. This leads to hyphal proliferation within the sinus and forms a 'fungal ball'.

What is the formal name for an Aspergillus fungal ball?
An 'aspergilloma'

Kerat

Orbital disease



Common Ocular Fungal Pathogens



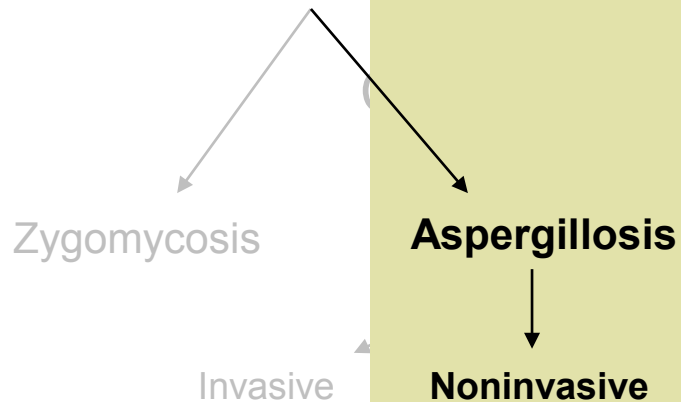
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Kerat

Orbital disease



Common Ocular Fungal Pathogens



Noninvasive aspergillosis: Orbital aspergilloma

Common Ocular Fungal Pathogens



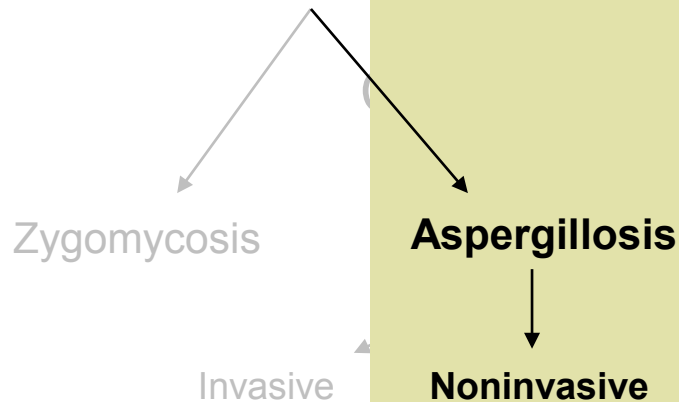
Fungal pathogenicic conditions

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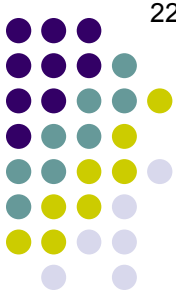
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mass—proptosis, decreased vision, etc. *Which sinuses are adjacent to the orbital apex?*

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

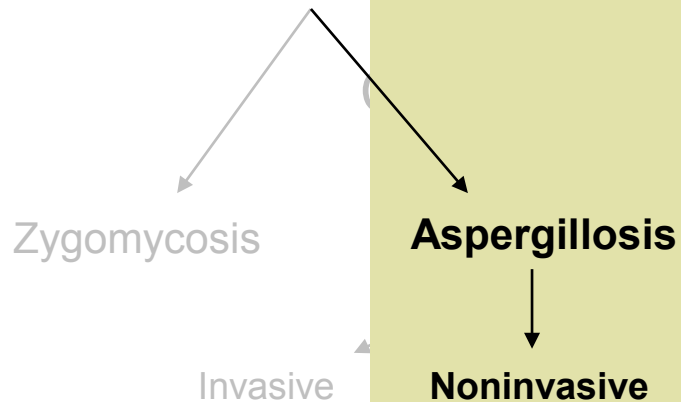
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Which sinuses are adjacent to the orbital apex?
The sphenoid and ethmoid

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

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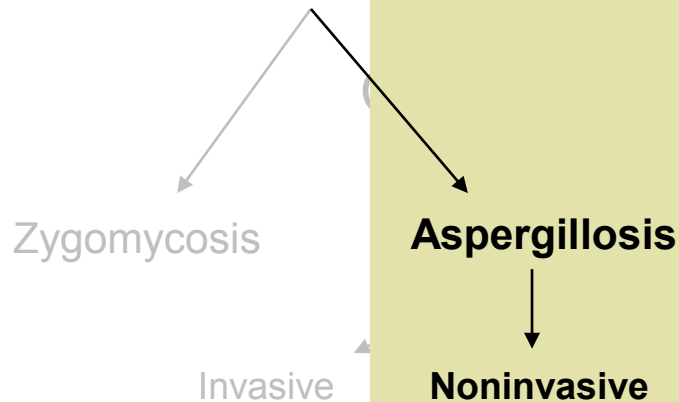
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Which sinuses are especially prone to hosting aspergillomas?

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

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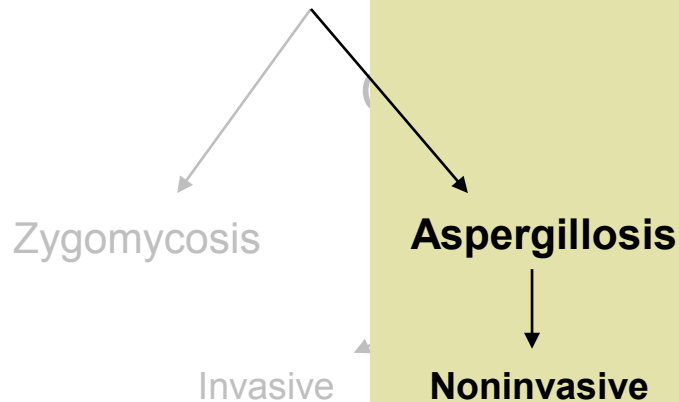
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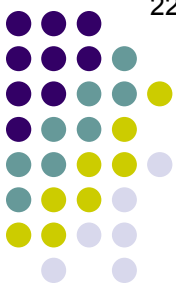
Orbital disease



Common Ocular Fungal Pathogens



CT showing large aspergilloma invading the sphenoid sinus and extending posteriorly with compression of the left optic nerve



Common Ocular Fungal Pathogens



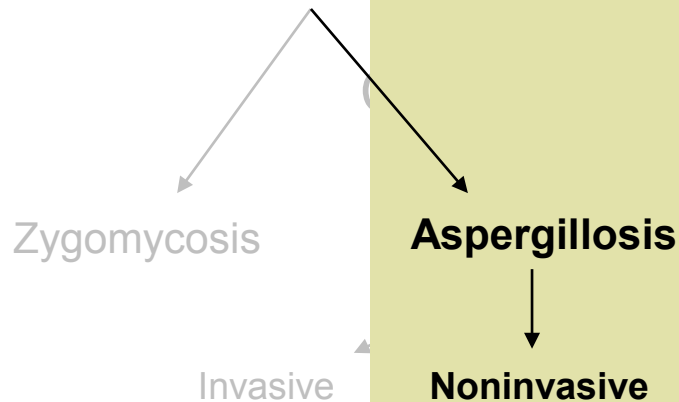
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In addition to orbital S/S, what other complaints are typical?

Orbital disease



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

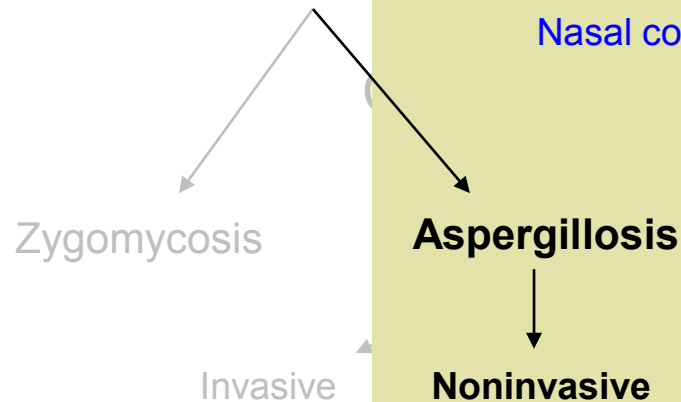
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Nasal congestion and rhinorrhea, and HA localizing to the periorbital region



Common Ocular Fungal Pathogens



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Kerat

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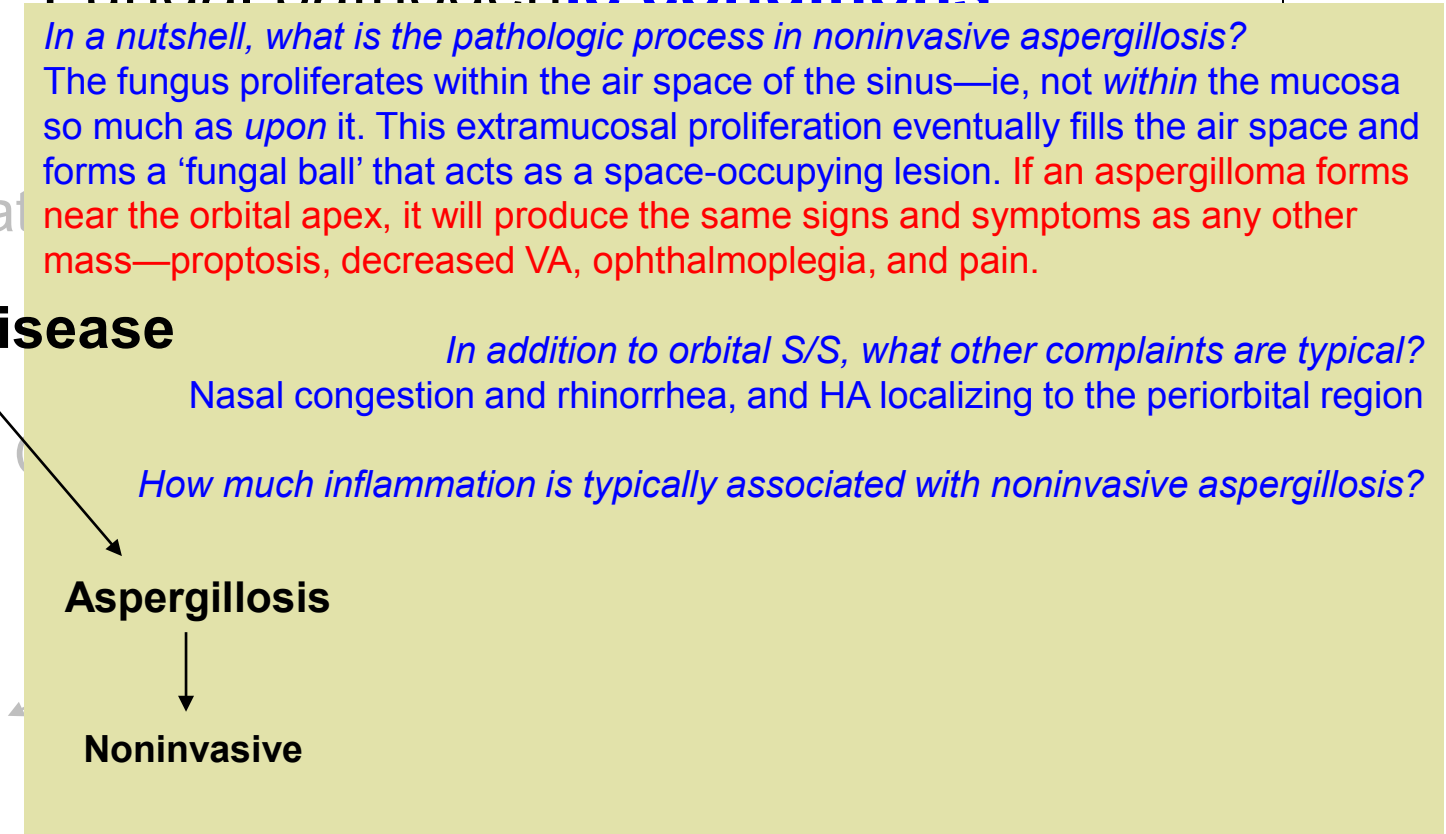
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Zygomycosis

Invasive

Aspergillosis

Noninvasive



Common Ocular Fungal Pathogens



Fungal pathogenic conditions

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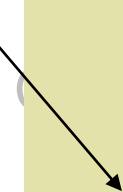
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Aspergillosis

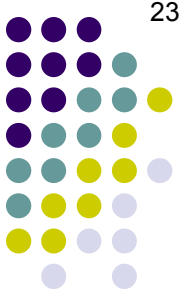
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Common Ocular Fungal Pathogens



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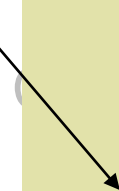
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Aspergillosis

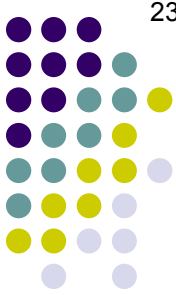
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Common Ocular Fungal Pathogens



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Surgically

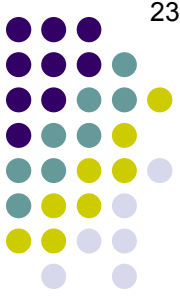
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Common Ocular Fungal Pathogens

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How much inflammation is typically associated with noninvasive aspergillosis?

Little to none

How much bony erosion typically occurs?

Little to none

How is noninvasive aspergillosis managed?

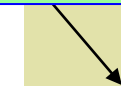
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Common Ocular Fungal Pathogens



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Common Ocular Fungal Pathogens

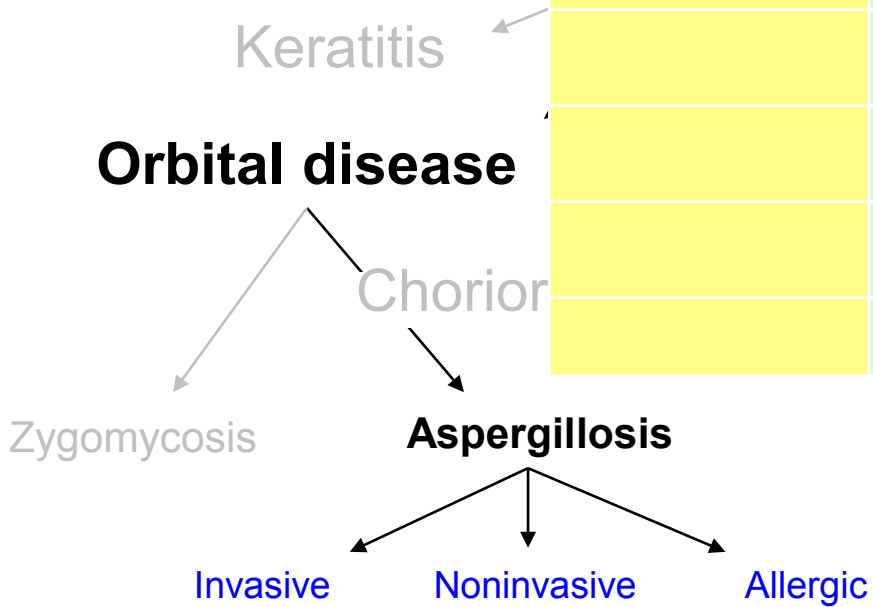


Orbital aspergillosis tl;dr				
Fungal		<i>Invasive aspergillosis</i>	<i>Allergic aspergillosis</i>	<i>Noninvasive aspergillosis</i>
	Immunostatus	?	?	?
itis				
sease				
Chorio				

Aspergillosis

Noninvasive

Allergic





Common Ocular Fungal Pathogens

Orbital aspergillosis tl;dr			
Fungus	<i>Invasive aspergillosis</i>	<i>Allergic aspergillosis</i>	<i>Noninvasive aspergillosis</i>
Immunostatus	Compromised	Competent	Competent
Bony erosions?	?	?	?
Keratitis			
Orbital disease			
Chorioretinitis			
Zygomycosis			
Aspergillosis			
Invasive			
Noninvasive			
Allergic			

Common Ocular Fungal Pathogens



Orbital aspergillosis tl;dr			
Fungal	Invasive aspergillosis	Allergic aspergillosis	Noninvasive aspergillosis
Immunostatus	Compromised	Competent	Competent
Bony erosions?	Yes	Yes	No
Inflammation present?	?	?	?

Orbital disease

Chorioretinitis

Zygomycosis

Aspergillosis

Invasive Noninvasive Allergic

Keratitis



Common Ocular Fungal Pathogens

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Fungal	<i>Invasive aspergillosis</i>	<i>Allergic aspergillosis</i>	<i>Noninvasive aspergillosis</i>
Immunostatus	Compromised	Competent	Competent
Bony erosions?	Yes	Yes	No
Inflammation present?	Yes	Yes	No
Treat with surgery?	?	?	?

Orbital disease

Keratitis

Chorioretinitis

Zygomycosis

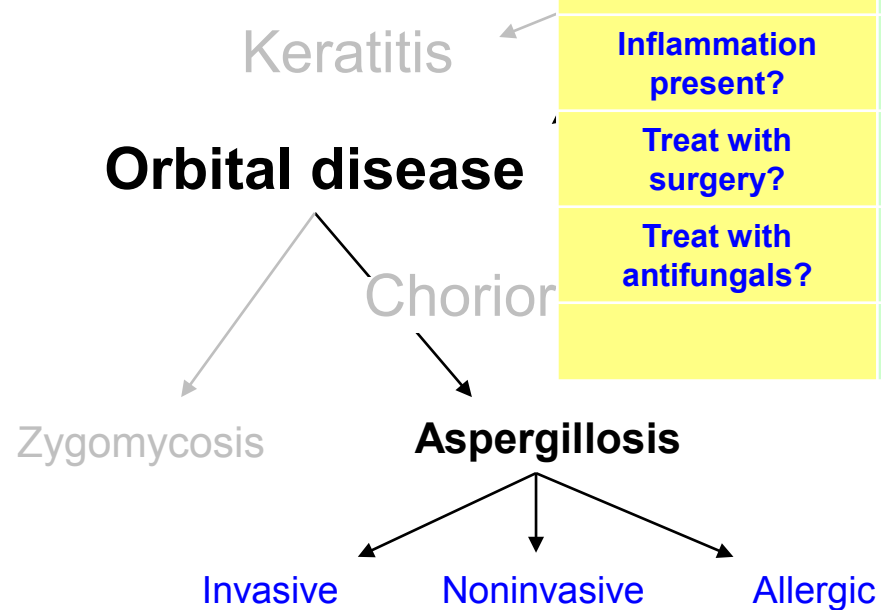
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Common Ocular Fungal Pathogens

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Bony erosions?	Yes	Yes	No
Inflammation present?	Yes	Yes	No
Treat with surgery?	Yes	Yes	Yes
Treat with antifungals?	?	?	?





Common Ocular Fungal Pathogens

Fungal

Orbital aspergillosis tl;dr

	<i>Invasive aspergillosis</i>	<i>Allergic aspergillosis</i>	<i>Noninvasive aspergillosis</i>
Immunostatus	Compromised	Competent	Competent
Bony erosions?	Yes	Yes	No
Inflammation present?	Yes	Yes	No
Treat with surgery?	Yes	Yes	Yes
Treat with antifungals?	Yes	No	No
Mortality rate?	?	?	?

Keratitis

Orbital disease

Chorioretinitis

Zygomycosis

Aspergillosis

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Noninvasive

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Common Ocular Fungal Pathogens

Fungal

Orbital aspergillosis tl;dr

	<i>Invasive aspergillosis</i>	<i>Allergic aspergillosis</i>	<i>Noninvasive aspergillosis</i>
Immunostatus	Compromised	Competent	Competent
Bony erosions?	Yes	Yes	No
Inflammation present?	Yes	Yes	No
Treat with surgery?	Yes	Yes	Yes
Treat with antifungals?	Yes	No	No
Mortality rate?	High	Lower	Lowest

Keratitis

Orbital disease

Chorioretinitis

Zygomycosis

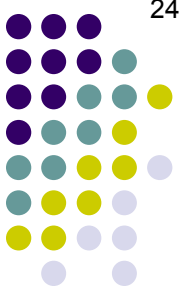
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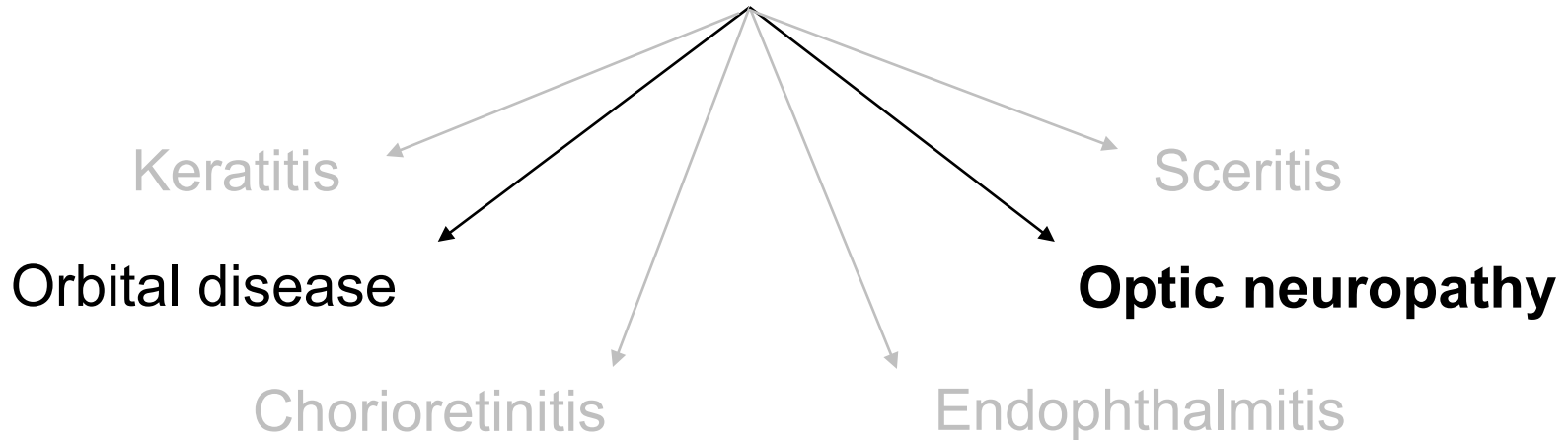
Noninvasive

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Common Ocular Fungal Pathogens

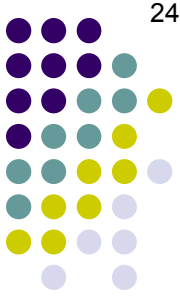


Fungal pathogenicic conditions

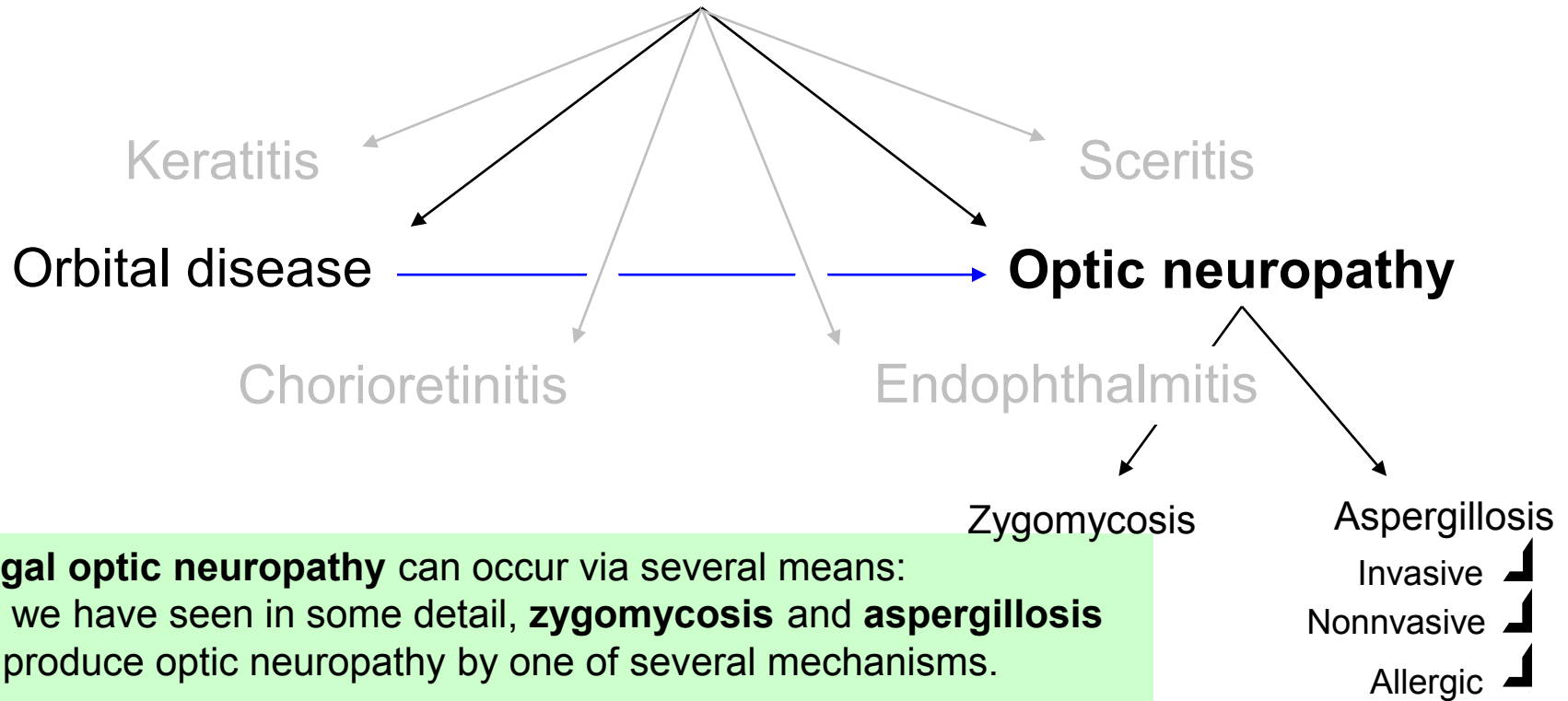


Fungal optic neuropathy can occur via several means:

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



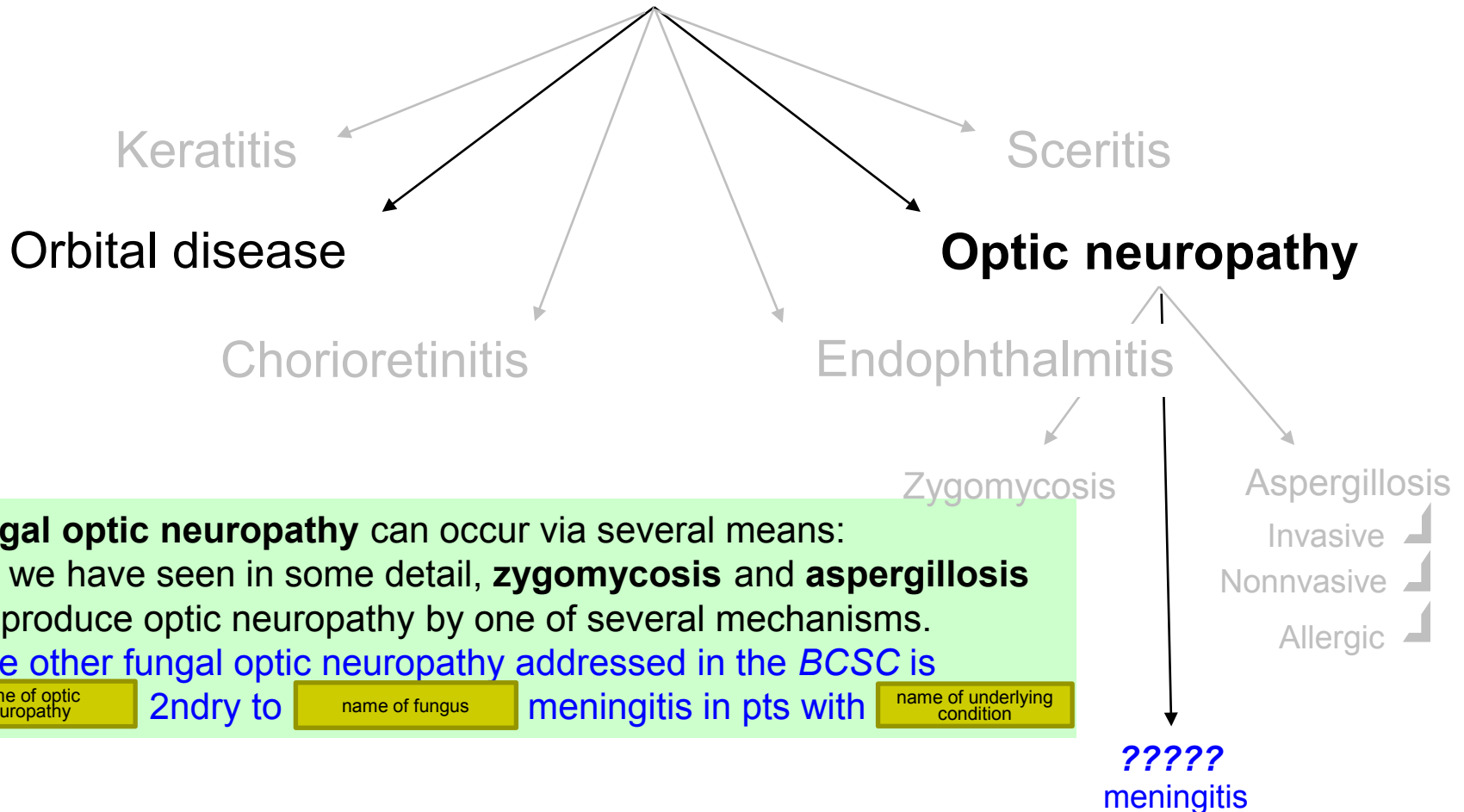
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--As we have seen in some detail, **zygomycosis** and **aspergillosis** can produce optic neuropathy by one of several mechanisms.



Common Ocular Fungal Pathogens

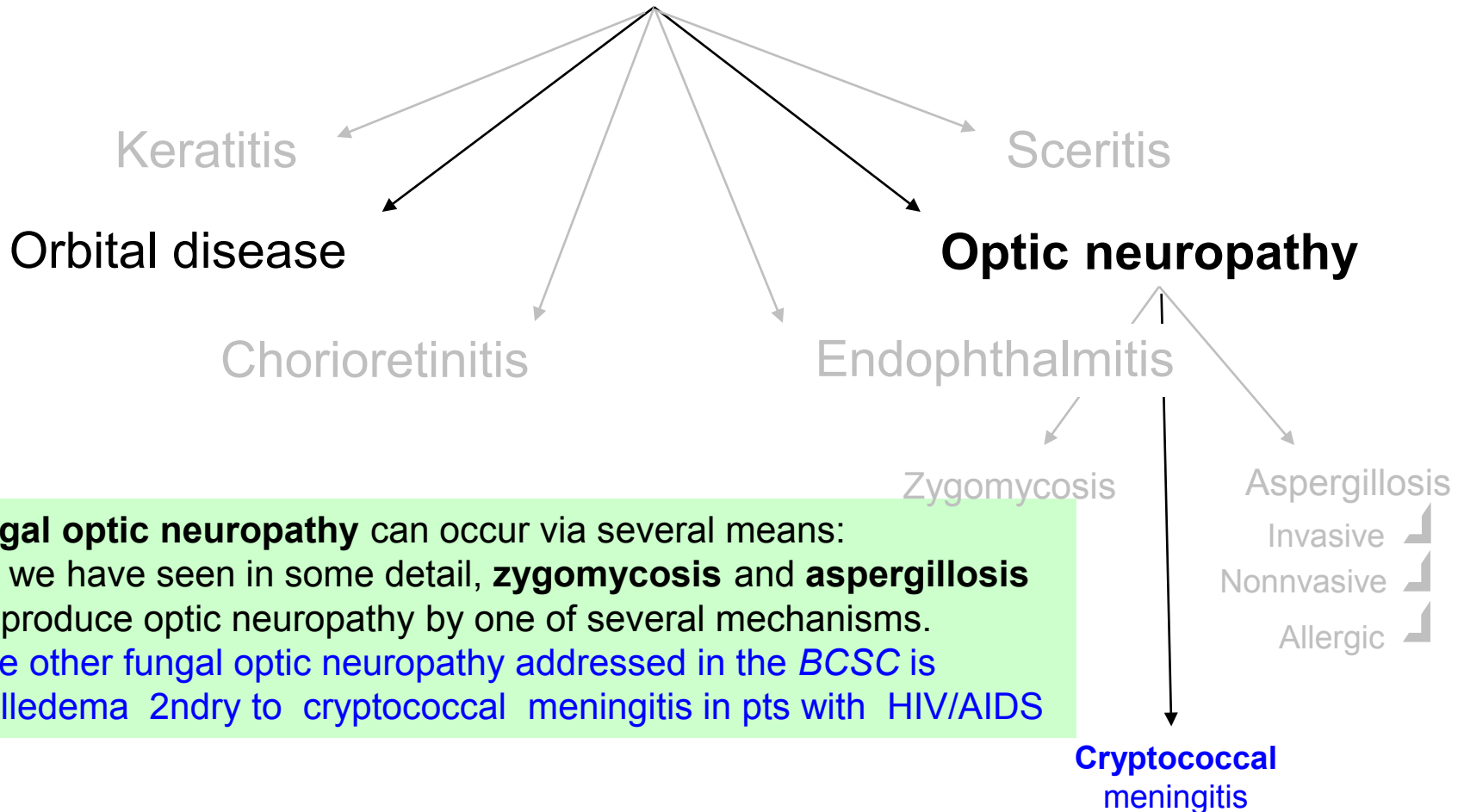
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Common Ocular Fungal Pathogens



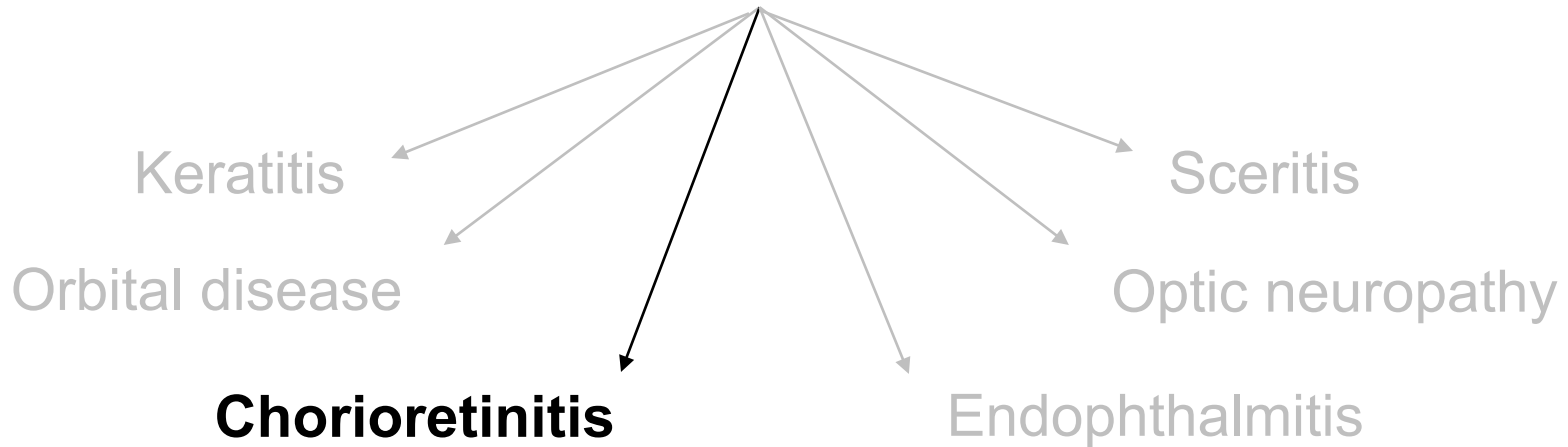
Fungal pathogenicic conditions



Common Ocular Fungal Pathogens

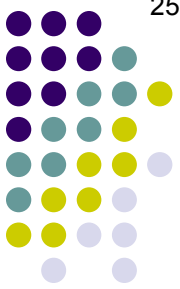


Fungal pathogenicic conditions

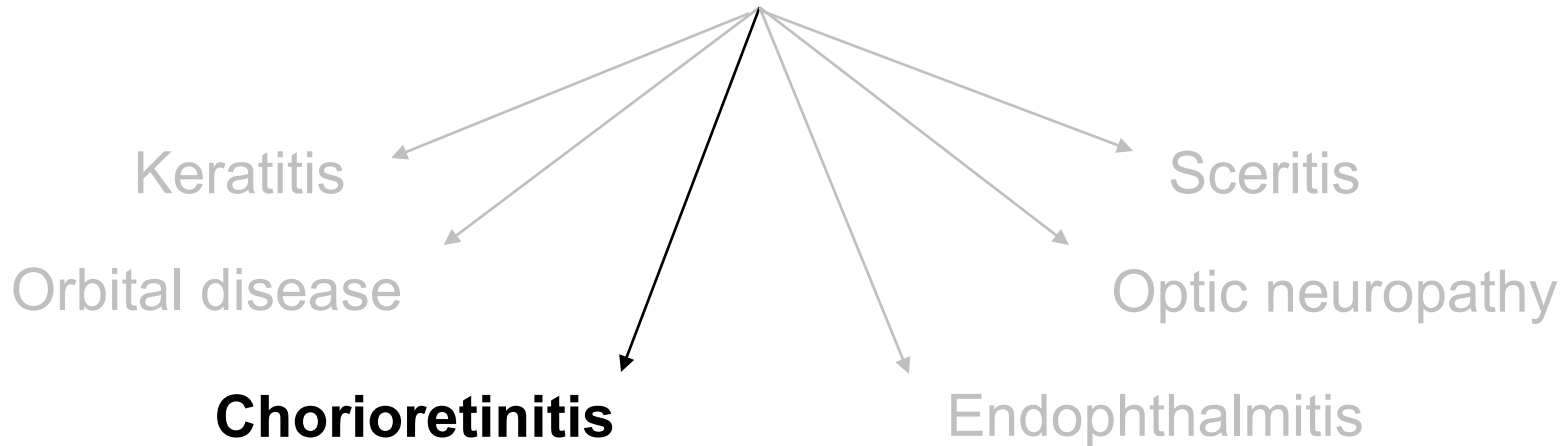


Is fungal chorioretinitis a common, or rare entity?

Common Ocular Fungal Pathogens



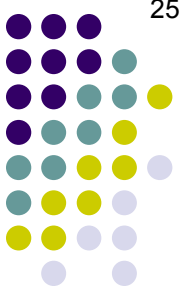
Fungal pathogenicic conditions



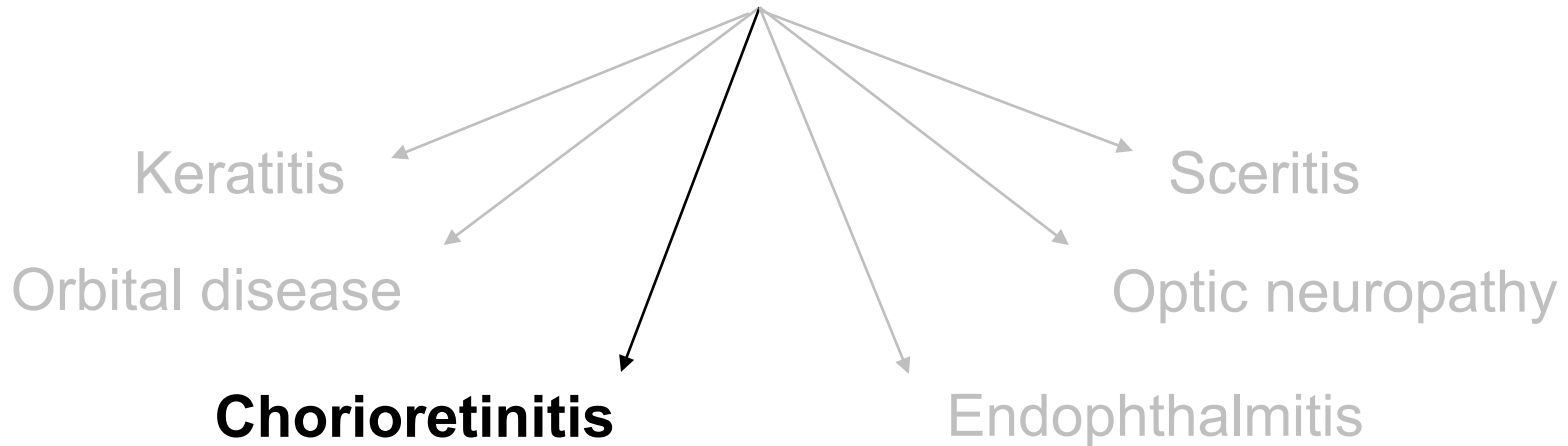
Is fungal chorioretinitis a common, or rare entity?

It is quite rare

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions

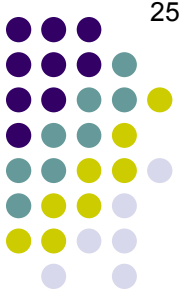


Is fungal chorioretinitis a common, or rare entity?

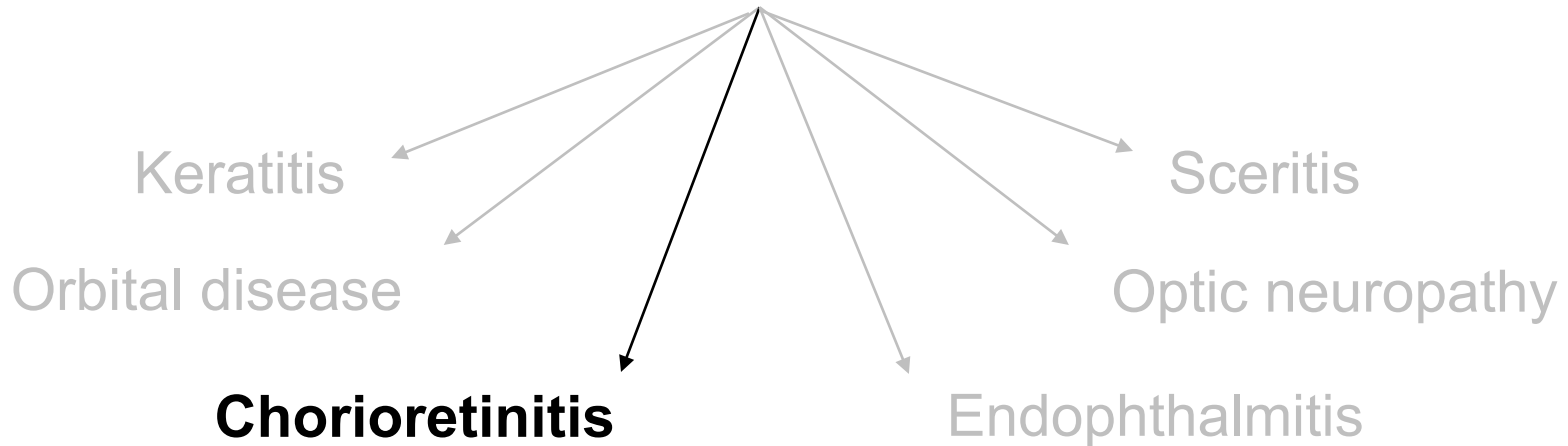
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It occurs almost exclusively in one sort of pt—what sort is that?

Common Ocular Fungal Pathogens



Fungal pathogenicic conditions



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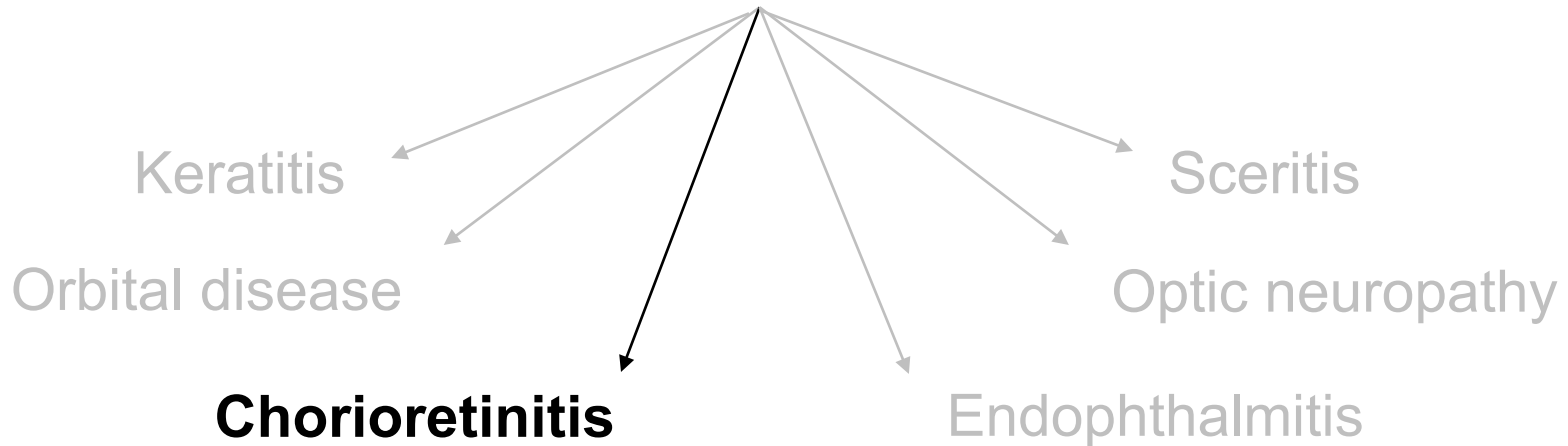
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Debilitated via AIDS, malignancy, steroids, chronic illness, etc

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



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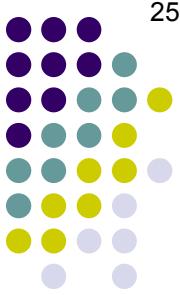
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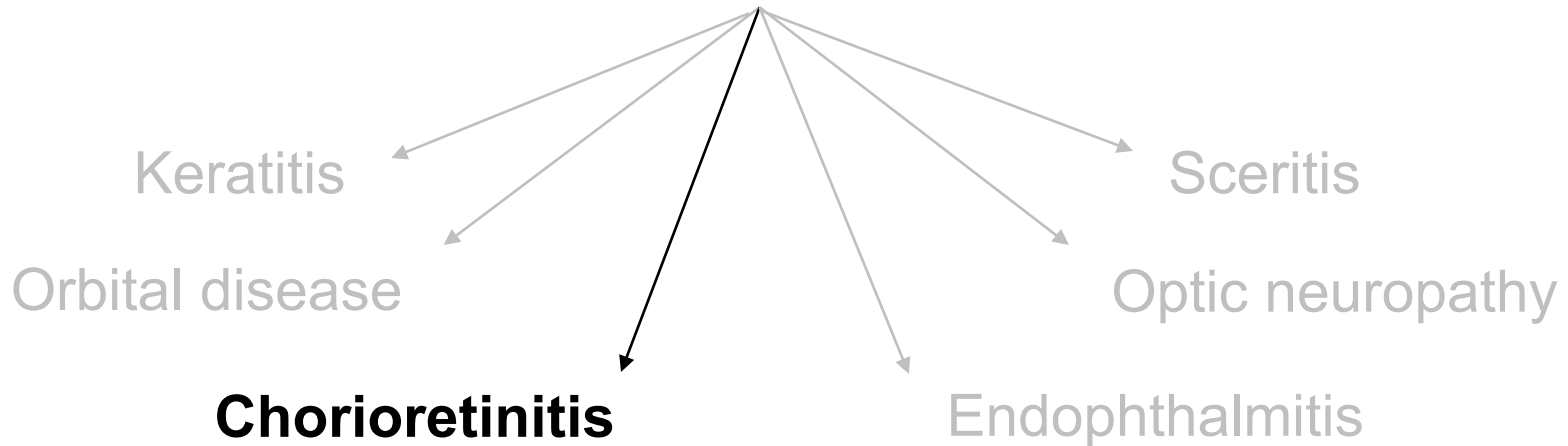
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Common Ocular Fungal Pathogens



Fungal pathogenic conditions



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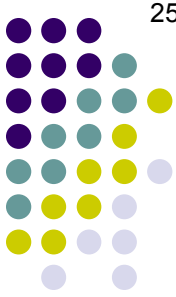
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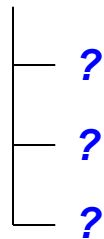
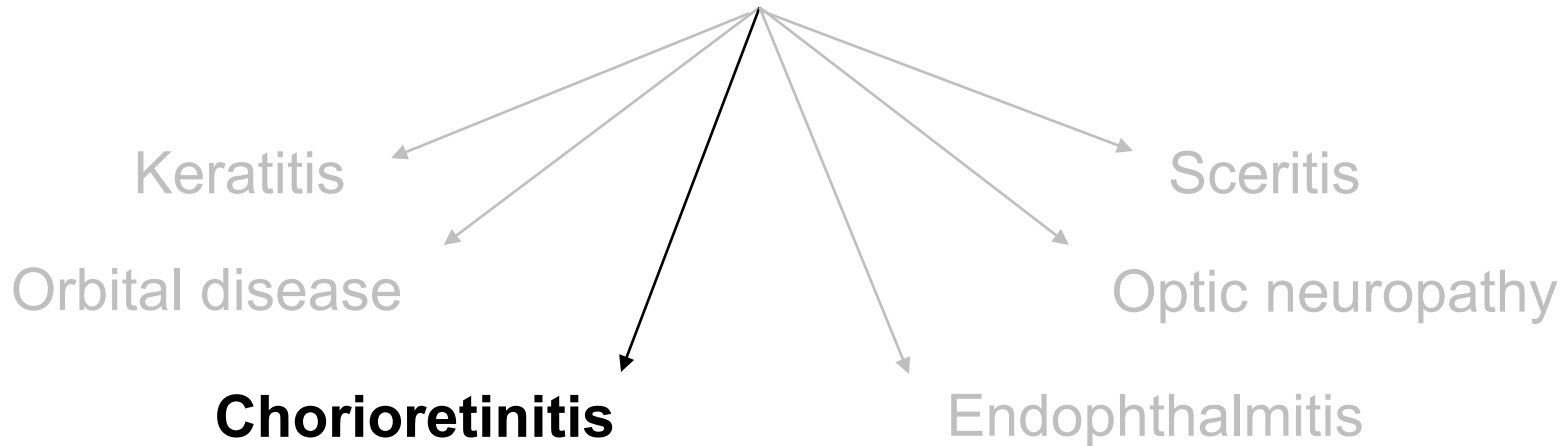
It occurs almost exclusively via one mechanism—what it is?

Fungemia, ie, hematogenous spread from elsewhere

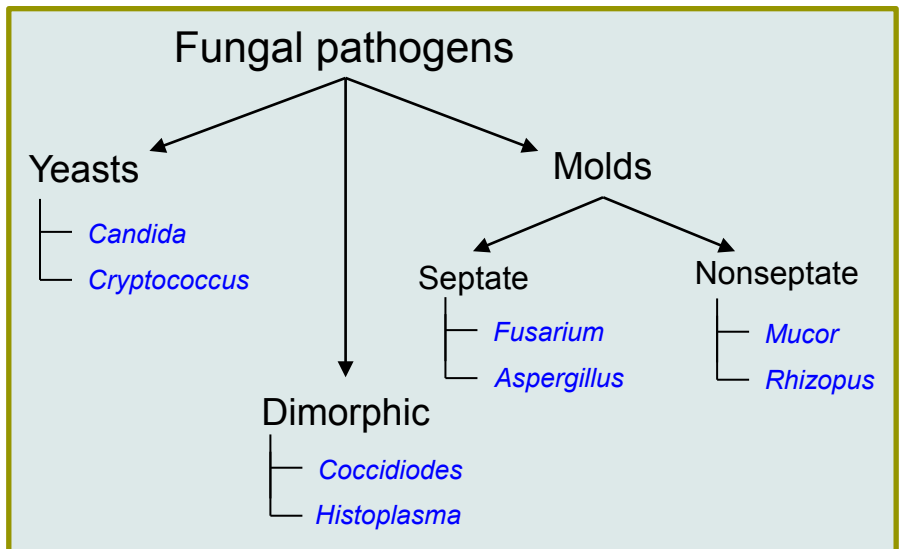
Common Ocular Fungal Pathogens



Fungal pathogenic conditions



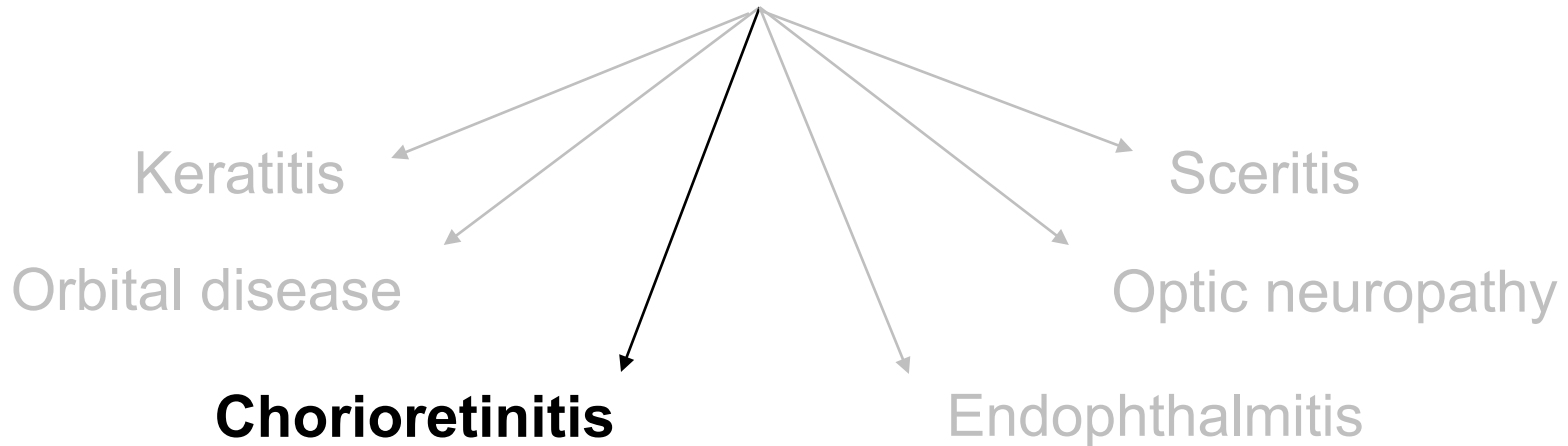
Which three species are responsible for the majority of fungal chorioretinitis cases?



Common Ocular Fungal Pathogens



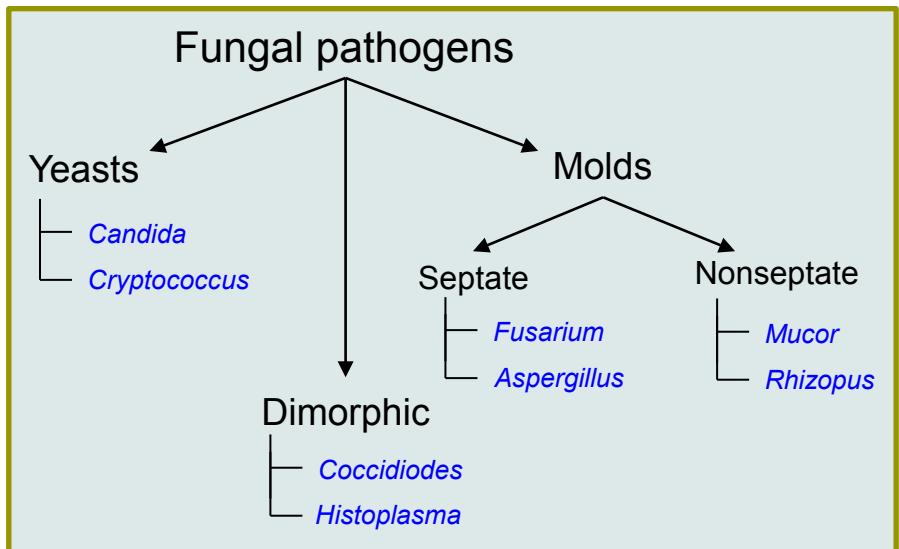
Fungal pathogenic conditions



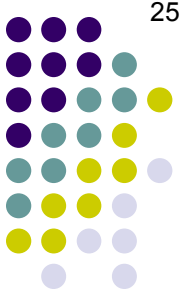
Chorioretinitis

- *Candida*
- *Aspergillus*
- *Cryptococcus*

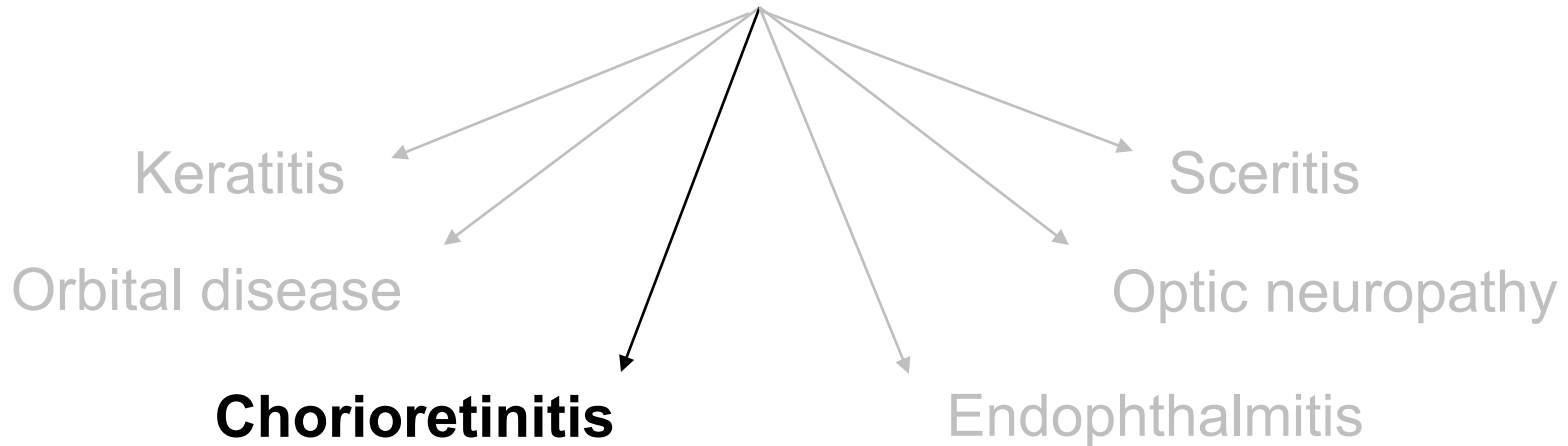
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Common Ocular Fungal Pathogens



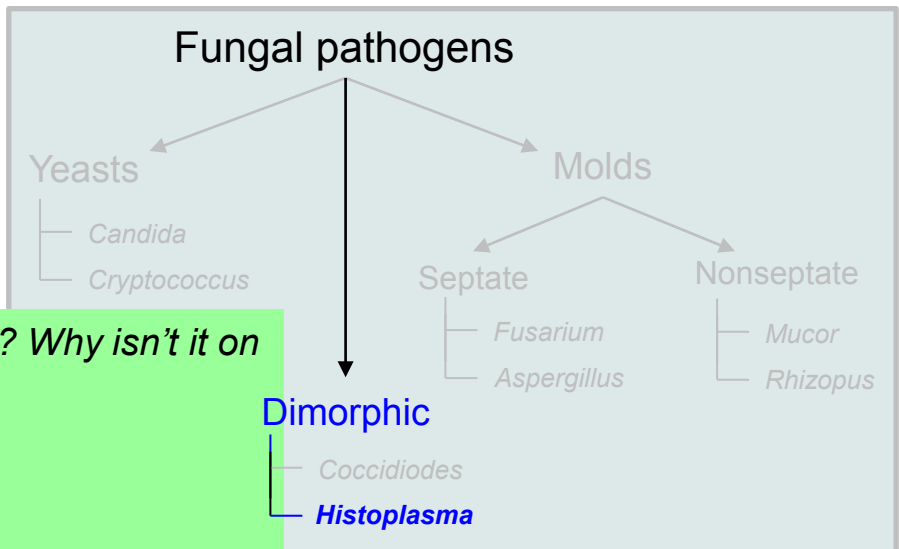
Fungal pathogenic conditions



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Histoplasma?

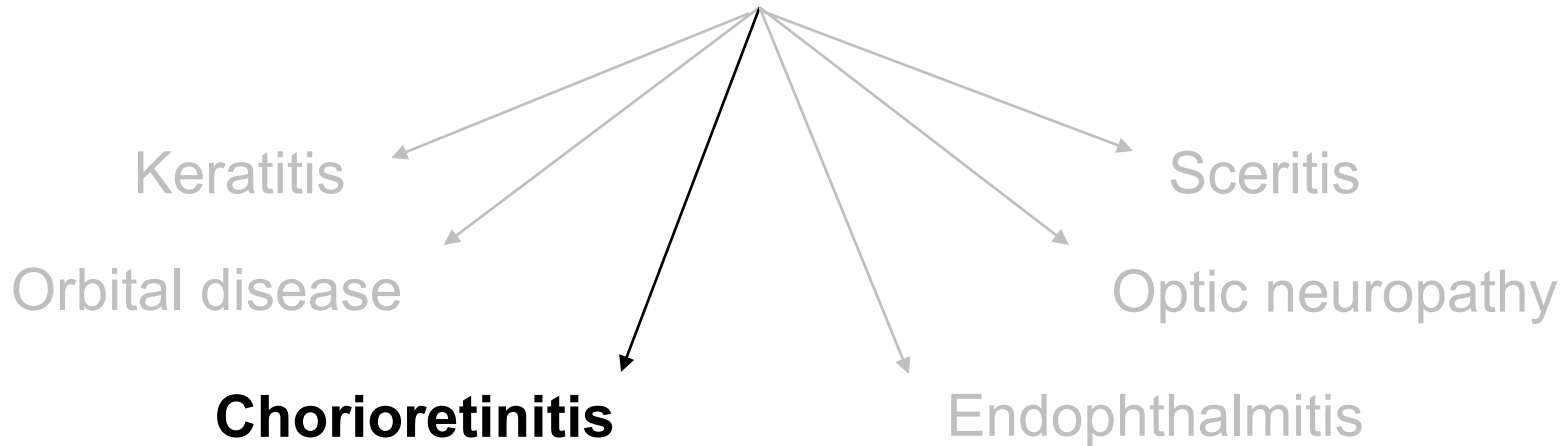
What about Histoplasma, the causative agent in POHS? Why isn't it on this list?





Common Ocular Fungal Pathogens

Fungal pathogenic conditions

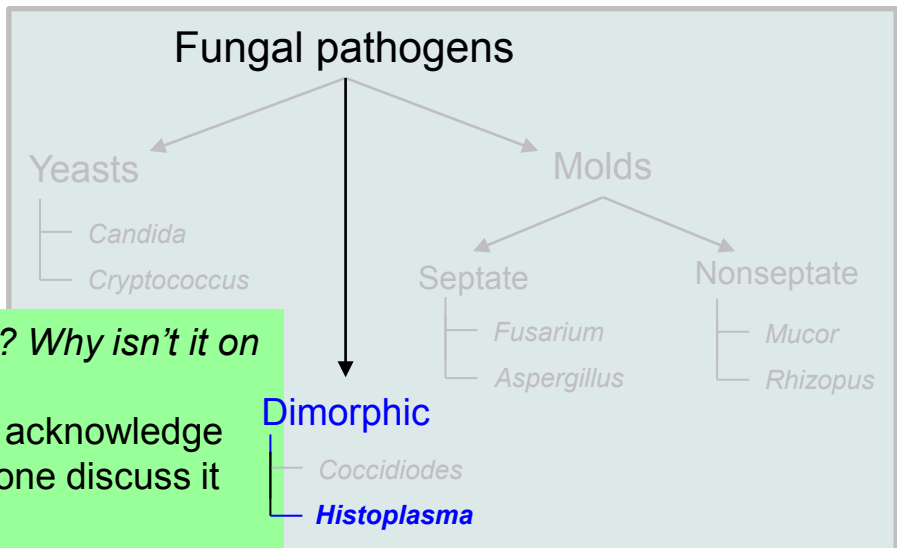


- *Candida*
- *Aspergillus*
- *Cryptococcus*

Histoplasma?

What about *Histoplasma*, the causative agent in POHS? Why isn't it on this list?

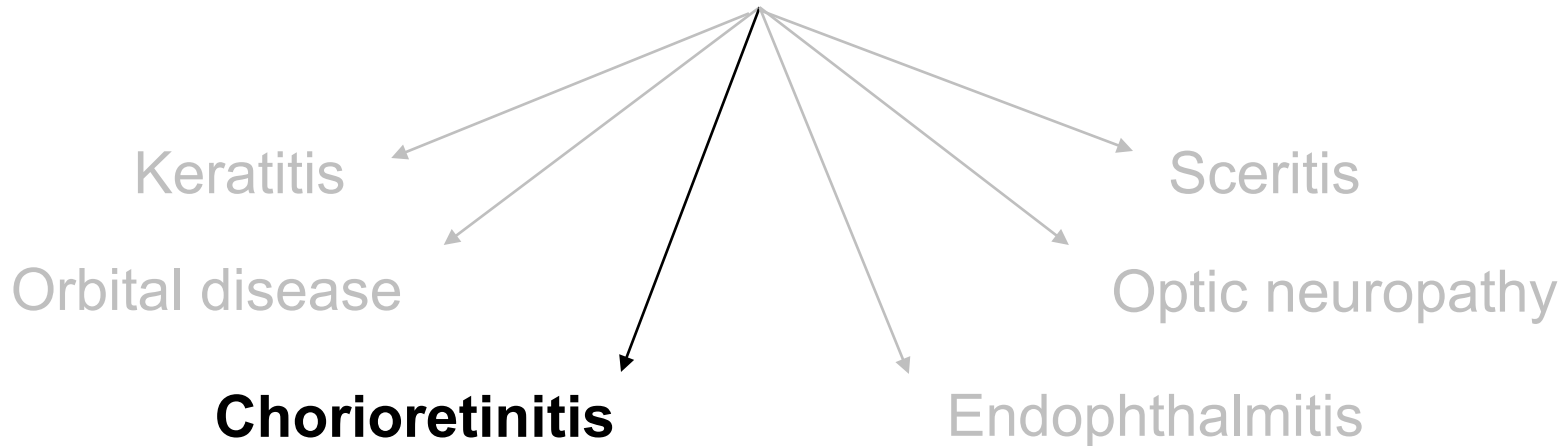
Good question. The *Path*, *Uveitis*, and *Retina* books all acknowledge POHS is a chorioretinitis caused by *Histoplasma*, but none discuss it alongside other causes of fungal chorioretinitis.



Common Ocular Fungal Pathogens



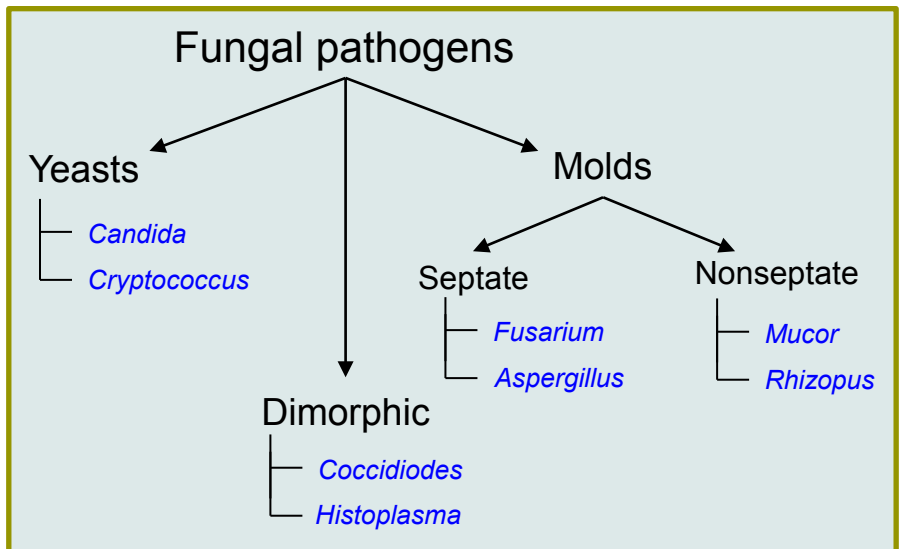
Fungal pathogenic conditions



- *Candida?*
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Which three species are responsible for the majority of fungal chorioretinitis cases?

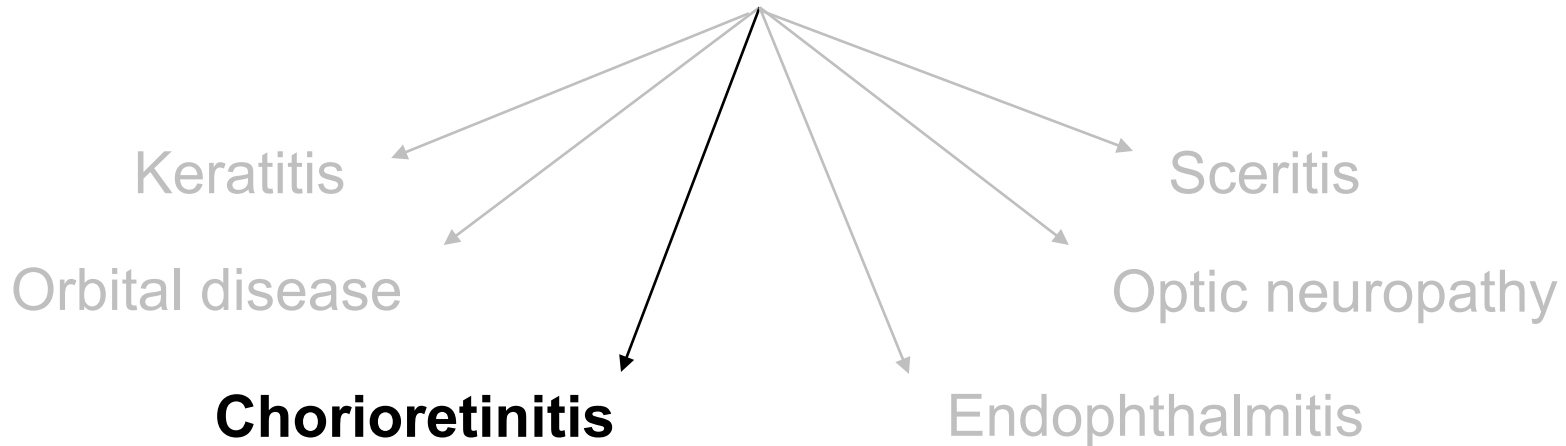
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Common Ocular Fungal Pathogens

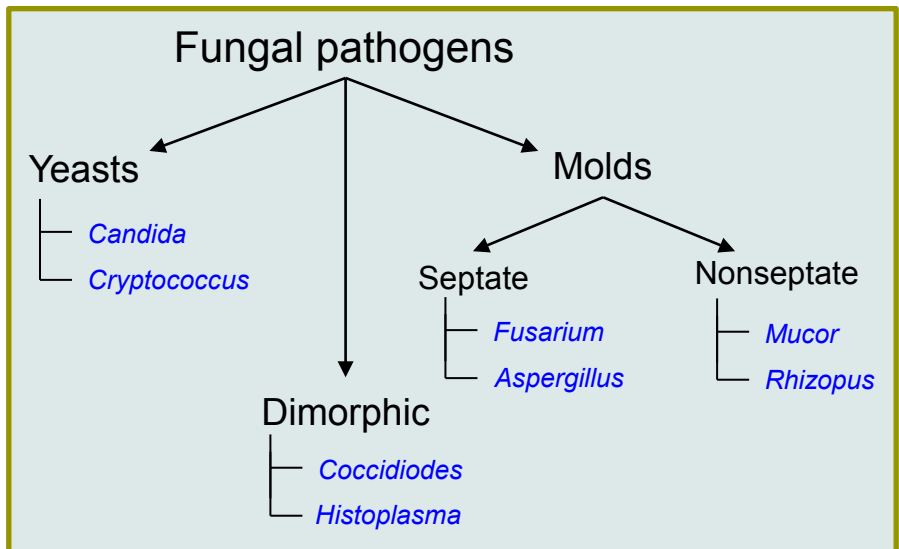


Fungal pathogenic conditions



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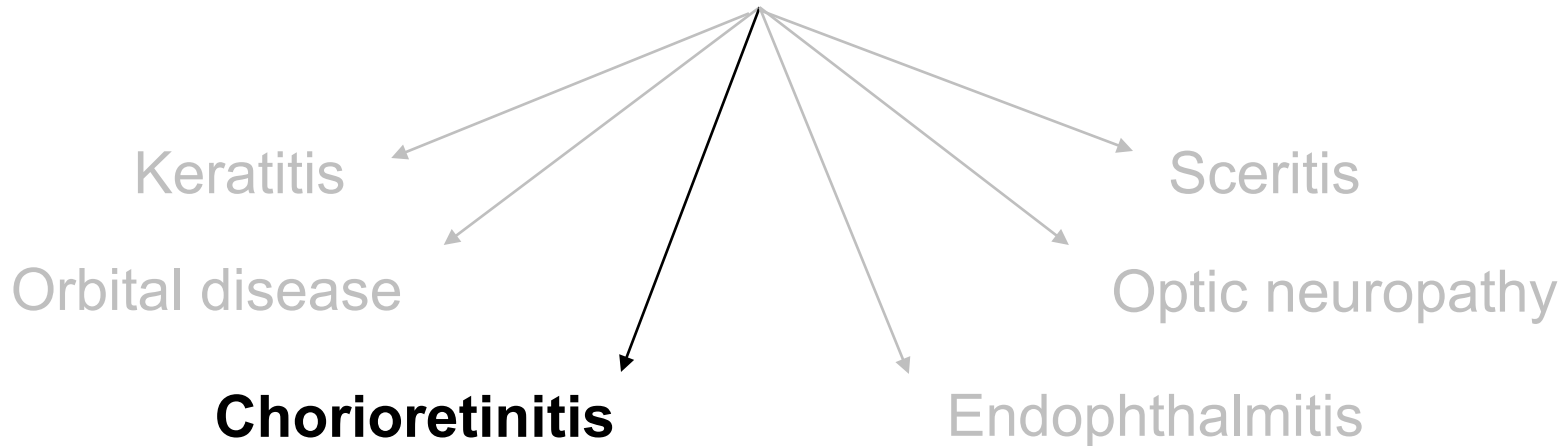
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



- Candida**
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Generally speaking, who is at risk for Candida chorioretinitis?

Which three species are responsible for the majority of fungal chorioretinitis cases?

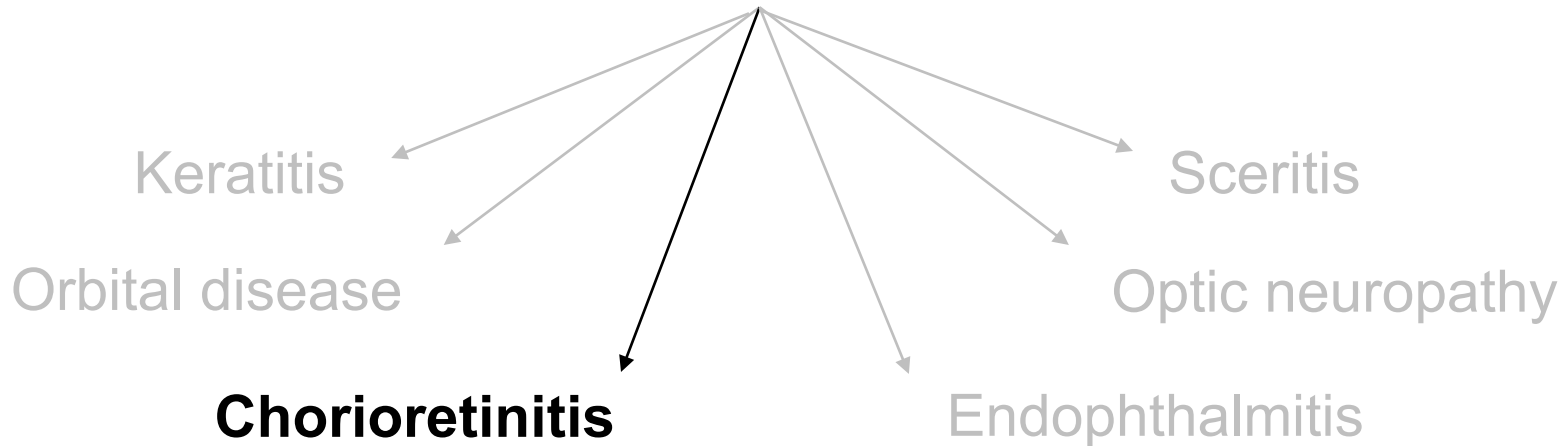
Of the three, which is the most common?
Candida

Septate
Mucor
Rhizopus



Common Ocular Fungal Pathogens

Fungal pathogenic conditions



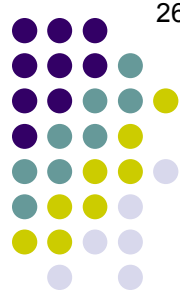
- **Candida**
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Generally speaking, who is at risk for *Candida* chorioretinitis?
Hospitalized, debilitated individuals

Which three species are responsible for the majority of fungal chorioretinitis cases?

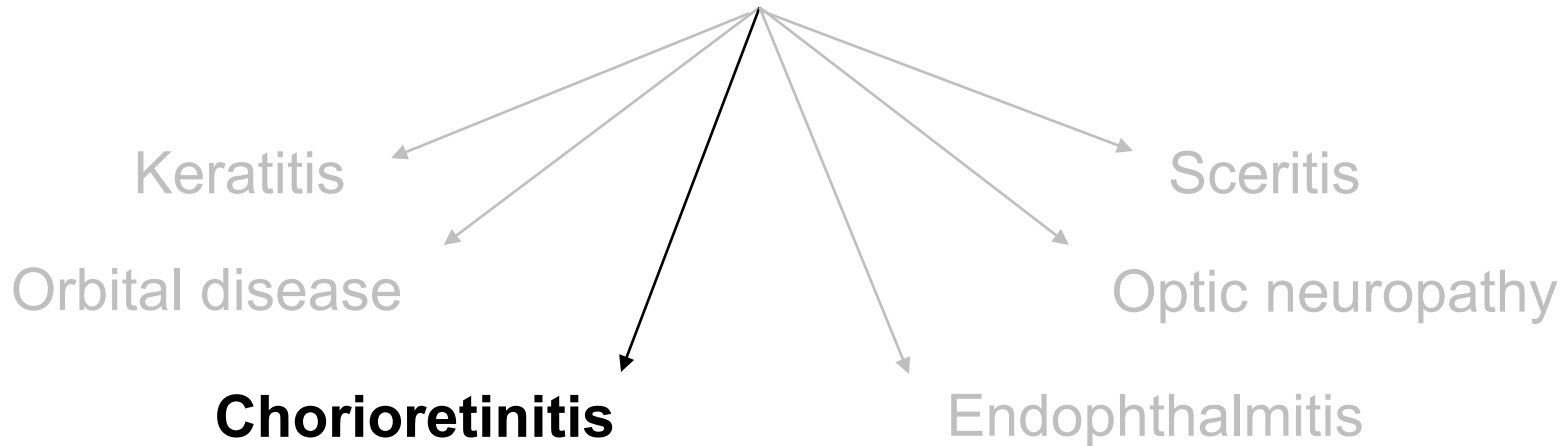
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



- Candida**
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Is there anything in particular that puts them at risk?

--?

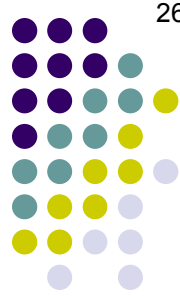
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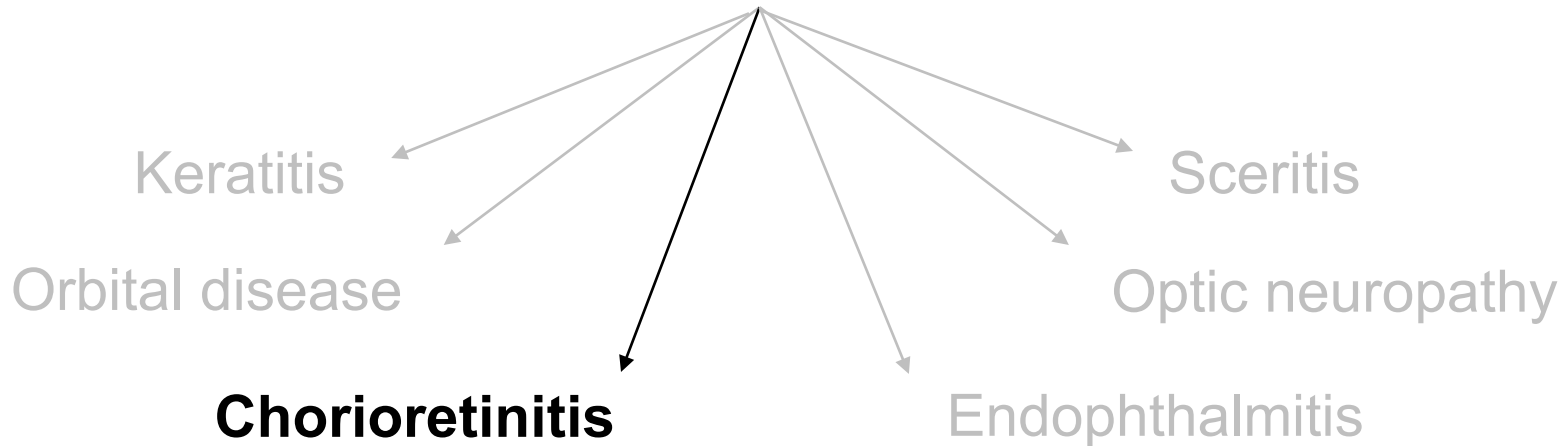
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



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--Hx major GI surgery
--Chronic lines/catheters

--Systemic antibiotics (think sepsis pt)

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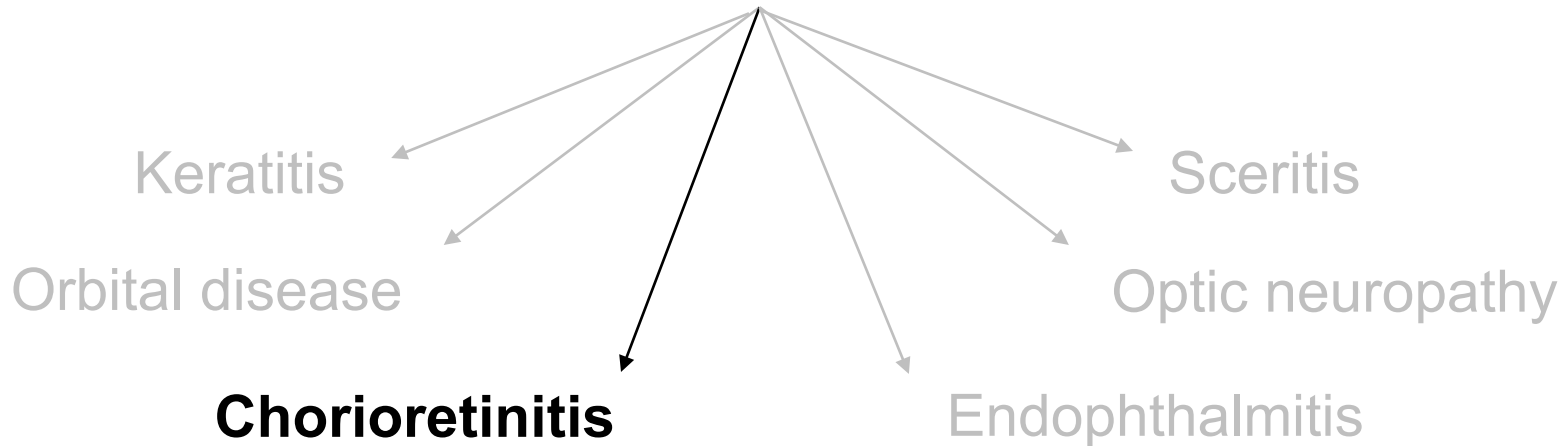
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



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—Hx major GI surgery

--**Chronic lines/catheters** (**Classic story:** Pt s/p GI surgery is NPO and receiving TPN)

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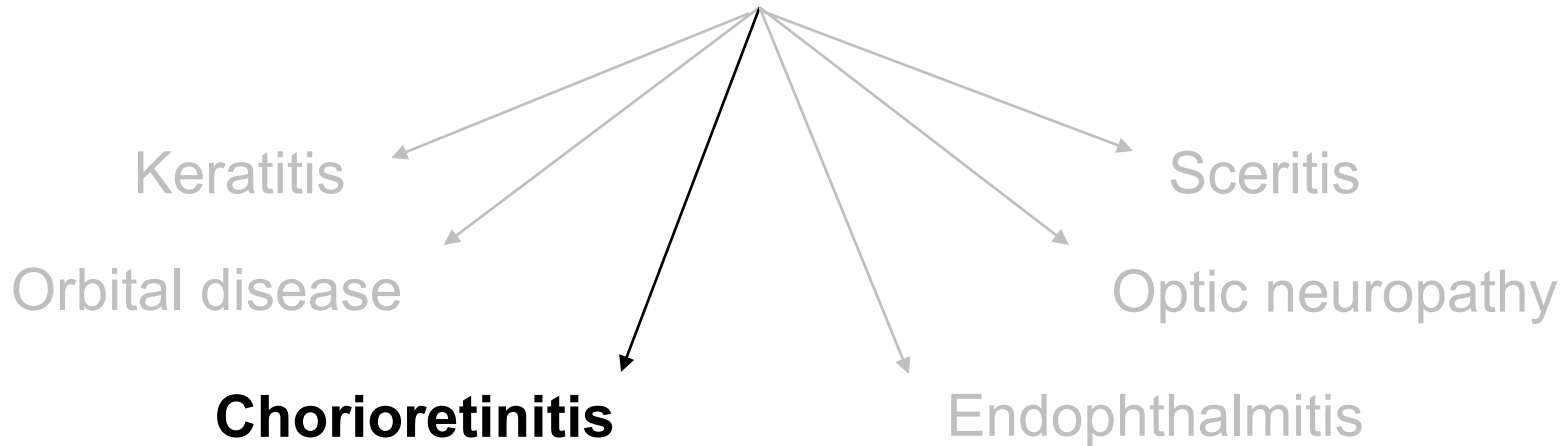
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions



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How about being immunocompromised?

Which three species are responsible for the majority of fungal chorioretinitis cases?

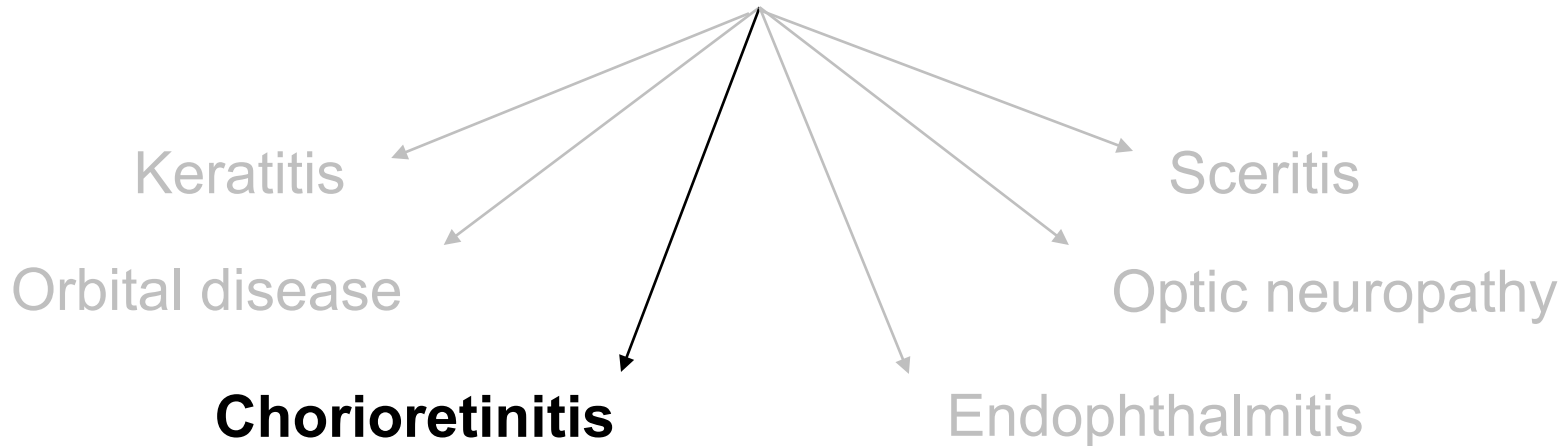
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Common Ocular Fungal Pathogens



Fungal pathogenic conditions



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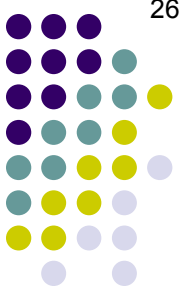
This does not seem to be a risk factor (eg, HIV/AIDS is **not** a risk factor for *Candida* chorioretinitis)

Which three species are responsible for the majority of fungal chorioretinitis cases?

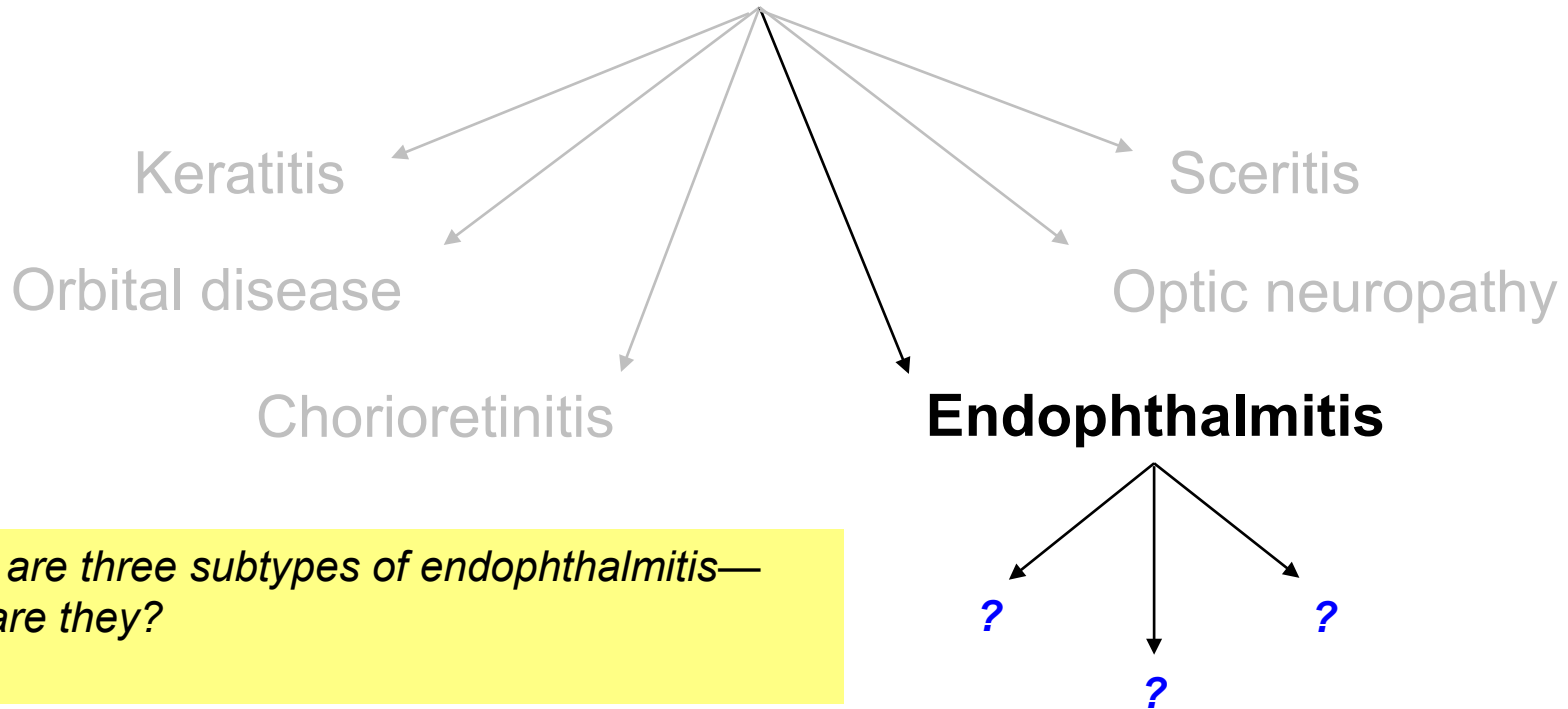
Of the three, which is the most common? *Candida*

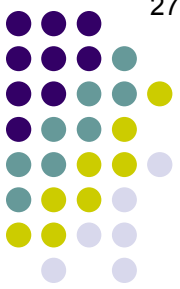
Septate
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Common Ocular Fungal Pathogens



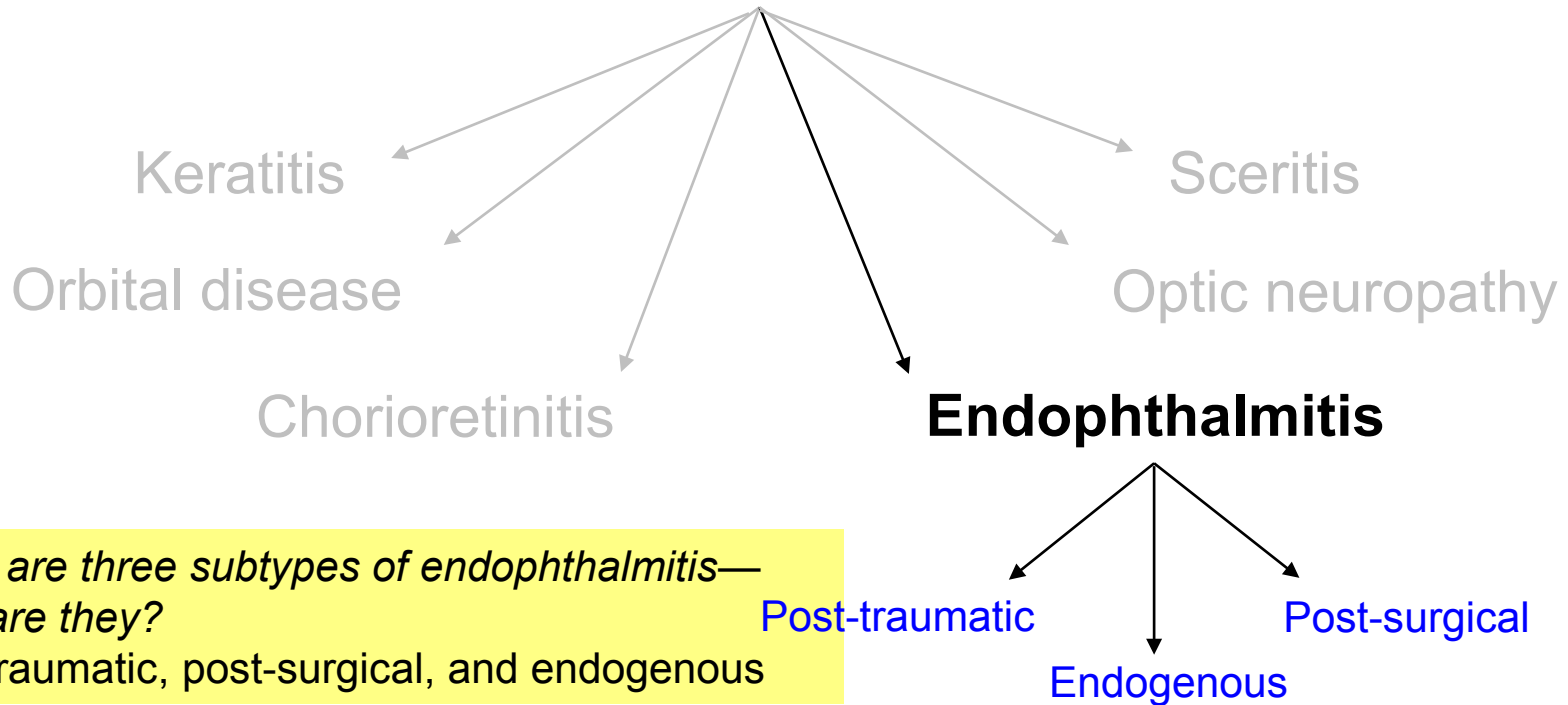
Fungal pathogenicic conditions





Common Ocular Fungal Pathogens

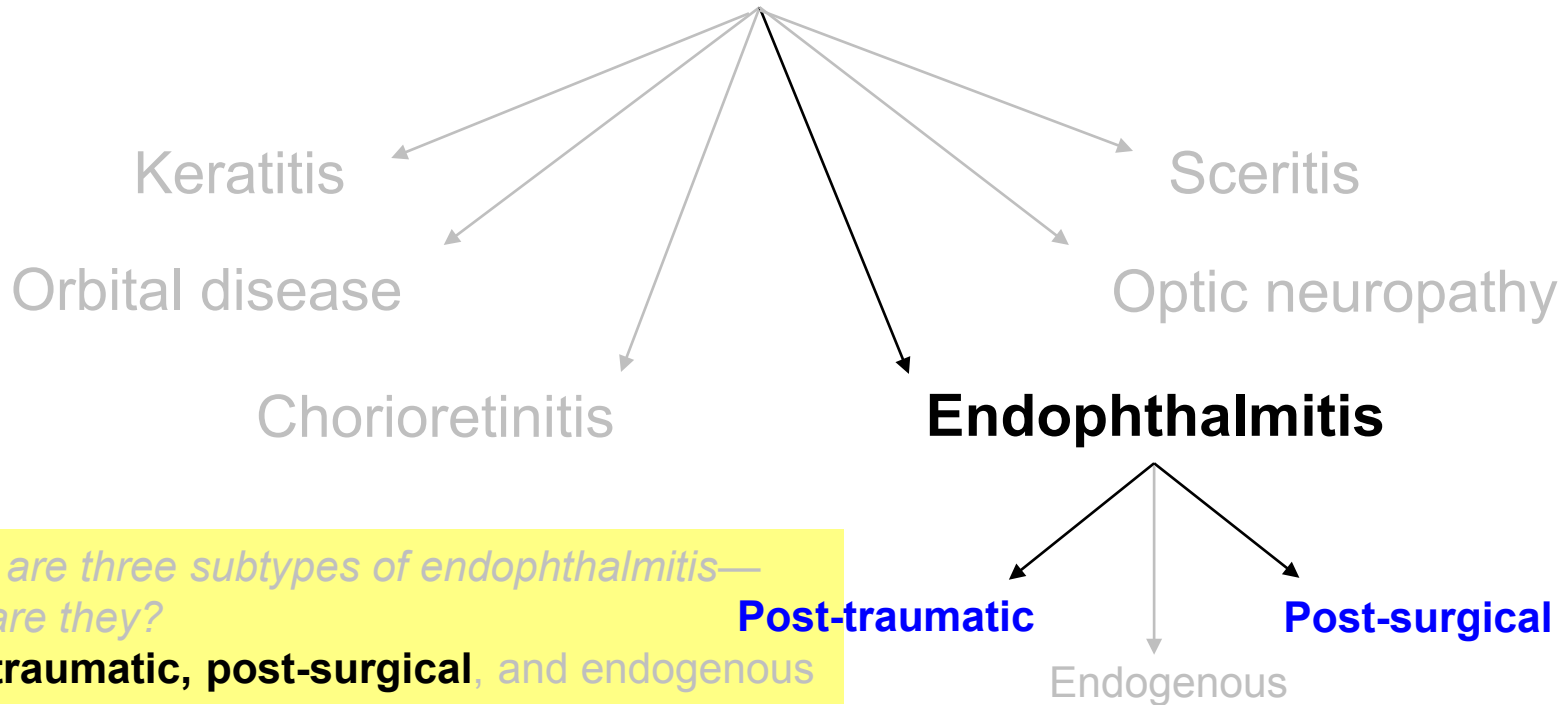
Fungal pathogenicic conditions



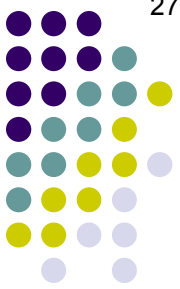


Common Ocular Fungal Pathogens

Fungal pathogenic conditions

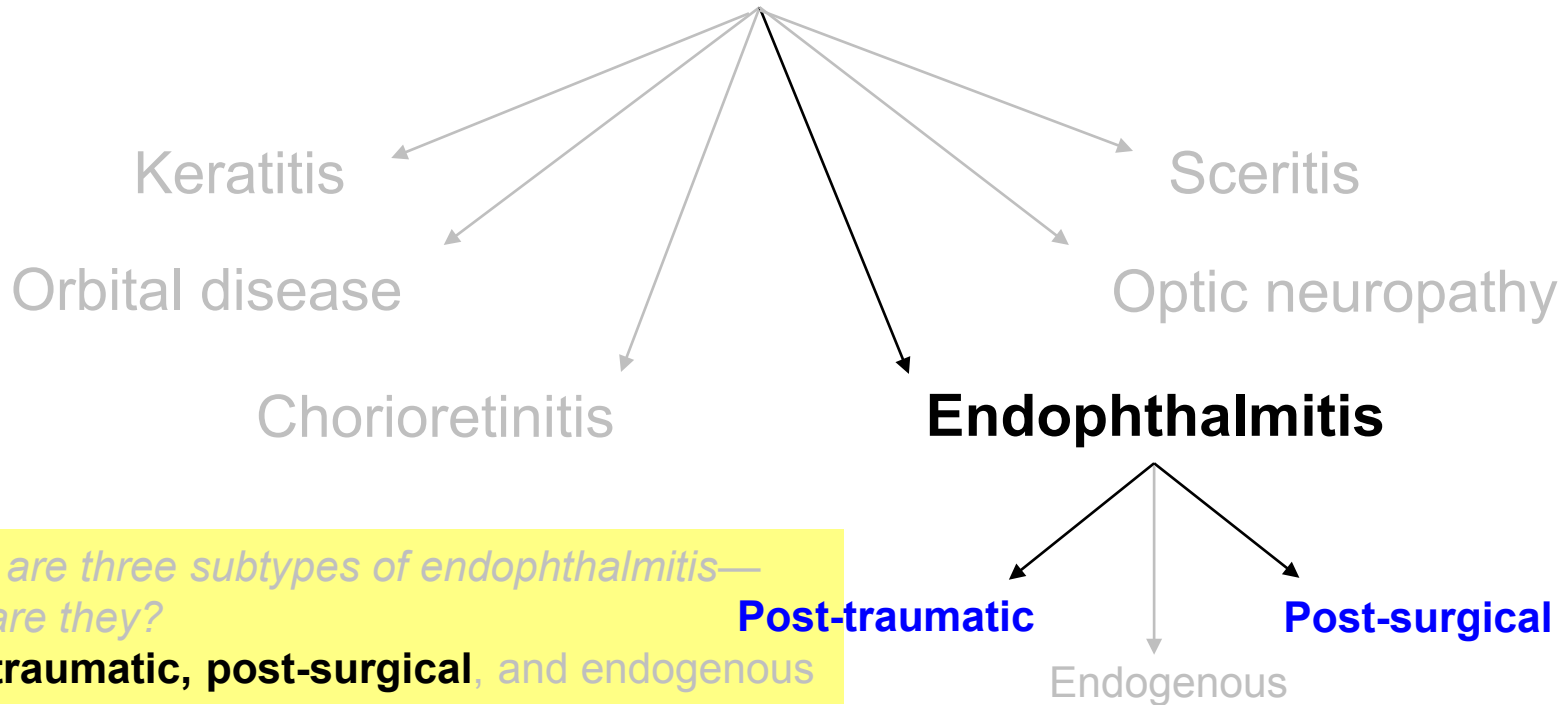


Are post-traumatic and/or post-surgical endophthalmitis common entities?



Common Ocular Fungal Pathogens

Fungal pathogenic conditions

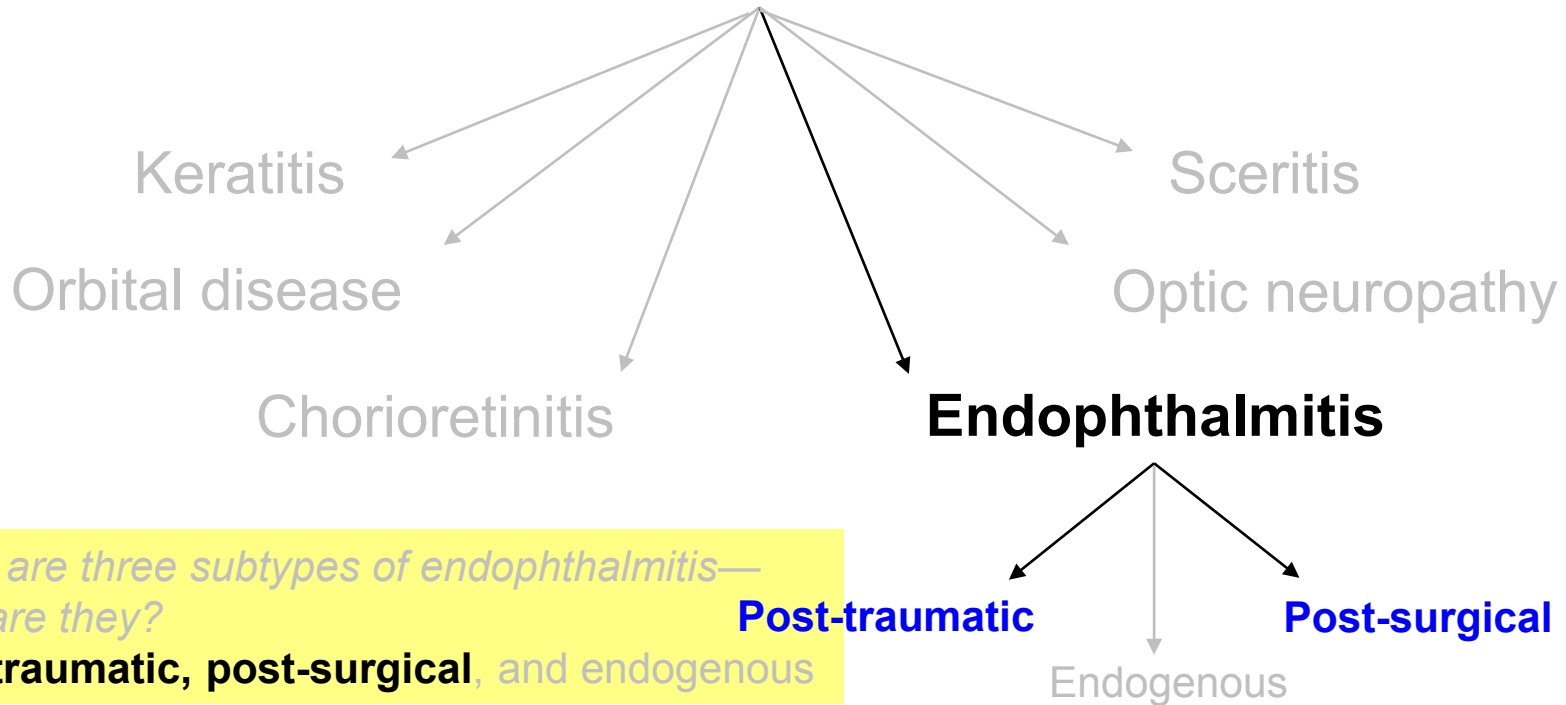


Are post-traumatic and/or post-surgical endophthalmitis common entities?
Not in the US, no



Common Ocular Fungal Pathogens

Fungal pathogenic conditions



*There are three subtypes of endophthalmitis—
what are they?*

Post-traumatic, post-surgical, and endogenous

Are post-traumatic and/or post-surgical endophthalmitis common entities?

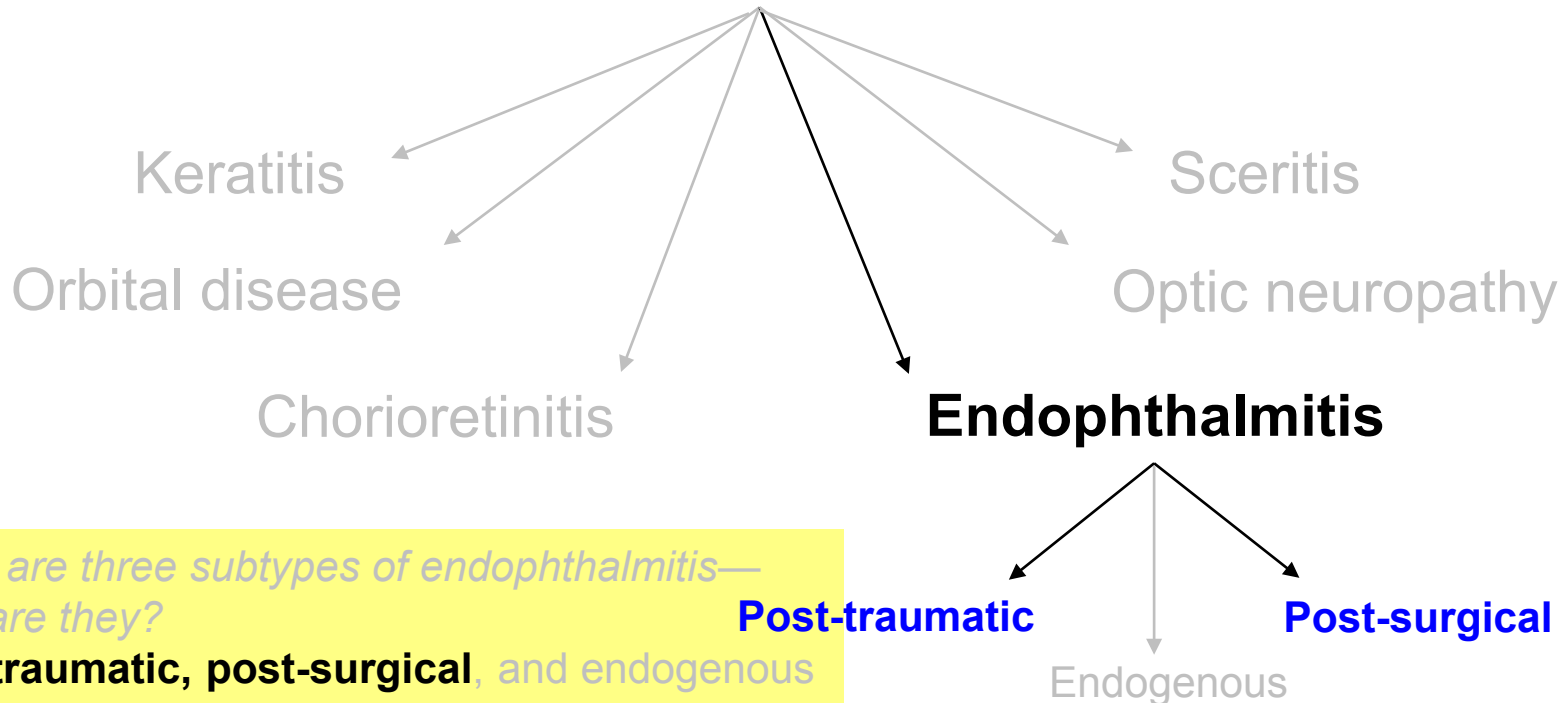
Not in the US, no

There is a country where fully 20% of post-surgical and post-traumatic endophthalmitis cases are fungal—which one?

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



*There are three subtypes of endophthalmitis—
what are they?*

Post-traumatic, post-surgical, and endogenous

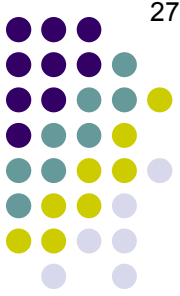
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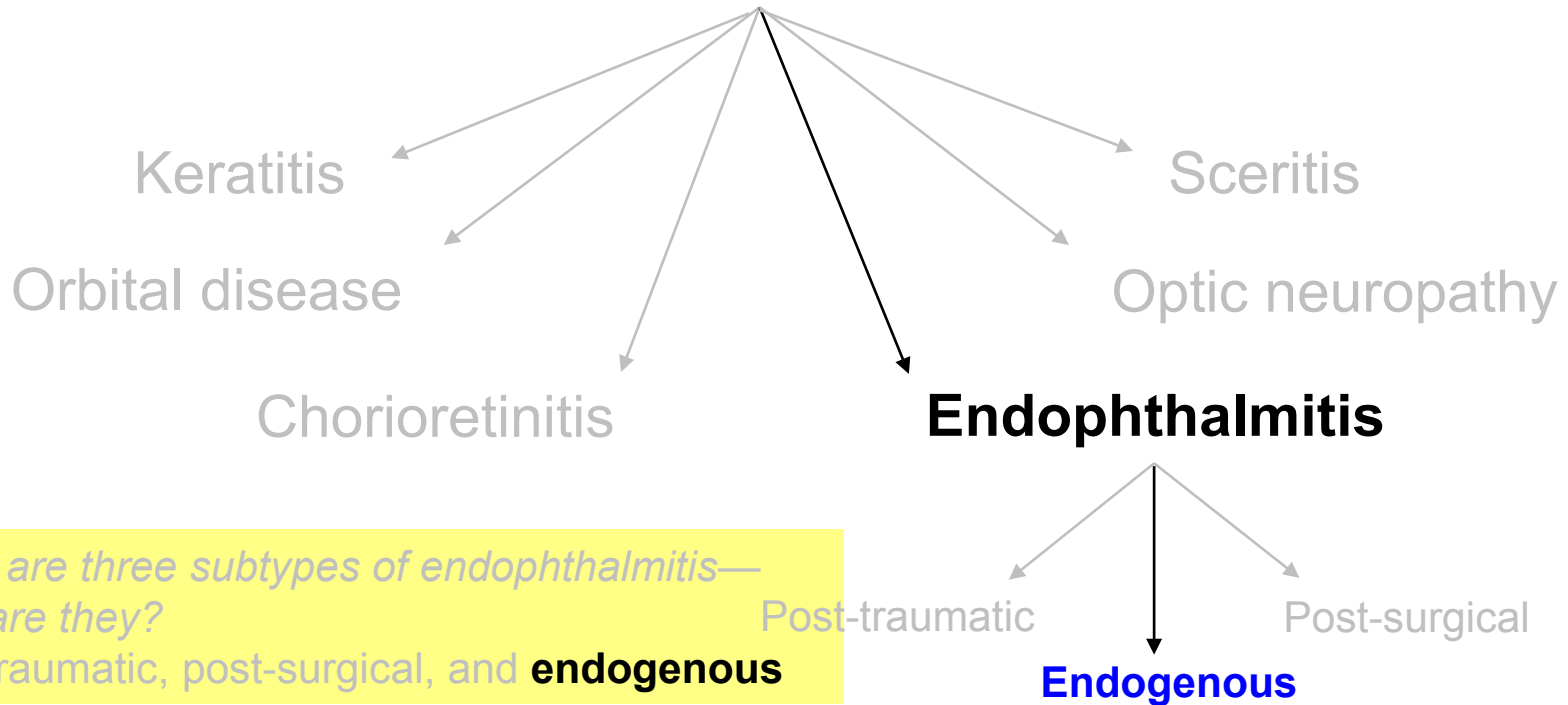
*There is a country where fully 20% of post-surgical and post-traumatic
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India

Common Ocular Fungal Pathogens

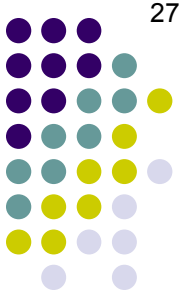


Fungal pathogenicic conditions

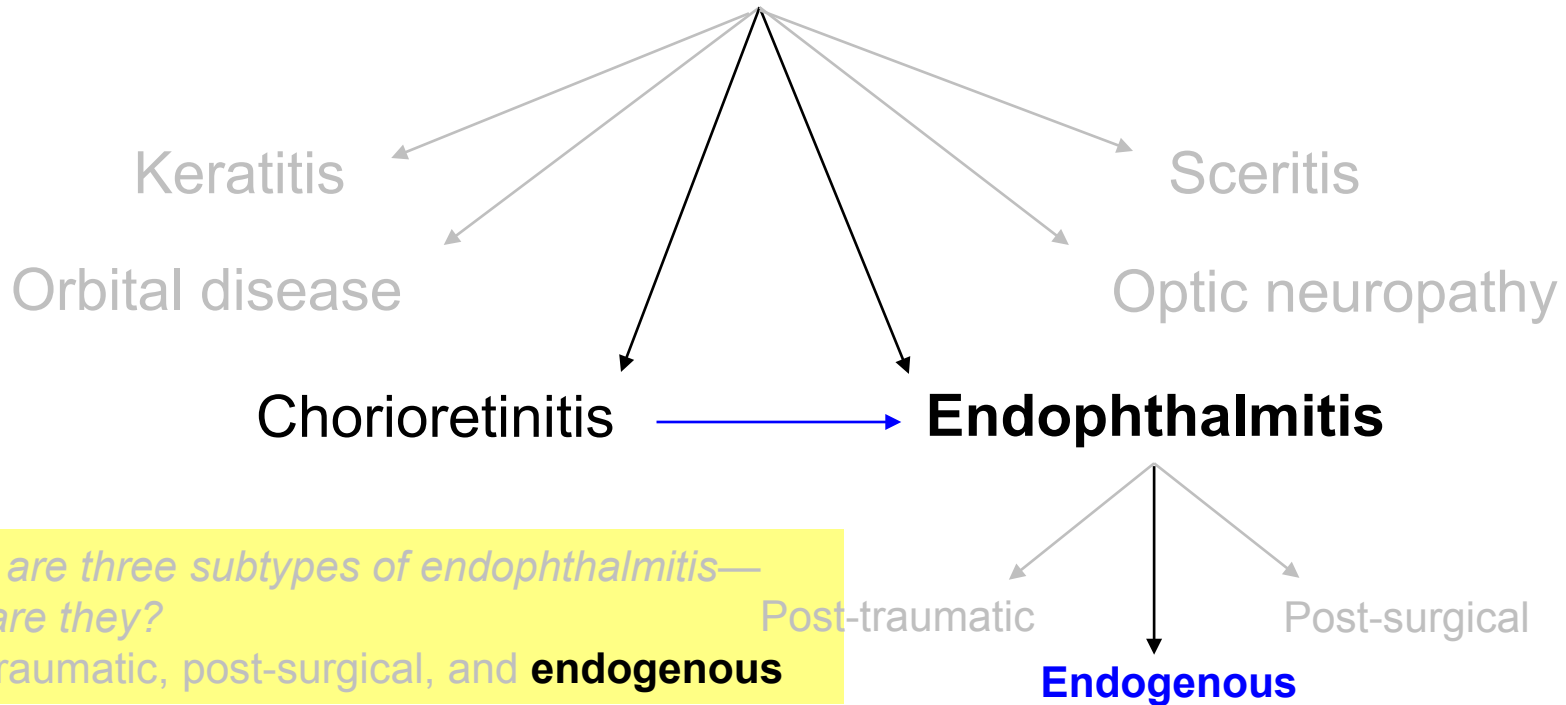


How does endogenous endophthalmitis come to happen, ie, what's the mechanism?

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



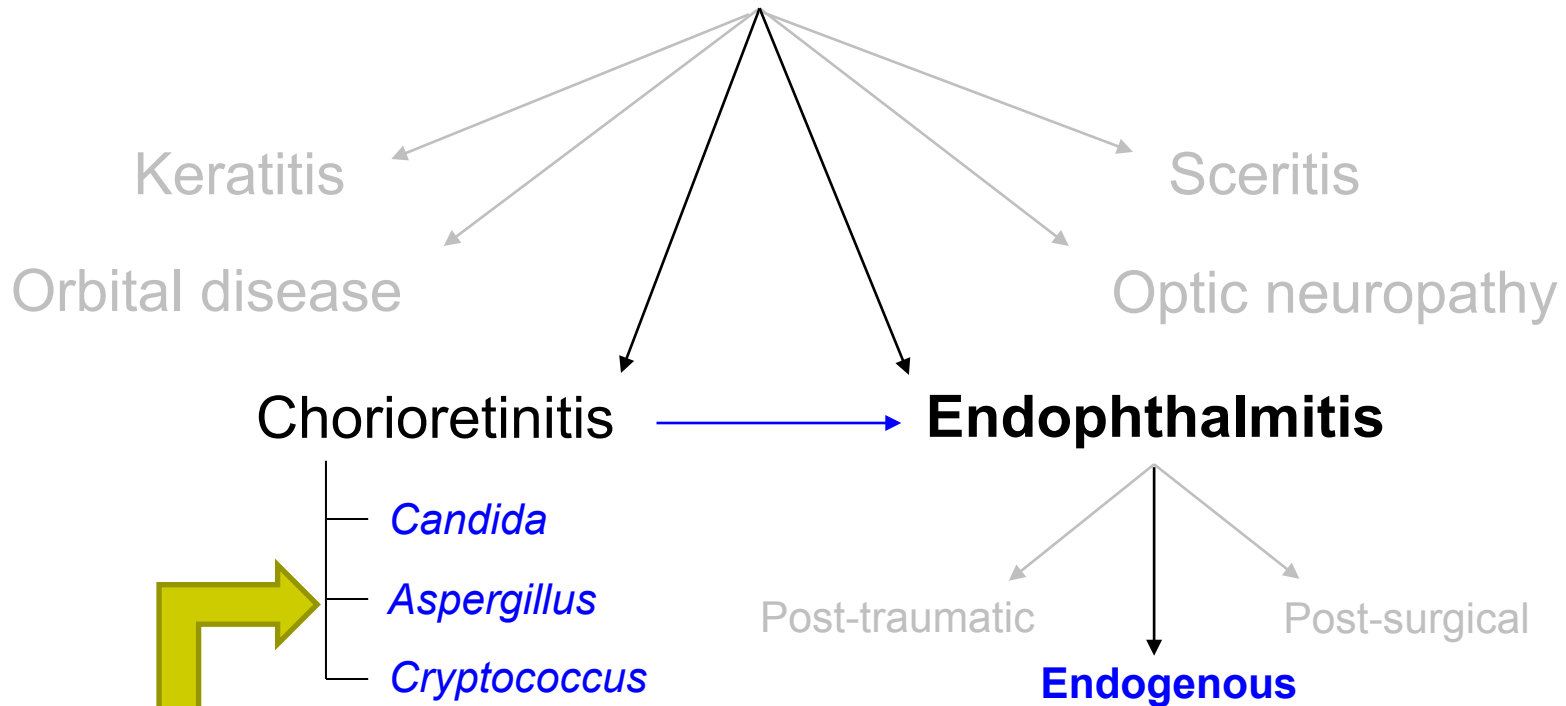
How does endogenous endophthalmitis come to happen, ie, what's the mechanism?

It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



How does endogenous endophthalmitis come to happen, ie, what's the mechanism?

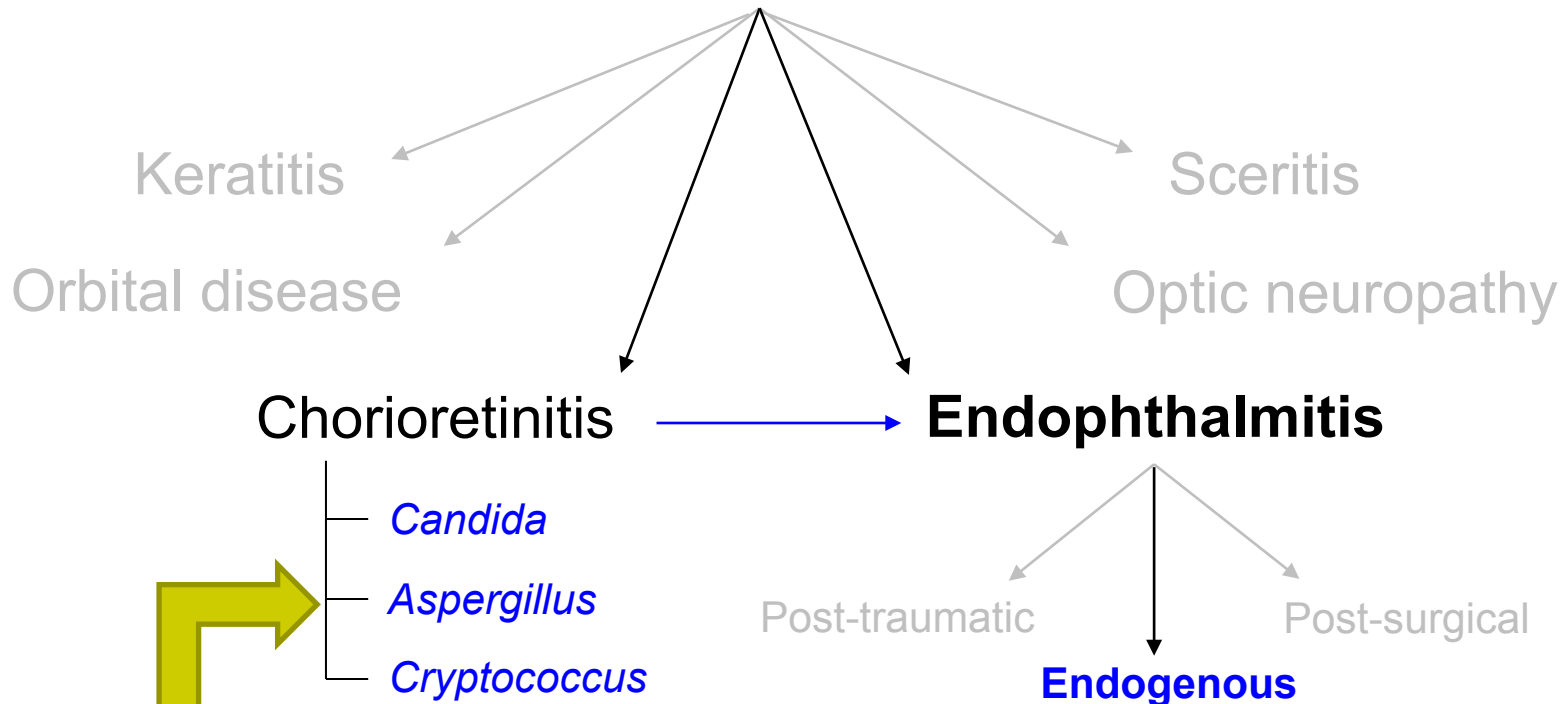
It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity

We said these are the common causes of endogenous chorioretinitis.

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



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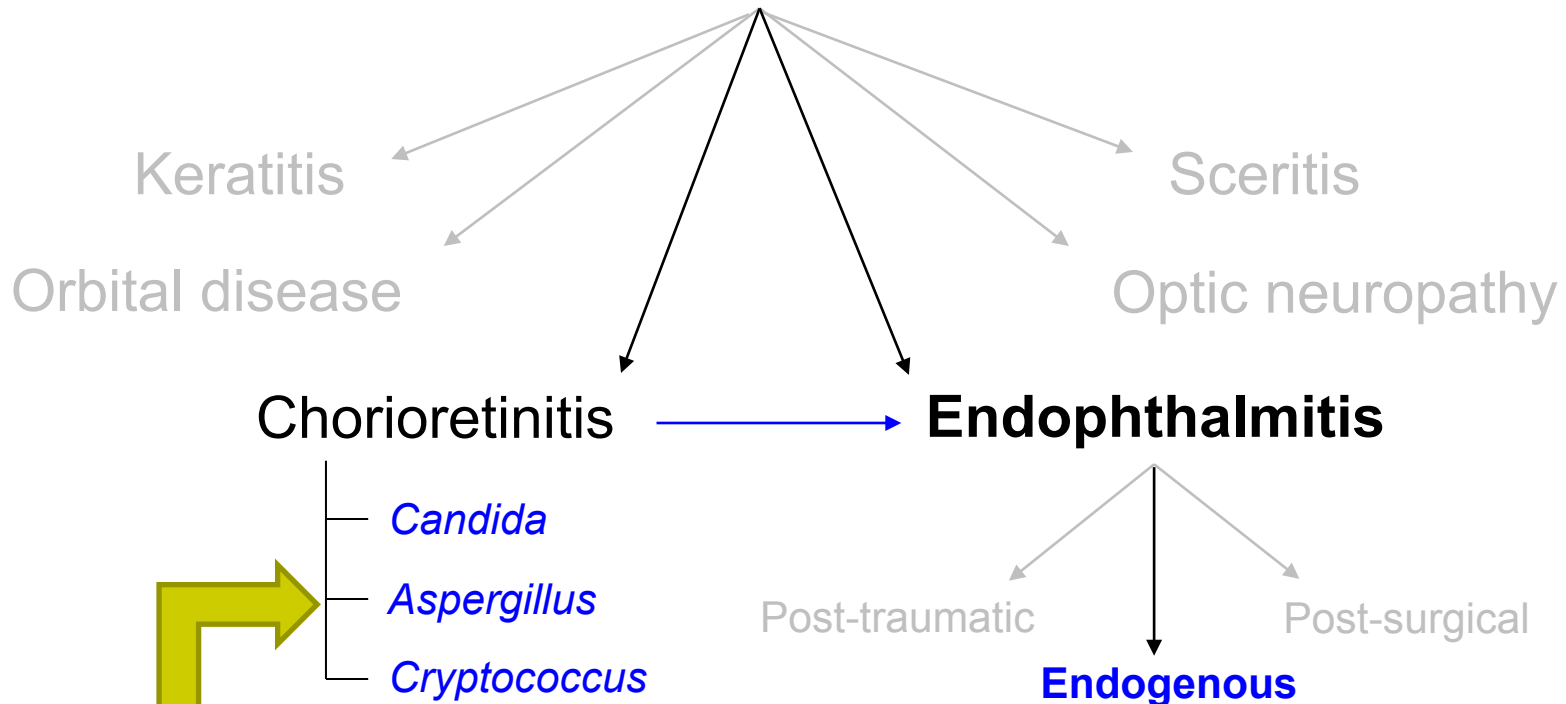
It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity

We said these are the common causes of endogenous chorioretinitis. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they?

Common Ocular Fungal Pathogens



Fungal pathogenic conditions



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It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity

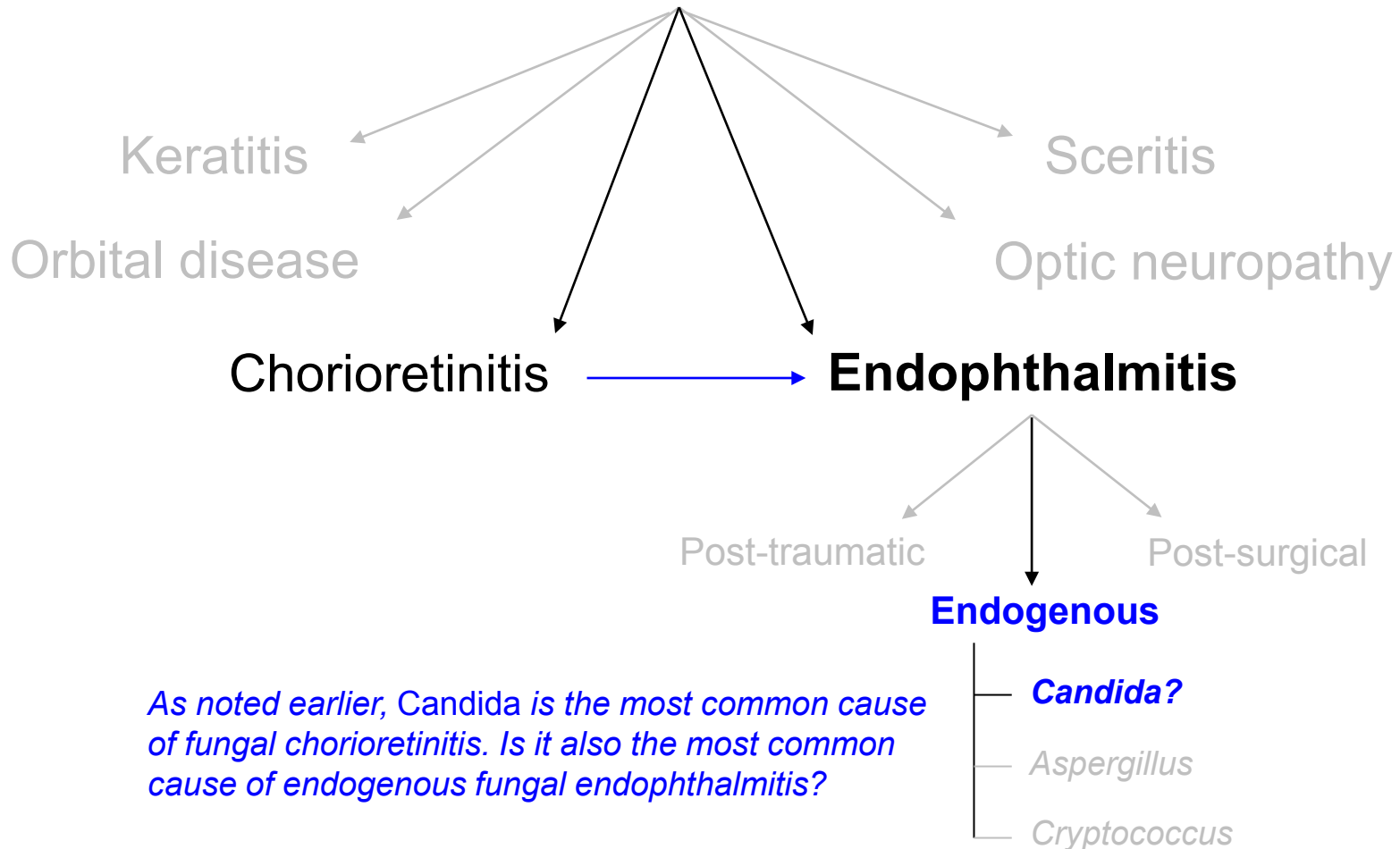
We said these are the common causes of endogenous chorioretinitis. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they?

Indeed they are

Common Ocular Fungal Pathogens



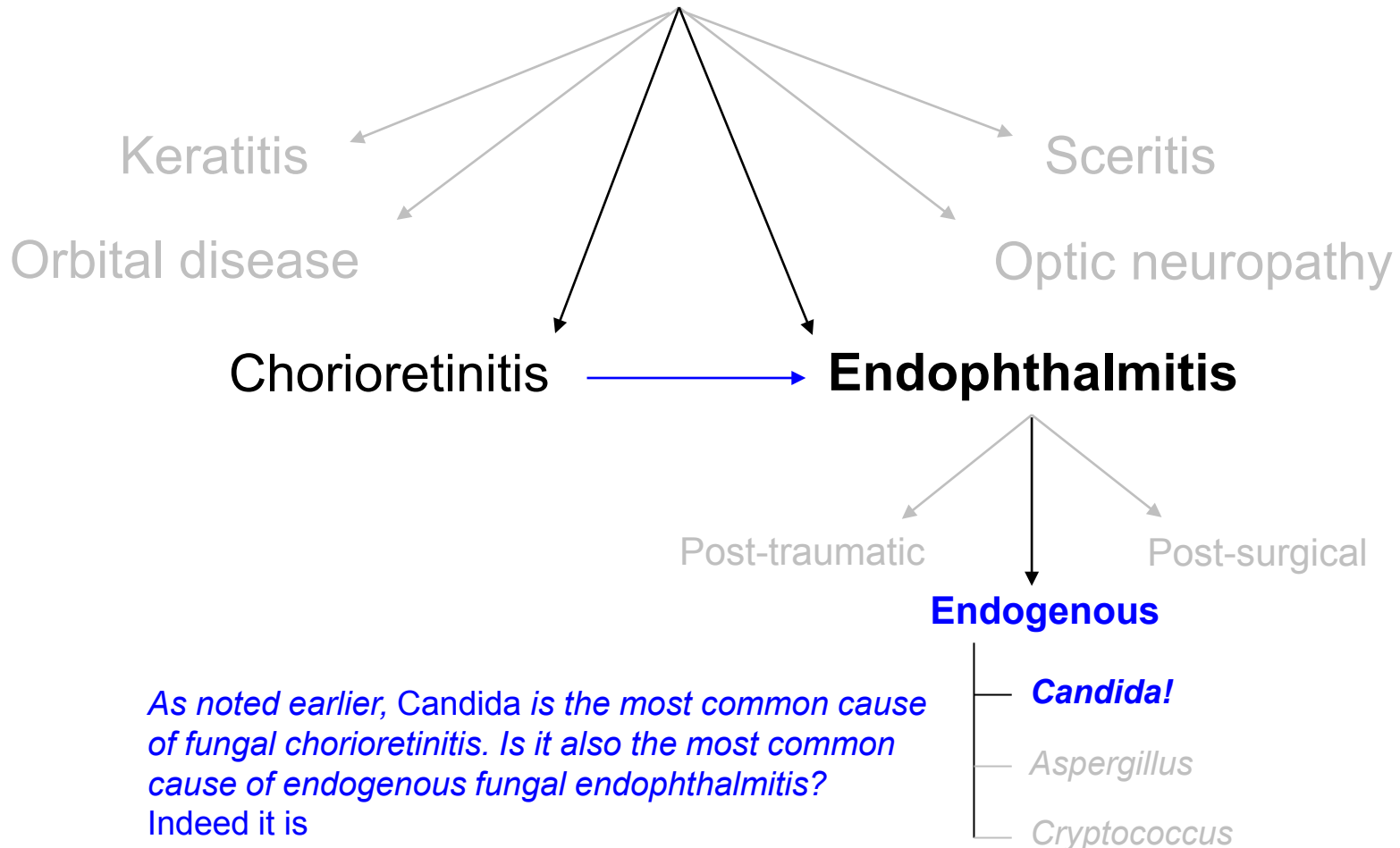
Fungal pathogenicic conditions



Common Ocular Fungal Pathogens



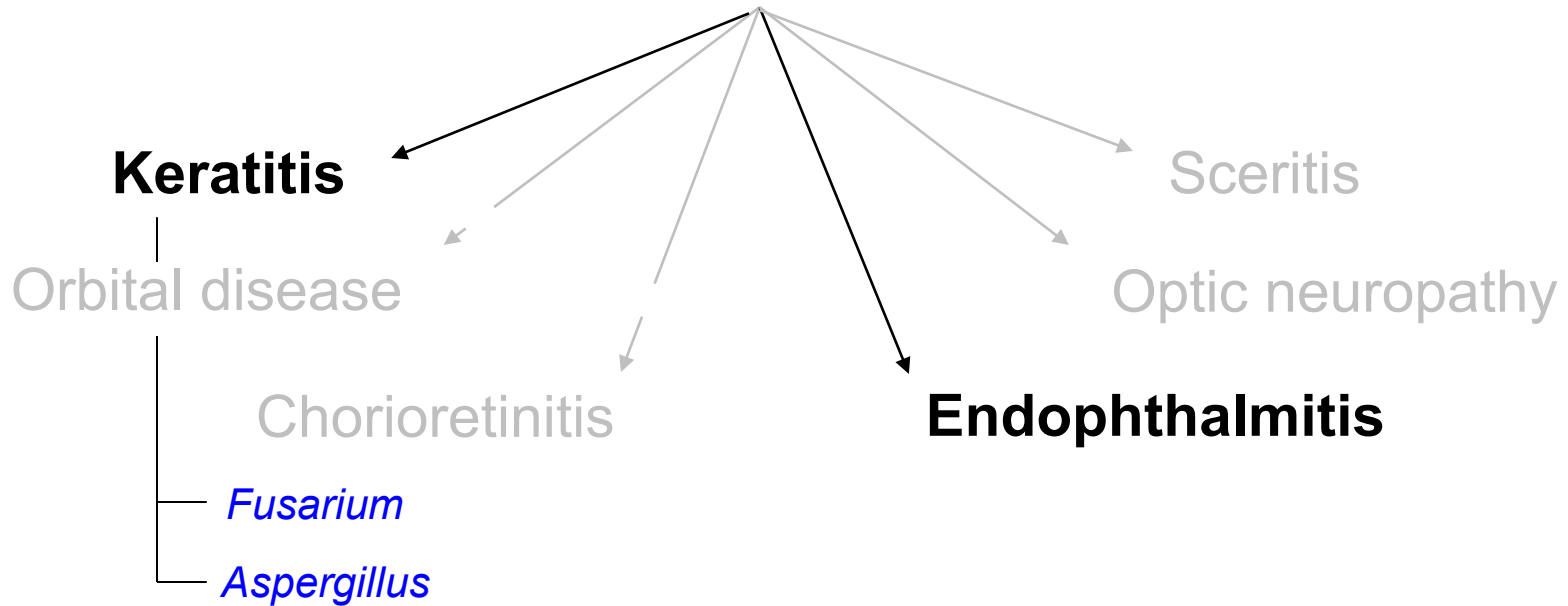
Fungal pathogenic conditions



Common Ocular Fungal Pathogens

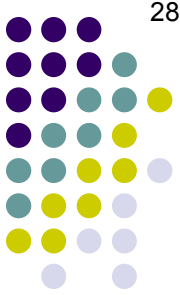


Fungal pathogenic conditions

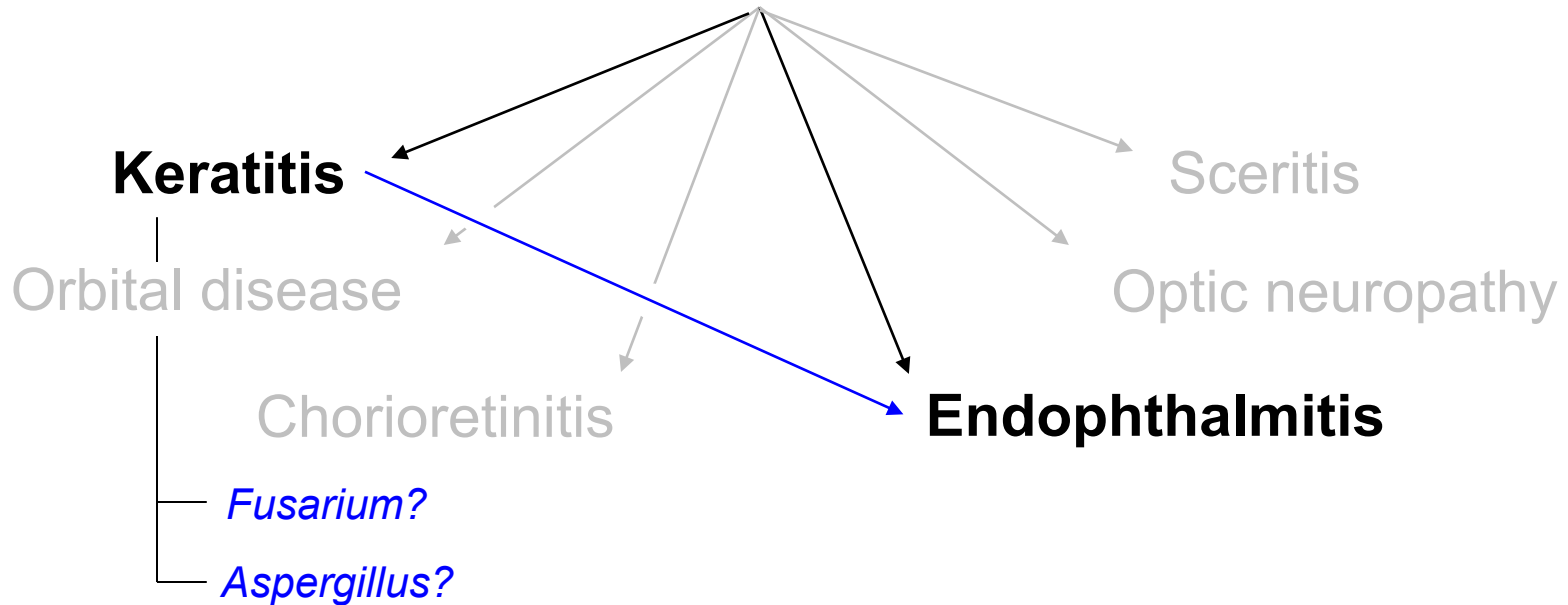


Recall that these are the two species responsible for most fungal keratitis cases.

Common Ocular Fungal Pathogens

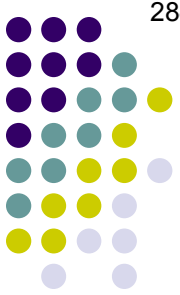


Fungal pathogenic conditions

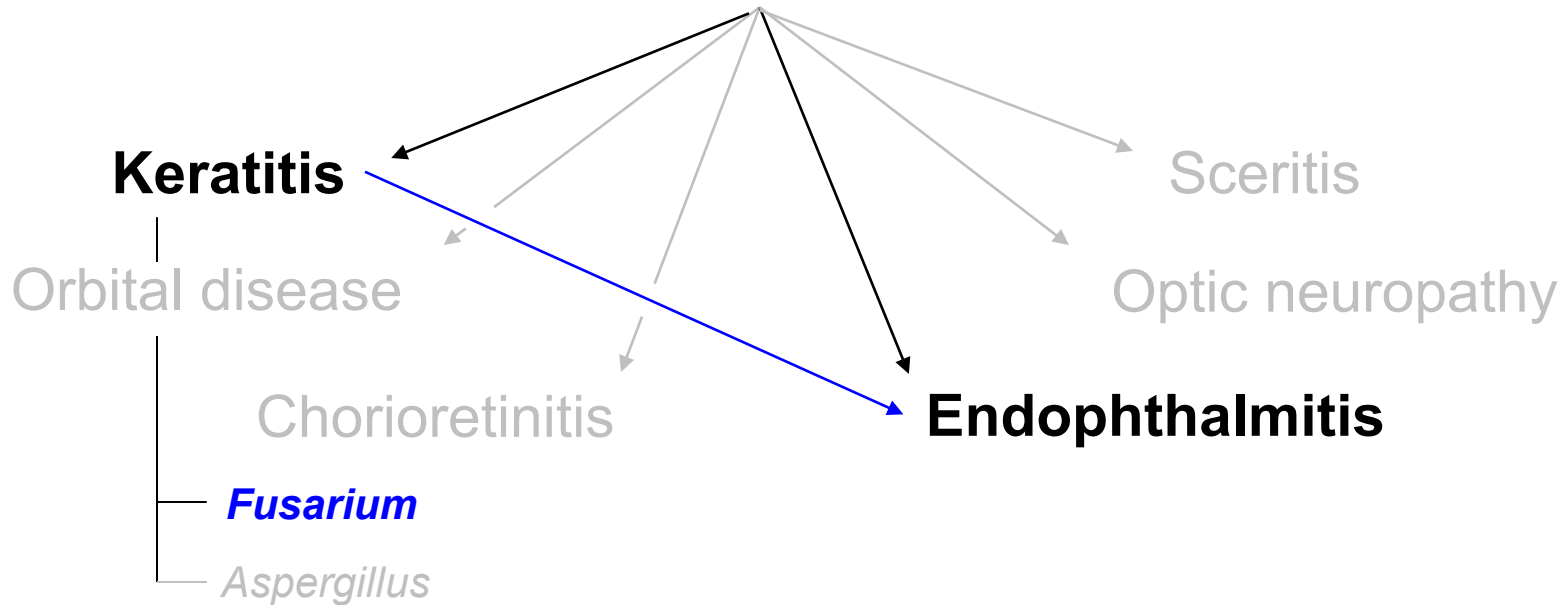


Recall that these are the two species responsible for most fungal keratitis cases. The *Retina* book goes out of its way to state that fungal keratitis can progress to endophthalmitis. It also indicates that one of these two pathogens is particularly likely to do so. Which one?

Common Ocular Fungal Pathogens

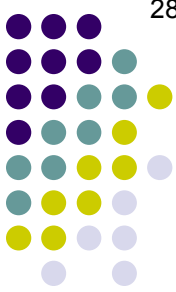


Fungal pathogenic conditions



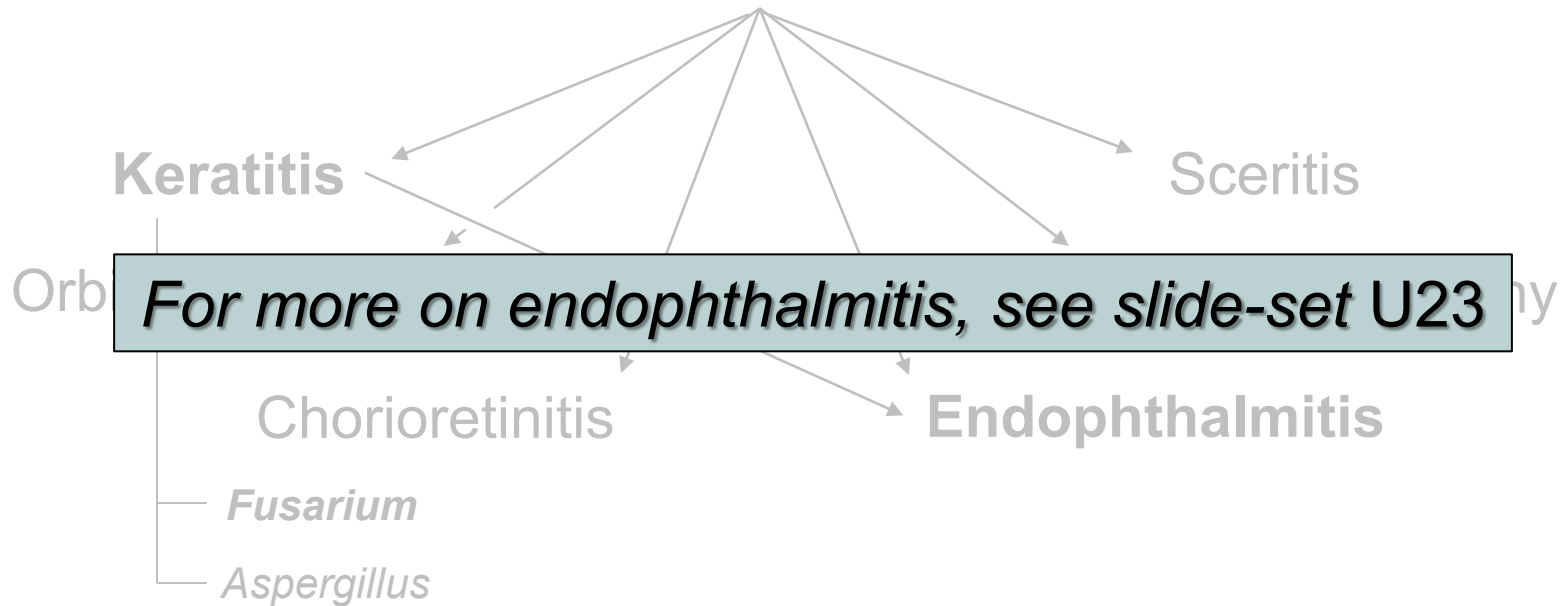
Recall that these are the two species responsible for most fungal keratitis cases. The *Retina* book goes out of its way to state that fungal keratitis can progress to endophthalmitis. It also indicates that one of these two pathogens is particularly likely to do so. Which one?

Fusarium



Common Ocular Fungal Pathogens

Fungal pathogenic conditions



Recall that these are the two species responsible for most fungal keratitis cases. The *Retina* book goes out of its way to state that fungal keratitis can progress to endophthalmitis. It also indicates that one of these two pathogens is particularly likely to do so. Which one?

Fusarium