Fungal pathogens come in two very basic flavors—what are they?
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What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?
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? Their appearance
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?

Their appearance

What do yeasts look like?
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?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms
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?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms

*What do molds look like?*
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?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms

*What do molds look like?*
Multicellular, filamentous organisms
Common Ocular Fungal Pathogens

Yeast VS Molds
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?

**Their appearance**

What do yeasts look like?
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?

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

**Their appearance**

What do yeasts look like?
Round, single-celled organisms

What do molds look like?
Multicellular, filamentous organisms

What’s the formal term for the filaments formed by molds?
Hyphae
Common Ocular Fungal Pathogens

Yeast vs Molds (vs bacteria for scale)
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast

Molds

A basic division among molds

Molds are further divided into two broad categories—what are they?
Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
- Molds
  - Septate
  - Nonseptate

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

Fungal pathogens

Yeast

Molds

Septate

Nonseptate

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.

What are septa?
Fungal pathogens

Yeasts

Molds

Septate

Nonseptate

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.

What are septa?
Cross-walls within hyphae that subdivide them into a series of individual compartments.
Molds are further divided into two broad categories—what are they? Based on the appearance of their hyphae, they can be classified as either septated or nonseptated.

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

Molds

- Septate
- Nonseptate
Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
  - ?
  - ?

- Molds
  - Septate
  - Nonseptate

*Two species account for the majority of yeast-mischief involving the eyes—what are they?*
Two species account for the majority of yeast-mischief involving the eyes—what are they?
**Common Ocular Fungal Pathogens**

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

*Cyptococcus*. Note the ‘India ink’ look—this is a good way to identify this species

Yeast
Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts
  - Candida
  - Cryptococcus

Molds
  - Septate
    - ?
    - ?
  - Nonseptate

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

Fungal pathogens

Yeast
- *Candida*
- *Cryptococcus*

Molds
- Septate
  - *Fusarium*
  - *Aspergillus*
- Nonseptate

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

Sepated molds
A high-mag *Aspergillus* photo may demonstrate ‘broad hyphae,’ a classic descriptor of the bug.
Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
  - Candida
  - Cryptococcus

- Molds
  - Septate
    - Fusarium
    - Aspergillus
  - Nonseptate

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

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Two species account for the majority of non-septated-mold eye issues—what are they?
No pic of *Mucor/Rhizopus*, as I don’t think you’ll be asked to ID it. Caveat emptor.
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

What is the go-to stain for fungi?
Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

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

Fungal pathogens

Yeast
- *Candida*
- *Cryptococcus*

Molds
- Septate
  - *Fusarium*
  - *Aspergillus*
- Nonseptate
  - *Mucor*
  - *Rhizopus*

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

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

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?
Candida
Common Ocular Fungal Pathogens

*Candida*: Gram stain
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**

**Fungal pathogens**

- **Yeast**
  - *Candida*
  - *Cryptococcus*

- **Molds**
  - **Septate**
    - *Fusarium*
    - *Aspergillus*
  - **Nonseptate**
    - *Mucor*
    - *Rhizopus*

*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?*
Sabouraud
Common Ocular Fungal Pathogens

*Candida* growing on Sabouraud
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:
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* and *Cryptococcus*.

Molds:
- Septate: *Fusarium*, *Aspergillus* (Nonseptate: *Mucor*, *Rhizopus*).
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*
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:
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*

* Aspergillus

Nonseptate

* Mucor

* Rhizopus
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

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

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: Candida

Warm, humid climes: Fusarium

These are the associations to bear in mind.

No question—proceed when ready.
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?
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?
Two species account for the majority of dimorphic fungi issues—what are they?
Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidioides
- Histoplasma

Two species account for the majority of dimorphic fungi issues—what are they?
Coccidiodes and Histoplasma have definite geographic preponderances in the United States. What are they?
Coccidiodes:
Histoplasma:
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidiodes
- Histoplasma

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

Coccidiodes: The Southwest, particularly the two words Valley in Cali
Histoplasma: The and River valleys
Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidioides
- Histoplasma

Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?
Coccidioides: The Southwest, particularly the San Joaquin Valley in California
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

Fungal pathogens

Yeasts
- *Candida*
- *Cryptococcus*

Molds
- Septate
  - *Fusarium*
  - *Aspergillus*
- Nonseptate
  - *Mucor*
  - *Rhizopus*

Dimorphic
- *Coccidioides*
- *Histoplasma*

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

No question—review slide
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidioides
- Histoplasma

Head’s up:
The *Neuro* book states that *Coccidioides* and *Histoplasma* are yeasts. This is incorrect; both are dimorphic.
Yeast Molds

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidiodes
- Histoplasma

Head’s up:
The *Neuro* book states that *Coccidiodes* 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

Fungal pathogens

Yeast

- *Candida*
- *Cryptococcus*

Molds

- Septate
  - *Fusarium*
  - *Aspergillus*
- Nonseptate
  - *Mucor*
  - *Rhizopus*

Dimorphic

- *Coccidioides*
- *Histoplasma*

Head's up part deaux:
The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast.

No question yet
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast

- Candida
- Cryptococcus

Molds

- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic

- Coccidioides
- Histoplasma

**Head’s up part deaux:**
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.
Head’s up part deaux:
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.
Candida. This pic was shown earlier in the set. The ‘budding’ structure that was remarked upon then is a pseudohyphae.

*Candida*
Fungal pathogenic 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)
Fungal pathogens cause six general conditions—what are they?
Fungal pathogens cause six general conditions—what are they?
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Chorioretinitis

Resulting in:
- Scleritis
- Optic neuropathy
- Endophthalmitis

*Important foreshadowing:* These conditions are not thrown up here rando. As we will see, the conditions on the right are often (in some cases always) caused by the condition on the left.
**Important foreshadowing:** These conditions are not thrown up here rando. 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.
In terms of presentation, how does fungal keratitis differ from bacterial?
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.
In terms of presentation, how does fungal keratitis differ from bacterial?
Bacterial tends to be fulminant, whereas fungal tends to be insidious.
In terms of presentation, how does fungal keratitis differ from bacterial? 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?
In terms of presentation, how does fungal keratitis differ from bacterial? 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? Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis
- Orbital disease
- Chorioretinitis

Sclerosis
Optic neuropathy
Endophthalmitis

In terms of presentation, how does fungal keratitis differ from bacterial?
- Bacterial tends to be fulminating, 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?
- Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC

There are three main risk factors for fungal keratitis—what are they?
- --
- --
- --
In terms of presentation, how does fungal keratitis differ from bacterial? 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? Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.

There are three main risk factors for fungal keratitis—what are they?
--Trauma, especially involving vegetative matter
--Chronic topical steroid use
--Contact lens wear

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis

Orbital disease

Sceritis

Optic neuropathy

Chorioretinitis

Endophthalmitis
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Sceritis
- Optic neuropathy
- Chorioretinitis
- Endophthalmitis

There are three main risk factors for fungal keratitis—what are they?
- Trauma, especially involving vegetative matter
- Chronic topical steroid use
- Contact lens wear

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

In terms of presentation, how does fungal keratitis differ from bacterial?
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?
Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.
Which two species are responsible for the vast majority of fungal keratitis cases?
Orbital disease

Keratitis

Orbital disease

Chorioretinitis

Endophthalmitis

Sceritis

Optic neuropathy

Fungal pathogenic conditions

Fungal pathogens

Yeast

Candida

Cryptococcus

Molds

Septate

Fusarium

Aspergillus

Nonseptate

Mucor

Rhizopus

Dimorphic

Coccidioides

Histoplasma

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

- Keratitis
- Orbital disease
- Chorioretinitis
- Optic neuropathy
- Endophthalmitis
- Scleritis

*Is fungal scleritis common, or rare?*
Fungal pathogenic conditions

Keratitis
Orbital disease
Chorioretinitis
Optic neuropathy
Endophthalmitis

Scleritis

Is fungal scleritis common, or rare?
It is very rare
Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Chorioretinitis
- Optic neuropathy
- Endophthalmitis
- Scleritis

*Is fungal scleritis common, or rare?*

It is very rare

*How do most cases of fungal scleritis start?*
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Chorioretinitis
- Endophthalmitis
- Optic neuropathy
- Sceritis

Is fungal scleritis common, or rare?

It is very rare

How do most cases of fungal scleritis start?

As a keratitis that crosses the limbus
Three fungi cause orbital disease— which ones?  
--?  
--?  
--?

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis

Sceritis

Orbital disease

Optic neuropathy

Chorioretinitis

Endophthalmitis

Fungal pathogens

Yeasts
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidioides
- Histoplasma
Three fungi cause orbital disease— which ones?

--Aspergillus
--Mucor
--Rhizopus
Three fungi cause orbital disease— which ones?
--**Aspergillus**
--Mucor
--Rhizopus

**Aspergillus** is responsible for three forms of orbital disease that all fall under the umbrella term **aspergillosis (aka sino-orbital aspergillosis)**
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Chorioretinitis
- Endophthalmitis
- Aspergillosis
- Optic neuropathy

Orbital disease

Three fungi cause orbital disease— which ones?
-- Aspergillus
-- Mucor
-- Rhizopus

In contrast, Mucor and Rhizopus both cause the same clinical condition.
Three fungi cause orbital disease— which ones?  
--Aspergillus  
--Mucor  
--Rhizopus

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.
Orbital disease

Fungal pathogenic conditions

Keratitis

Scleritis

Optic neuropathy

Endophthalmitis

Chorioretinitis

Common Ocular Fungal Pathogens

Zygomycosis

Aspergillosis

Yeasts

Molds

Septate

Nonseptate

Fungal pathogens

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

---

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

Zygomycosis
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 commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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So, these are highly virulent pathogens?

Zygomycosis
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

So, these are highly virulent pathogens?
Actually no—they are ubiquitous, and normally pose little or no threat
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.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent?
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.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

Zygomycosis
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.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

What is the classic debilitating factor/scenario?

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

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So, these are highly virulent pathogens?
Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent?
When the individual is debilitated.

What is the classic debilitating factor/scenario?
A pt in DKA.
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.

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So then, under what circumstance are they highly virulent? When the individual is debilitated.

Zygomycosis

What is the classic debilitating factor/scenario? A pt in DKA.

What other scenarios do the BCSC books mention? --? --? --?
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.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

**Zygomycosis**

*What is the classic debilitating factor/scenario?* A pt in DKA

*What other scenarios do the BCSC books mention?*  
--A pt with extensive burns  
--Malignancy, both solid and hematologic  
--Neutropenic pts, especially if they’re on abx
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.

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Zygomycosis

What is the classic debilitating factor/scenario? A pt in DKA.

What other scenarios do the BCSC books mention? --A pt with extensive burns --Malignancy, both solid and hematologic --Neutropenic pts, especially if they’re on abx.
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?

Zygomycosis
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
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.

How does the organism get into the sinus? (Note: It's not ophthalmic.) How is the diagnosis confirmed? Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed? -- The underlying debilitating condition must be reversed—get IM to resolve the DKA. -- The infected tissue must be debrided—get your friends in ENT involved. -- Get Ampho B on board.

Zygomycosis
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.

Zygomycosis

How does the organism get into the sinus? Via fungemia.
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.

How does the organism get into the sinus? Via fungemia.

How does the organism get into the body in the first place? Inhalation of the lungs.

Zygomycosis
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.

How does the organism get into the sinus? Via fungemia.

How does the organism get into the body in the first place? The lungs, ie, inhalation.

Zygomycosis
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?

Zygomycosis
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.

---

**Zygomycosis**
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.

What specific derangements of blood flow are involved?

Zygomycosis
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—derangements of blood flow.

What specific derangements of blood flow are involved?
The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which can lead to ischemic or compressive insults.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact. Derangements of blood flow.

What specific derangements of blood flow are involved? The most common is thrombosis.

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

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Blood vessels. This is a key fact

derangements of blood flow

What specific derangements of blood flow are involved?
The most common is thrombosis, which leads to infarction, which in turn produces:

two words
Common Ocular Fungal Pathogens

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Zygomycosis
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What specific derangements of blood flow are involved? The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is...

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Zygomycosis
Common Ocular Fungal Pathogens

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Via direct extension of infection from an adjacent sinus.

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Zygomycosis
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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:

**derangements of blood flow.**

*What specific derangements of blood flow are involved?*
The most common is **thrombosis**, which leads to **infarction**, which in turn produces **tissue necrosis**. Another is **hemorrhage**, which can lead to ischemic or compressive insults.

**Zygomycosis**
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.

What specific derangements of blood flow are involved?
The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which...

In addition to its myriad deleterious effects on tissue, this thrombosing vasculitis can produce a misleading general clinical picture. In what way?
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. 

What specific derangements of blood flow are involved? The most common is **thrombosis**, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which.

**Zygomycosis**

In addition to its myriad deleterious effects on tissue, this thrombosing vasculitis can produce a misleading general clinical picture. In what way? 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.
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?

Zygomycosis
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
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?
--?
--?
--?
--?
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.

What are the exam findings in orbital apex syndrome?
--Complete lid finding
--?
--?
--?
Zygomycosis

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.

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How do these pts typically present? With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--?
--?
--?
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.

What are the exam findings in orbital apex syndrome? --Complete ptosis --Ophthalmoplegia (both internal and external) --? --?

Zygomycosis
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)
--?
--?
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?
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How does the organism get into orbit?
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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

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--?

What is an external ophthalmoplegia?

Zygomycosis
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?
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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)
--?

What is an external ophthalmoplegia?
Paralysis of the extraocular muscles
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].

What are the exam findings in orbital apex syndrome?

--- Complete ptosis
--- Ophthalmoplegia (both internal and external)
--- ?

--- What is an external ophthalmoplegia? Internal? Paralysis of the extraocular muscles.

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)
---?

What is an external ophthalmoplegia? Internal? Paralysis of the extraocular muscles. Paralysis of the muscles inside the eye, ie, the pupillary and ciliary muscles.
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.

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--Corneal sensation is decreased
--?
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.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What are the exam findings in orbital apex syndrome?
--Complete ptosis
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Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

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

Zygomycosis
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.

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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 decreased
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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.)
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.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) Spotting a black eschar on the nasopharyngeal mucosa.
Zygomycosis: Necrotic sinus tissue with eschar
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.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) How is the diagnosis confirmed? Spoting a black eschar on the nasopharyngeal mucosa.
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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) How is the diagnosis confirmed? Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.
Common Ocular Fungal Pathogens

A, A patient with zygomycosis eroding the hard palate

Zygomycosis
A, A patient with zygomycosis eroding the hard palate
B, Biopsy specimen demonstrates typical nonseptate hyphae

Zygomycosis
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?
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How does the organism get into orbit?
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How do these pts typically present?
With proptosis and orbital apex syndrome

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed?

Three things have to happen…
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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.)*
*How is the diagnosis confirmed?*
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

*How is zygomycosis managed?*
-- [what got the pt in this mess in the first place]
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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’?
(Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed?
--The underlying debilitating condition must be reversed—get IM to resolve the DKA
-- [this surgical goal is pretty obvious]
**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?
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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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’?
(Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

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]
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 is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’?
(Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

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
--Get Ampho B on board
Zygomycosis in a patient with diabetic ketoacidosis. A, Complete right upper eyelid ptosis and ophthalmoplegia are present in the patient.
Zygomycosis in a patient with diabetic ketoacidosis. A, Complete right upper eyelid ptosis and ophthalmoplegia are present in the patient. B, Wide surgical debridement consisting of orbital exenteration and sinus surgery was life-saving.
Zygomycosis in a patient with diabetic ketoacidosis. A, Complete right upper eyelid ptosis and ophthalmoplegia are present in the patient. 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).
Aspergillosis can produce orbital dz via three distinct mechanisms:

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Aspergillosis can produce orbital disease via three distinct mechanisms:

---By orbital tissue
Aspergillosis can produce orbital dz via three distinct mechanisms:
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--By forming a space-occupying mass in the orbit.
Fungal pathogenic conditions

Orbital disease

Keratitis

Sceritis

Optic neuropathy

Endophthalmitis

Chorioretinitis

Zygomycosis

Aspergillosis

Invasive
Noninvasive
Allergic

Aspergillosis can produce orbital dz via three distinct mechanisms:
--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
--By eliciting an allergic reaction in orbital tissue. This is called allergic aspergillosis.
--By forming a space-occupying mass in the orbit. This is noninvasive aspergillosis.
What is the chief predisposing factor in invasive aspergillosis?

- Being immunocompromised/debilitated
- Direct spread from adjacent sinusitis

How does it present?

- Highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis, and decreased VA. Intracranial spread is common, resulting in a high mortality rate. Chronic cases mimic malignancy—less pain, more gradual proptosis, and loss of function. The mortality rate is lower but still significant.

(Note: The textbook reserves the term invasive aspergillosis for fulminant cases and refers to chronic cases as chronic necrotizing aspergillosis.)
Orbital disease

Fungal pathogenic conditions

Keratitis

Scleritis

Optic neuropathy

Sceritis

Zygomycosis

Chorioretinitis

What is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated

Aspergillosis

Invasive

Common Ocular Fungal Pathogens
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Choroiditis
- Optic neuropathy
- Osteomyelitis
- Zygomycosis
- Invasive Aspergillosis
- Zygomycosis

What is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated

How does the fungus gain access to the orbit?
By direct spread from adjacent sinusitis

How does it present?
It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate. Chronic cases mimic malignancy—less pain, more gradual proptosis and loss of function. The mortality rate is lower, but still significant.
Orbital disease

Fungal pathogenic conditions

Keratitis

Scheritis

Common Ocular Fungal Pathogens

Aspergillosis

Zygomycosis

Invasive

Choroiditis

What is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated

How does the fungus gain access to the orbit?
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**Common Ocular Fungal Pathogens**

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Orbital disease
  - Zygomycosis
  - Aspergillosis
    - Invasive
      - What is the chief predisposing factor in invasive aspergillosis?
        - Being immunocompromised/debilitated
      - How does the fungus gain access to the orbit?
        - By direct spread from adjacent sinusitis
      - How does it present?
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  - Chorioretinitis
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Optic neuropathy
- Sceritis
- Choroidal infection
- Zygomycosis

**Aspergillosis**

- **What is the chief predisposing factor in invasive aspergillosis?**
  - Being immunocompromised/debilitated

- **How does the fungus gain access to the orbit?**
  - By direct spread from adjacent sinusitis

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  - It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate.
Orbital disease

Fungal pathogenic conditions

Keratitis

Scleritis

Ocular infection

Zygomycosis

Chorioretinitis

Invasive Aspergillosis

How is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated

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

Orbital disease

Keratitis

Zygomycosis

Invasive

Allergic

Fungal pathogenic conditions

Common Ocular Fungal Pathogens
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**Common Ocular Fungal Pathogens**

### Fungal pathogenic conditions

- **Keratitis**
- **Orbital disease**
- **Zygomycosis**
- **Aspergillosis**
  - **Invasive**
  - **Allergic**

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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. (This is especially the case if the sphenoid sinus is involved.)
CT demonstrating allergic aspergillosis involving the left posterior ethmoid and sphenoid sinus with bony expansion and compression of the left optic nerve.
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?
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.
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

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**Orbital disease**

**Keratitis**

**Zygomycosis**

**Invasive**

**Allergic**

**Chorioretinitis**
### Common Ocular Fungal Pathogens

#### Fungal pathogenic conditions

<table>
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<tr>
<td>Zygomycosis</td>
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<td>Orbital disease</td>
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#### Allergic aspergillosis

**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.)

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Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Endophthalmitis
- Fungal pathogen
- Sceritis
- Keratitis
- Optic neuropathy
- Zygomycosis

Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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Allergic
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Endophthalmitis
- Fungal pathogen
- Ic conditions

**Keratitis**

- Sceritis
- Keratitis
- Optic neuropathy

**Orbital disease**

- Zygomycosis
- Invasive

**Aspergillosis**

- Allergic
- Invasive

*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.

*No question—proceed when ready*
Common Ocular Fungal Pathogens

Allergic aspergillosis: Bony destruction
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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How is allergic aspergillosis diagnosed?
Via sinus biopsy

How is it treated?
Via surgical debridement of the sinuses, and steroids
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What does the biopsy reveal?
Thick mucus (the classic description is 'peanut-butter like') containing fungal hyphae.

Sinus biopsy
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Endophthalmitis
- Fungal pathogen
- Ic conditions
- Sceritis
- Keratitis
- Optic neuropathy

**Common Ocular Fungal Pathogens**

**Zygomycosis**

**Chorioretinitis**

**Invasive**

**Noninvasive**

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**Aspergillosis**

**Orbital disease**

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**eww**

**sinus biopsy**
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Endophthalmitis
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- Sceritis
- Keratitis
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**Chorioretinitis**

**Invasive Noninvasive**

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**Sinus biopsy**

**Aspergillosis**

**Orbital disease**

**Keratitis**

**Zygomycosis**

**Invasive**

**Allergic**
Common Ocular Fungal Pathogens

Allergic aspergillosis: Biopsy specimen plated on whole-wheat agar
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Zygomycosis
- Chorioretinitis
- Endophthalmitis
- Sceritis
- Keratitis
- Orbital disease

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Fungal pathogenic conditions

- Zygomycosis
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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

How is it treated?
Via surgical debridement of the sinuses, and steroids

You forgot to say ‘antifungals.’ And antifungals, right?
**Common Ocular Fungal Pathogens**

Fungal pathogenic conditions:
- Keratitis
- Orbital disease
- Zygomycosis
- Aspergillosis
- Chorioretinitis
- Invasive
- Noninvasive
- Endophthalmitis

**Endophthalmitis**

**Fungal pathogen**

**ic conditions**

**203**

**Sceritis**

**Keratitis**

**Optic neuropathy**

---

**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.
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**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Endophthalmitis
- Fungal pathogen
- Other conditions

**Orbital disease**

- Keratitis
- Chorioretinitis
- Optic neuropathy

**Aspergillosis**

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Nope—antifungals are not indicated (unless this is a very unusual case of allergic aspergillosis in an immunocompromised pt). Remember: Allergic aspergillosis is not an invasive condition—the pt does not have an Aspergillus infection! Rather, it is the manifestation of a crazy immune response on the mucosal surface of the sinus (and orbit).
In a nutshell, what is the pathologic process in noninvasive aspergillosis?

The fungus proliferates within the air space of the sinus—i.e., 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. If an aspergilloma forms near the orbital apex, it will produce the same signs and symptoms as any other mass—proptosis, decreased VA, ophthalmoplegia, and pain.

In addition to orbital symptoms, what other complaints are typical?

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

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?

Surgically
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What is the formal name for an Aspergillus fungal ball?

Noninvasive

Aspergillosis

Orbital disease

Zygomycosis

Invasive

Keratitis

Orbital disease
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Surgically

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Aspergillosis
- Noninvasive
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Orbital disease

Keratitis
Noninvasive aspergillosis: Orbital aspergilloma
Fungal pathogenic conditions

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How is noninvasive aspergillosis managed? Surgically.

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

Which sinuses are especially prone to hosting aspergillomas? The sphenoid and ethmoid.
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What is the relationship of sinus disease to orbital disease?

The sphenoid and ethmoid sinuses are adjacent to the orbital apex and especially prone to hosting aspergillomas.

How much inflammation is typically associated with noninvasive aspergillosis?

Little to none.

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How is noninvasive aspergillosis managed?

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CT showing large aspergilloma invading the sphenoethmoid sinus and extending posteriorly with compression of the left optic nerve.
Fungal pathogenic conditions

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**Common Ocular Fungal Pathogens**

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How much bony erosion typically occurs? Little to none.

How is noninvasive aspergillosis managed? Surgically.

Are noninvasive aspergillosis pts immunocompromised like invasive aspergillosis pts, or immunocompetent like allergic aspergillosis pts? Unclear. The Plastics book states that it occurs in immunocompetent individuals. The Neuro book says it occurs in both immunocompetent and compromised individuals. Eyewiki says it occurs “primarily in immunocompetent pts.” FWIW, I think an OKAP/Boards pt would be presented as immunocompetent. Caveat emptor.
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**Fungal pathogenic conditions**

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Orbital disease

Fungal conditions

Keratitis

Orbital aspergillosis

Invasive aspergillosis

Allergic aspergillosis

Noninvasive aspergillosis

Immunostatus

Yes

No

Treat with surgery?

Yes

No

Treat with antifungals?

Yes

No

Mortality rate?

High

Lowest

Common Ocular Fungal Pathogens

Zygomycosis

Aspergillosis

Invasive

Noninvasive

Allergic
## Common Ocular Fungal Pathogens

**Orbital aspergillosis tl;dr**

<table>
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<tbody>
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<td>Immunostatus</td>
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<td>Bony erosions?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Inflammation</td>
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<td>Mortality rate?</td>
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**Zygomycosis**

**Aspergillosis**

- Invasive
- Noninvasive
- Allergic

**Orbital disease**

- Keratitis
- Choriorretinitis

**Orbital disease**

- Zygomycosis
Common Ocular Fungal Pathogens

Orbital aspergillosis tl;dr

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Orbital disease

Aspergillosis

Invasive

Noninvasive

Allergic

Keratitis

Orbital aspergillosis

Zygomycosis

Fungal conditions

Fungal

Optic neuropathy

Sceritis

Keratitis

Chorioretinitis

Immunostatus

Bony erosions?

Inflammation present?
### Common Ocular Fungal Pathogens

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**Orbital disease**

- Zygomycosis
- Aspergillosis
  - Invasive
  - Noninvasive
  - Allergic

**Keratitis**

**Choroiditis**
### Common Ocular Fungal Pathogens

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**Aspergillosis**
- Invasive
- Noninvasive
- Allergic

**Keratitis**

**Orbital disease**

**Chorioretinitis**

**Zygomycosis**

**Sceritis**

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**Fungal conditions**
- Orbital disease
- Endophthalmitis
### Common Ocular Fungal Pathogens

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- Zygomycosis
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- Keratitis
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**Orbital disease:**
- Sceritis
- Keratitis
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**Zygomyces:**
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### Common Ocular Fungal Pathogens

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<td>Compromised</td>
<td>Competent</td>
<td>Competent</td>
</tr>
<tr>
<td><strong>Bony erosions?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Inflammation present?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Treat with surgery?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Treat with antifungals?</strong></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Mortality rate?</strong></td>
<td>High</td>
<td>Lower</td>
<td>Lowest</td>
</tr>
</tbody>
</table>

- **Orbital disease**
  - Zygomycosis
  - Fungal
  - Keratitis
  - Chorioretinitis

- **Aspergillosis**
  - Invasive
  - Noninvasive
  - Allergic
Fungal optic neuropathy can occur via several means:

- Zygomycosis and aspergillosis can produce optic neuropathy by one of several mechanisms.
- The other fungal optic neuropathy addressed in the BCSC is papilledema secondary to cryptococcal meningitis in patients with HIV/AIDS.

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Orbital disease
- Chorioretinitis
- Endophthalmitis

Fungal optic neuropathy can occur via several means:
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--As we have seen in some detail, zygomycosis and aspergillosis can produce optic neuropathy by one of several mechanisms.
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--The other fungal optic neuropathy addressed in the BCSC is 2ndry to cryptococcal meningitis in pts with HIV/AIDS.
Fungal optic neuropathy can occur via several means:
--As we have seen in some detail, *zygomycosis* and *aspergillosis* can produce optic neuropathy by one of several mechanisms.
--The other fungal optic neuropathy addressed in the BCSC is papilledema 2ndry to *cryptococcal meningitis* in pts with HIV/AIDS.
Is fungal chorioretinitis a common, or rare entity?
Is fungal chorioretinitis a common, or rare entity?
It is quite rare
Is fungal chorioretinitis a common, or rare entity?
It is quite rare

It occurs almost exclusively in one sort of pt—what sort is that?
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Orbital disease
- Optic neuropathy
- Chorioretinitis
- Endophthalmitis

*Is fungal chorioretinitis a common, or rare entity?*
It is quite rare

*It occurs almost exclusively in one sort of pt—what sort is that?*
Debilitated via AIDS, malignancy, steroids, chronic illness, etc
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?
Debilitated via AIDS, malignancy, steroids, chronic illness, etc

It occurs almost exclusively via one mechanism—what it is?
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
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- Optic neuropathy
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- Endophthalmitis

Is fungal chorioretinitis a common, or rare entity?
It is quite rare

It occurs almost exclusively in one sort of pt—what sort is that?
Debilitated via AIDS, malignancy, steroids, chronic illness, etc

It occurs almost exclusively via one mechanism—what it is?
Fungemia, ie, hematogenous spread from elsewhere
Which three species are responsible for the majority of fungal chorioretinitis cases?
Which three species are responsible for the majority of fungal chorioretinitis cases?
Which three species are responsible for the majority of fungal chorioretinitis cases? Orbital disease, Endophthalmitis, Fungal pathogenic conditions, Keratitis, Scleritis, Optic neuropathy, Chorioretinitis, Endophthalmitis.

Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
  - Candida
  - Cryptococcus
- Molds
  - Septate
    - Fusarium
    - Aspergillus
  - Nonseptate
    - Mucor
    - Rhizopus
- Dimorphic
  - Coccidioides
  - Histoplasma

What about Histoplasma, the causative agent in POHS? Why isn’t it on this list?
Which three species are responsible for the majority of fungal chorioretinitis cases?

Orbital disease

Endophthalmitis

Fungal pathogenic conditions

Keratitis

Scleritis

Optic neuropathy

Fungal pathogens

Yeast

- Candida
- Aspergillus
- Cryptococcus

Molds

- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

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.
Fungal pathogenic conditions

Common Ocular Fungal Pathogens

Keratitis
Orbital disease
Sceritis
Optic neuropathy
Endophthalmitis

Chorioretinitis

Candida?
Aspergillus?
Cryptococcus?

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

Of the three, which is the most common?
Which three species are responsible for the majority of fungal chorioretinitis cases?

Of the three, which is the most common? 
*Candida*
Which three species are responsible for the vast majority of fungal chorioretinitis cases?

Of the three, which is the most common?

Generally speaking, who is at risk for Candida chorioretinitis?

- Hospitalized, debilitated individuals
- Is there anything in particular that puts them at risk?
  - Hx major GI surgery
  - Chronic lines/catheters (Classic story: Pt s/p GI surgery is NPO and receiving TPN)
  - Systemic antibiotics (think sepsis pt)
- How about being immunocompromised?
  - This does not seem to be a risk factor (eg, HIV/AIDS is not a risk factor for Candida chorioretinitis)
Orbital disease
Endophthalmitis
Fungal pathogenic conditions
Keratitis
Scleritis
Orbital disease
Optic neuropathy
Common Ocular Fungal Pathogens
Fungal pathogens
Candida
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Coccidiods
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Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis
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Endophthalmitis

Fungal pathogenic conditions

Keratitis

Sceritis

Optic neuropathy

Common Ocular Fungal Pathogens

Fungal pathogens

Candida

Aspergillus

Cryptococcus

Septate Nonseptate

Dimorphic

Coccidiodes

Histoplasma

Fusarium

Aspergillus

Mucor

Rhizopus

Candida

Cryptococcus

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

--Systemic antibiotics (think sepsis pt)

How about being immunocompromised?

--HIV/AIDS is not a risk factor for Candida chorioretinitis
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How about being immunocompromised?
This does not seem to be a risk factor (eg, HIV/AIDS is not a risk factor for Candida chorioretinitis)
There are three subtypes of endophthalmitis—what are they?
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Post-traumatic, post-surgical, and endogenous
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?
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 are three subtypes of endophthalmitis—what are they?

- Post-traumatic
- Post-surgical
- 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?
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?
India.
There are three subtypes of endophthalmitis—what are they?
Post-traumatic, post-surgical, and endogenous

How does endogenous endophthalmitis come to happen, ie, what's the mechanism?
There are three subtypes of endophthalmitis—what are they?
Post-traumatic, post-surgical, and endogenous

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

Keratitis  
Scleritis
Orbital disease  
Optic neuropathy

Chorioretinitis  → Endophthalmitis

- Candida
- Aspergillus
- Cryptococcus

Endogenous

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.

(No question yet—proceed)
Fungal pathogenic conditions

Keratitis
Orbital disease
Sceritis
Optic neuropathy

Chorioretinitis → Endophthalmitis

Common Ocular Fungal Pathogens

Candida
Aspergillus
Cryptococcus

Endogenous
Post-traumatic
Post-surgical

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. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they?
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. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they? Indeed they are.
As noted earlier, Candida is the most common cause of fungal chorioretinitis. Is it also the most common cause of endogenous fungal endophthalmitis?
As noted earlier, Candida is the most common cause of fungal chorioretinitis. Is it also the most common cause of endogenous fungal endophthalmitis? Indeed it is
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
  - Orbital disease
  - Chorioretinitis
  - Fusarium
  - Aspergillus
- Sceritis
- Endophthalmitis
- Optic neuropathy

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

(No question yet—proceed)
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?
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*Fusarium*
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis

Scleritis

Orbital

Chorioretinitis

Endophthalmitis

For more on endophthalmitis, see slide-set U23

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*