Parasitic pathogens

Three types of parasitic pathogen

? ? ?
Common Parasitic Pathogens

Parasitic pathogens

- Three types of parasitic pathogen

- Protozoa
- Helminths
- Arthropods
Broadly speaking, what are protozoa?
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They are unicellular eukaryotes capable of some form of motility. Protozoa feed on organic material, and many are parasites.
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What is the opposite (so to speak) of the term eukaryote?
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What is the opposite (so to speak) of the term eukaryote?
Prokaryote
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What is the opposite (so to speak) of the term eukaryote? Prokaryote

How do eukaryotes and prokaryotes differ?
Broadly speaking, what are protozoa? They are unicellular eukaryotes capable of some form of motility. Protozoa feed on organic material, and many are parasites. The term *protozoa* is considered outdated by modern biologists, but it persists in the ophthalmic literature.

What is the opposite (so to speak) of the term eukaryote? Prokaryote

How do eukaryotes and prokaryotes differ? Eukaryotic cells have a nucleus, whereas prokaryotic cells do not have a nucleus.
Broadly speaking, what are protozoa?
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What is the opposite (so to speak) of the term eukaryote?
Prokaryote

How do eukaryotes and prokaryotes differ?
Eukaryotic cells have a membrane-bound nucleus, whereas prokaryotic cells do not.
Likewise, what are helminths?
Likewise, what are helminths?
Helminths are parasitic worms (or worm-like organisms).
By definition, they live inside the body of their host.
Protozoa

Helminths

Arthropods

Finally—what are arthropods?
Protozoa
Parasitic pathogens
Helminths
Arthropods

Finally—what are arthropods?
Arthropods are bugs—literally. They have a body, and may have an exoskeleton and/or appendages.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Four protozoa discussed in one or more of the BCSC books
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

Four protozoa discussed in one or more of the BCSC books
Acanthamoeba is notorious for causing what sort of ocular infection?

A devastating, sight-threatening keratitis

Acanthamoeba exist in two forms (i.e., life-cycle stages). What are they?

- The motile trophozoite (infectious)
- The hard-to-kill cyst
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

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--The motile
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Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?

-- The motile trophozoite
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Acanthamoeba Trophozoite form

Acanthamoeba
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Common Parasitic Pathogens

Acanthamoeba

Trophozoite form

Cyst form
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-- The motile trophozoite (is infectious?)
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--The motile trophozoite
--The hard-to-kill cyst

What constitutes a positive 'culture'?
When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

What medium is used when culturing for Acanthamoeba?
Acanthamoeba is notorious for causing what sort of ocular infection?
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Acanthamoeba exist in two forms (i.e., life-cycle stages). What are they?
-- The motile trophozoite (is infectious!)
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What medium is used when culturing for Acanthamoeba?
Non-nutrient agar with E. coli overlay

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Non-nutrient agar with E. coli overlay

What constitutes a positive ‘culture’?
When placed on such a culture plate, the trophozoite form of the amoeba will graze, in the process leaving observable trails in the agar
Common Parasitic Pathogens

*Acanthamoeba*: Feeding tracks on non-nutrient agar *E. coli* plate
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- A devastating, sight-threatening keratitis

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What constitutes a positive ‘culture’?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.
What is the most common misdiagnosis of early Acanthamoeba keratitis?
- HSV keratitis

Why HSV?
- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

What constitutes a positive ‘culture’?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar

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- Non-nutrient agar with E. coli overlay

Which form is infectious?
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- The hard-to-kill cyst
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths

Arthropods

What is the most common misdiagnosis of early Acanthamoeba keratitis?
HSV keratitis

Why HSV?

When culturing for Acanthamoeba?
Non-nutrient agar with E. coli overlay

Positive ‘culture’?
When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- *Acanthamoeba*
- *Toxoplasma*

Helminths

Arthropods

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- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

What medium is used when culturing for *Acanthamoeba*?
- Non-nutrient agar with *E. coli* overlay

What constitutes a positive ‘culture’?
- When placed on such a culture plate, the motile trophozoite respond by grazing its way around the plate, in the process leaving **observable trails** in the agar

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- HSV keratitis

Why HSV?
- Because early *Acanthamoeba* keratitis is often dendritic in appearance at the slit lamp
Common Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma

- Helminths

- Arthropods

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What is the most common misdiagnosis of early Acanthamoeba keratitis?
- HSV keratitis

Why HSV?
- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp
Acanthamoeba: (Pseudo)dendrites
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths

Arthropods

Acanthamoeba

- What is the most common misdiagnosis of early Acanthamoeba keratitis?
  - HSV keratitis
- Why HSV?
  - Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

What constitutes a positive 'culture'?
- When culturing for Acanthamoeba?
  - Non-nutrient agar with E. coli overlay
  - When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar

Dendritic in appearance??!! I thought Acanthamoeba was known for having a ring infiltrate. What's the dealio?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
  - Toxoplasma

Helminths

Arthropods

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

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- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

Which form is infectious?
- The motile trophozoite (is infectious!)

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp
**Protozoa**

- **Acanthamoeba**
  - Toxoplasma

**Parasitic pathogens**

- Helminths
- Arthropods

**What is the most common misdiagnosis of early Acanthamoeba keratitis?**

- HSV keratitis

**Why HSV?**

Because early *Acanthamoeba* keratitis is often **dendritic in appearance** at the slit lamp.

**What medium is used when culturing for Acanthamoeba?**

- Non-nutrient agar with E. coli overlay

**What constitutes a positive ‘culture’?**

When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, leaving **observable trails** in the agar.

**Dendritic in appearance??!! I thought *Acanthamoeba* was known for having a ‘ring infiltrate.’ What’s the dealio?**

A ring-shaped infiltrate is indeed classic for *Acanthamoeba*; however, it is a relatively **late** finding in the dz.
Acanthamoeba: Ring-shaped infiltrate
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

Acanthamoeba keratitis?
HSV keratitis

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp.

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?

Dendritic in appearance?!!! I thought a ‘ring infiltrate.’ What’s the dealio?

A ring-shaped infiltrate is indeed classic for Acanthamoeba; however, it is a relatively late finding in the disease.
Acanthamoeba is notorious for causing what sort of ocular infection? A devastating, sight-threatening keratitis.

Acanthamoeba exist in two forms (ie, life-cycle stages). Which form is infectious? The motile trophozoite (is infectious!)

The hard-to-kill cyst.

What medium is used when culturing for Acanthamoeba? Non-nutrient agar with E. coli overlay.

What constitutes a positive 'culture'? When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

Protozoa

Parasitic pathogens

Helminths

Arthropods

Common Parasitic Pathogens

Toxoplasma

Parasitic pathogens

Protozoa

Acanthamoeba

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis? HSV dendrites usually have terminal bulb, whereas Acanthamoeba dendrites don't.

What is the most common misdiagnosis of early Acanthamoeba keratitis? HSV keratitis.

Why HSV? Because early Acanthamoeba keratitis is often dendritic in appearance. Dendritic in appearance??!! I thought Acanthamoeba was known for having a 'ring infiltrate.' What's the dealio? A ring-shaped infiltrate is indeed classic for Acanthamoeba; however, it is a relatively late finding in the disease.

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis? HSV dendrites usually have terminal bulb, whereas Acanthamoeba dendrites don't. Be sure to evaluate all dendrites carefully for the presence of terminal bulbs!
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- *Acanthamoeba*

Helminths

Arthropods

*Toxoplasma*

**Microsporidia**

**Leishmania**

**Acanthamoeba** is notorious for causing what sort of ocular infection?

- A devastating, sight-threatening keratitis

What constitutes a positive 'culture'?

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What is the most common misdiagnosis of early *Acanthamoeba* keratitis?

- HSV keratitis

Why HSV?

- Because early *Acanthamoeba* keratitis is often dendritic in appearance at the slit lamp.

Dendritic in appearance??!! I thought *Acanthamoeba* was known for having a 'ring infiltrate.' What's the dealio?

- A ring-shaped infiltrate is indeed classic for *Acanthamoeba*, however, it is a relatively late finding in the disease.

In what key way do the dendrites of *Acanthamoeba keratitis* differ from those of *HSV keratitis*?

- HSV dendrites usually have terminal bulbs, whereas *Acanthamoeba* dendrites don't.

What medium is used when culturing for *Acanthamoeba*?

- Non-nutrient agar with *E. coli* overlay

Which form is infectious?

- The motile trophozoite (is infectious!)

- The hard-to-kill cyst

What is the life-cycle stage of *Acanthamoeba*?
Common Parasitic Pathogens

HSV dendrites: Terminal bulbs (look carefully)
What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why HSV?

Because early Acanthamoeba keratitis is often dendritic in appearance, it may be mistaken for HSV keratitis which also presents with dendrites.

What medium is used when culturing for Acanthamoeba?

Non-nutrient agar with E. coli overlay

What constitutes a positive ‘culture’?

When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?

HSV dendrites usually have terminal bulbs, whereas Acanthamoeba dendrites don’t. Evaluate all dendrites carefully for the presence of terminal bulbs!
**Common Parasitic Pathogens**

Parasitic pathogens

- Protozoa
  - *Acanthamoeba*
  - Toxoplasma

- Helminths

- Arthropods

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**Acanthamoeba**

- What is the most common misdiagnosis of early *Acanthamoeba* keratitis?
  - HSV keratitis
  - **Why HSV?**
    - Because early *Acanthamoeba* keratitis is often dendritic in appearance at the slit lamp.

- In what key way might the presenting complaint of an *Acanthamoeba* keratitis patient differ from that of an HSV keratitis patient?
  - The patient with *Acanthamoeba* keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea.

- Dendritic in appearance??!! Isn’t that a ‘ring infiltrate.’ What’s the dealio?
  - A ring-shaped infiltrate is indeed classic for *Acanthamoeba*, however, it is a relatively late finding in the dz.

- In what key way do the dendrites of *Acanthamoeba* keratitis differ from those of HSV keratitis?
  - HSV dendrites usually have terminal bulbs, whereas *Acanthamoeba* dendrites don’t. **Evaluate all dendrites carefully for the presence of terminal bulbs!**
Acanthamoeba is notorious for causing what sort of ocular infection?
- A devastating, sight-threatening keratitis

Acanthamoeba exist in two forms (i.e., life-cycle stages). What are they?
- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

What medium is used when culturing for Acanthamoeba?
- Non-nutrient agar with E. coli overlay

What constitutes a positive ‘culture’?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar

What is the most common misdiagnosis of early Acanthamoeba keratitis?
- HSV keratitis

Why HSV?
- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

Dendritic in appearance??!! Isn’t that a ‘ring infiltrate.’ What’s the deal?
- A ring-shaped infiltrate is indeed classic for Acanthamoeba; however, it is a relatively late finding in the dz

In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?
- The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?
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Common Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

Helminths

Arthropods

Toxoplasma

Common Parasitic Pathogens

Microsporidia

Leishmania

Acanthamoeba

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Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?

- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

What medium is used when culturing for Acanthamoeba?

- Non-nutrient agar with E. coli overlay

What constitutes a positive 'culture'?

- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar

What is the most common misdiagnosis of early Acanthamoeba keratitis?

- HSV keratitis

Why HSV?

- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

Dendritic in appearance??!! I thought Acanthamoeba was known for having a ‘ring infiltrate.’ What’s the dealio?

- A ring-shaped infiltrate is indeed classic for Acanthamoeba; however, it is a relatively late finding in the dz

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?

- HSV dendrites usually have terminal bulbs, whereas Acanthamoeba dendrites don’t.

Evaluate all dendrites carefully for the presence of terminal bulbs!

In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?

- The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain

Why is Acanthamoeba keratitis so painful?

- Because the bug has a propensity for perineural invasion
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths

Arthropods

What differential diagnosis would you consider in the absence of a characteristic ring infiltrate in Acanthamoeba keratitis?

HSV keratitis

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance, while HSV keratitis is often interstitial.

Dendritic in appearance?!! Not always.

Why is Acanthamoeba keratitis still so painful? Because the bug has a propensity for perineural invasion.

In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?

The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain compared to the clinical picture.

Why is Acanthamoeba keratitis so painful?
Because the bug has a propensity for perineural invasion.

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance, which is similar to HSV keratitis.

Dendritic in appearance??!! Not always.

Why is Acanthamoeba keratitis still so painful?
Because the bug has a propensity for perineural invasion.

A ring-shaped infiltrate is indeed classic for Acanthamoeba; however, it is a relatively late finding in the disease.
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Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?
- The motile trophozoite (is infectious!)
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What medium is used when culturing for Acanthamoeba?
- Non-nutrient agar with E. coli overlay

What constitutes a positive 'culture'?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

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Dendritic in appearance??!! I thought Acanthamoeba was known for having a 'ring infiltrate.' What's the dealio?
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- The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea.

Why is Acanthamoeba keratitis so painful?
- Because the bug has a propensity for perineural invasion

Evaluate all dendrites carefully for the presence of terminal bulbs!
Common Parasitic Pathogens

Protozoa

- Toxoplasma

- Acanthamoeba

- Microsporidia

- Leishmania

Parasitic pathogens

Acanthamoeba

- notorious for causing what sort of ocular infection?
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Acanthamoeba

- exist in two forms (ie, life-cycle stages). What are they?
- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

What medium is used when culturing for Acanthamoeba?
- Non-nutrient agar with E. coli overlay

What constitutes a positive 'culture'?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar

Protozoa

- What is the most common misdiagnosis of early Acanthamoeba keratitis?
- HSV keratitis

- Why HSV?
- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp

Dendritic in appearance?!!! No, Acanthamoeba dendrites don't. Evaluate all dendrites carefully for the presence of terminal bulbs!

A ring-shaped infiltrate is indeed classic for Acanthamoeba, however, it is a relatively late finding in the dz

- In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?
- HSV dendrites usually have terminal bulbs, whereas Acanthamoeba dendrites don't.

- How specific for Acanthamoeba is this sign?
- The Cornea book says it's "nearly pathognomonic for amebic keratitis"

- In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?
- The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea

Why is Acanthamoeba keratitis so painful?
- Because the bug has a propensity for perineural invasion

- Does perineural invasion manifest in manner visible at the slit lamp?
- It can—it presents as whitish radial lines (these are the inflamed nerves)

When present, what is this sign called?
- Radial perineuritis (or keratoneuritis)
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- Toxoplasma
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- Microsporidia
- Leishmania

Acanthamoeba

- A devastating, sight-threatening keratitis

Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?

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What medium is used when culturing for Acanthamoeba?

Non-nutrient agar with E. coli overlay

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Protozoa

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HSV keratitis

Why HSV?

Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp.

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The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea.

Why is Acanthamoeba keratitis so painful?

Because the bug has a propensity for perineural invasion.

Does perineural invasion manifest in manner visible at the slit lamp?

It can—it presents as whitish radial lines (these are the inflamed nerves).

Radial perineuritis (or keratoneuritis)

How specific for Acanthamoeba is this sign?

The Cornea book says it's "nearly pathognomonic for amebic keratitis".
Common Parasitic Pathogens

Acanthamoeba: Perineural invasion
Acanthamoeba is notorious for causing what sort of ocular infection?
- A devastating, sight-threatening keratitis

Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?
- The motile trophozoite (is infectious!)
- The hard-to-kill cyst

What medium is used when culturing for Acanthamoeba?
- Non-nutrient agar with E. coli overlay

What constitutes a positive 'culture'?
- When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

What is the most common misdiagnosis of early Acanthamoeba keratitis?
- HSV keratitis

Why HSV?
- Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp.

Dendritic in appearance??!! But isn’t a 'ring infiltrate' what’s classic for Acanthamoeba? A ring-shaped infiltrate is indeed classic for Acanthamoeba, however, it is a relatively late finding in the disease.

In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?
- HSV dendrites usually have terminal bulbs, whereas Acanthamoeba dendrites don't.

Evaluate all dendrites carefully for the presence of terminal bulbs!

In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?
- The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea.

Why is Acanthamoeba keratitis so painful?
- Because the bug has a propensity for perineural invasion.

Does perineural invasion manifest in manner visible at the slit lamp?
- It can—it presents as whitish radial lines (these are the inflamed nerves)

When present, what is this sign called?
- Radial perineuritis (or keratoneuritis)

How specific for Acanthamoeba is this sign?
- The Cornea book says it's "nearly pathognomonic for amebic keratitis."

Protozoa

Parasitic pathogens

Common Parasitic Pathogens

- Toxoplasma
- Parasitic pathogens
- Arthropods
- Helminths
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- Toxoplasma
- Acanthamoeba
- Microsporidia
- Leishmania

Acanthamoeba

- Notorious for causing what sort of ocular infection?
  - A devastating, sight-threatening keratitis

- Exist in two forms (ie, life-cycle stages). What are they?
- Which form is infectious?
  - The motile trophozoite (is infectious!)
- The hard-to-kill cyst

- What medium is used when culturing for Acanthamoeba?
  - Non-nutrient agar with E. coli overlay

- What constitutes a positive 'culture'?
  - When placed on such a culture plate, the motile trophozoite form of the amoeba will respond by grazing its way around the plate, in the process leaving observable trails in the agar.

HSV keratitis

- What is the most common misdiagnosis of early Acanthamoeba keratitis?
  - HSV keratitis
- Why HSV?
  - Because early Acanthamoeba keratitis is often dendritic in appearance at the slit lamp.

- Why is Acanthamoeba keratitis so painful?
  - Because the bug has a propensity for perineural invasion.

- Does perineural invasion manifest in manner visible at the slit lamp?
  - It can—it presents as whitish radial lines (these are the inflamed nerves)

- When present, what is this sign called?
  - Radial perineuritis (or keratoneuritis)

- In what key way do the dendrites of Acanthamoeba keratitis differ from those of HSV keratitis?
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- In what key way might the presenting complaint of an Acanthamoeba keratitis patient differ from that of an HSV keratitis patient?
  - The patient with Acanthamoeba keratitis will complain of pain that seems out of proportion to the clinical picture, while the HSV keratitis patient will have less pain than would be expected given the appearance of the cornea.

- Why is Acanthamoeba keratitis so painful? perineural invasion
Parasitic pathogens

Acanthamoeba

Does perineural invasion manifest in manner visible at the slit lamp?
It can—it presents as whitish radial lines (these are the inflamed nerves)

When present, what is this sign called?
Radial perineuritis (or keratoneuritis)

How specific for Acanthamoeba is this sign?

Why HSV?
Because early Acanthamoeba keratitis is often dendritic in appearance

HSV keratitis

Why is Acanthamoeba keratitis so painful?
Because the bug has a propensity for perineural invasion

Dendritic in appearance??!! It's a 'ring infiltrate.' What's the dealio?
A ring-shaped infiltrate is indeed classic for Acanthamoeba, however, it is a relatively late finding in the dz

Evaluated all dendrites carefully for the presence of terminal bulbs!
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- **Acanthamoeba**

**HSV keratitis**

What is the most common misdiagnosis of early Acanthamoeba keratitis?

**HSV keratitis**

Why HSV?

Because early Acanthamoeba keratitis is often dendritic in appearance, at the slit lamp.

When present, what is this sign called?

A ring-shaped infiltrate.

What is the most common misdiagnosis of early Acanthamoeba keratitis?

**HSV keratitis**

Why HSV?

Because early Acanthamoeba keratitis is often dendritic in appearance, at the slit lamp.

**When present, what is this sign called?**

A ring-shaped infiltrate.

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It can—it presents as whitish radial lines (these are the inflamed nerves).

When present, what is this sign called?

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The *Cornea* book says it’s “nearly pathognomonic for amebic keratitis”

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Why is Acanthamoeba keratitis so painful?

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**Acanthamoeba** dendrites don't. Evaluate all dendrites carefully for the presence of terminal bulbs!
What is the full name of the causative organism in ocular toxoplasmosis?

Toxoplasma gondii
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

What is the full name of the causative organism in ocular toxoplasmosis?
Toxoplasma gondii

Everywhere—it has a worldwide distribution
Yes—it's likely that a billion people are infected worldwide

What animal is its definitive host?
The cat
Common Parasitic Pathogens

Toxoplasma gondii
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

What is the full name of the causative organism in ocular toxoplasmosis? *Toxoplasma gondii*

*Where in the world can T gondii be found?*
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

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Parasitic pathogens

Protozoa

- Acanthamoeba
- **Toxoplasma**
- Microsporidia

Helminths

Arthropods

What is the full name of the causative organism in ocular toxoplasmosis? **Toxoplasma gondii**

*Where in the world can T gondii be found? Is it a common human pathogen?*

Everywhere—it has a worldwide distribution.
What is the full name of the causative organism in ocular toxoplasmosis? *Toxoplasma gondii*

*Where in the world can T. gondii be found? Is it a common human pathogen?*
Everywhere—it has a worldwide distribution. Yes—it’s likely that a big number of people are infected worldwide.
Common Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
- Helminths
- Arthropods

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*What animal is its definitive host?*
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*What animal is its definitive host?* The cat
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

What is the full name of the causative organism in ocular toxoplasmosis?
Toxoplasma gondii

Where in the world can T. gondii be found? Is it a common human pathogen?
Everywhere—it has a worldwide distribution
Yes—it’s likely that a billion people are infected worldwide

What animal is its definitive host?
The cat

Which ocular structures are most commonly involved in Toxoplasma infection?
The retina and choroid

Is toxoplasmosis a common form of infectious posterior uveitis?
It is indeed—in fact, it is the most common
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

 Protozoa

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The retina and choroid

Is toxoplasmosis a common form of infectious posterior uveitis?

It is indeed—in fact, it is the most common
Classic presentation of *Toxoplasma* retinochoroiditis: An active retinal lesion next to an old inactive scar
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

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Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
- Helminths
- Arthropods

**Common Parasitic Pathogens**

**Protozoa**

- Toxoplasma

**Helminths**

**Arthropods**

**What is the full name of the causative organism in ocular toxoplasmosis?**

*Toxoplasma gondii*

**Where in the world can *T. gondii* be found? Is it a common human pathogen?**

Everywhere—it has a worldwide distribution.
Yes—it’s likely that a billion people are infected worldwide.

**What animal is its definitive host?**

The cat.

**Which ocular structures are most commonly involved in *Toxoplasma* infection?**

The retina and choroid.

**Is toxoplasmosis a common form of infectious posterior uveitis?**

It is indeed—in fact, it is the **most** common.

*Which ocular structures are most commonly involved in Toxoplasma infection?*
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*Is toxoplasmosis a common form of infectious posterior uveitis?*
It is indeed—in fact, it is the **most** common.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
Leishmania

Arthropods

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It is indeed—in fact, it is the most common

What are the three common means of catching the toxo bug?

- Ingestion of undercooked meat (#1 type: pork) that harbors toxo cysts
- Ingestion of cysts directly from cat feces (well, not directly)
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
  - Acanthamoeba
  - *Toxoplasma*
  - Microsporidia

Helminths
  - *Toxoplasma*

Arthropods

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What are the three common means of catching the toxo bug?
--Transplacentally
--Ingestion of undercooked meat (#1 type: pork) that harbors toxo cysts
--Ingestion of cysts directly from cat feces (well, not directly)
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Leishmania

Arthropods

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- Ingestion of cysts directly from cat feces (well, not directly)

Parasitic pathogens

**Toxoplasmosis** has its own slide-set (U7); see it for more detail re this very important bug!

- **Protozoa**
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

**What is the full name of the causative organism in ocular toxoplasmosis?**

- **Toxoplasma gondii**

**Where in the world can T. gondii be found? Is it a common human pathogen?**

- Everywhere—it has a worldwide distribution
- Yes—it's likely that a billion people are infected worldwide

**What animal is its definitive host?**

- The cat

**Which ocular structures are most commonly involved in Toxoplasma infection?**

- The retina and choroid

**Is toxoplasmosis a common form of infectious posterior uveitis?**

- It is indeed—in fact, it is the **most** common

**What are the three common means of catching the toxo bug?**

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- Ingestion of undercooked meat (#1 type: pork) that harbors toxo cysts
- Ingestion of cysts directly from cat feces (well, not directly)

Toxoplasmosis has its own slide-set (U7); see it for more detail re this very important bug!
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

Note: The Cornea book mentions that there is evidence suggesting Microsporidia might actually be a fungus, but for now it is still classified (by the book) as a protozoan.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

Note: The Cornea book mentions that there is evidence suggesting Microsporidia might actually be a fungus, but for now it is still classified (by the book) as a protozoan.
What sort of ocular infection is caused by Microsporidia?

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Arthropods

Common Parasitic Pathogens
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis?

AIDS patients
What sort of ocular infection is caused by Microsporidia? Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis? AIDS patients
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis?
AIDS patients

What is the classic presentation of Microsporidia conjunctivitis?
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis?
AIDS patients

What is the classic presentation of Microsporidia conjunctivitis?
Bilateral irritation, photophobia, decreased vision, and conjunctival injection
Microsporidia keratoconjunctivitis
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis?
AIDS patients

What is the classic presentation of Microsporidia conjunctivitis?
Bilateral irritation, photophobia, decreased vision, and conjunctival injection

What is the treatment for Microsporidia keratitis?
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

Who (ie, what pt population) gets Microsporidia keratoconjunctivitis?
AIDS patients

What is the classic presentation of Microsporidia conjunctivitis?
Bilateral irritation, photophobia, decreased vision, and conjunctival injection

What is the treatment for Microsporidia keratitis?
Topical fumagillin
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

What ophthalmic condition is associated with Leishmania?
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

What ophthalmic condition is associated with Leishmania?
An eyelid ulcer as a manifestation of cutaneous leishmaniasis (the general term for the condition caused by this protozoan)
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
  - Leishmania

Helminths

Arthropods

What ophthalmic condition is associated with Leishmania?
An eyelid ulcer as a manifestation of *cutaneous leishmaniasis*
(the general term for the condition caused by this protozoan)

What is the mechanism by which humans become infected?
Common Parasitic Pathogens

Paraesthetic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

What ophthalmic condition is associated with Leishmania?
An eyelid ulcer as a manifestation of cutaneous leishmaniasis (the general term for the condition caused by this protozoan)

What is the mechanism by which humans become infected?
Via a bite by the (female) sandfly
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- ?
- ?
-?

Arthropods

Common Parasitic Pathogens

Three worms addressed in the BCSC
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Three worms addressed in the BCSC
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- **Toxocara**
- Onchocerca

Arthropods

Toxocara has its own slide-set (U22)
The three helminths implicated in DUSN are covered in slide-set R15.
The three helminths implicated in DUSN are covered in slide-set R15.

What does DUSN stand for in this context?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

The three helminths implicated in DUSN are covered in slide-set R15

What does DUSN stand for in this context? Diffuse unilateral subacute neuroretinitis
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

The three helminths implicated in DUSN are…?
are covered in slide-set R15
The three helminths implicated in DUSN are…?
are covered in slide-set R15
Parasitic pathogens

- **Protozoa**
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

- **Helminths**
  - *Toxocara*
  - *Onchocerca*
  - *Loa Loa*

Re helminthic ocular conditions…
Which causes a condition known as *river blindness*?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions…
Which causes a condition known as river blindness? Onchocerca
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Re helminthic ocular conditions...
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly?
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions…
Which causes a condition known as river blindness? *Onchocerca*
Which is transmitted via the bite of the blackfly? *Onchocerca*
Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

- Helminths
  - Toxocara
  - Onchocerca
    - Transmitted by the blackfly
  - Loa Loa
    - Transmitted by the sandfly

- Arthropods

Re helminthic ocular conditions...

Take note, and don’t get them confused!
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions…
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly? Onchocerca
Which can be observed moving beneath the conjunctiva?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions…
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly? Onchocerca
Which can be observed moving beneath the conjunctiva? Loa Loa
Loa Loa. Yikes
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions...
Which causes a condition known as river blindness? *Onchocerca*
Which is transmitted via the bite of the blackfly? *Onchocerca*
Which can be observed moving beneath the conjunctiva? *Loa Loa*
Which can be observed swimming in the AC?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
  - Onchocerca
  - Loa Loa

Arthropods

Re helminthic ocular conditions...
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly? Onchocerca
Which can be observed moving beneath the conjunctiva? Loa Loa
Which can be observed swimming in the AC? Onchocerca
Common Parasitic Pathogens

*Onchocerca* swimming in the AC (the video is more impressive)

https://www.youtube.com/watch?v=_xljzQAstaM
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions...
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly? Onchocerca
Which can be observed moving beneath the conjunctiva? Loa Loa
Which can be observed swimming in the AC? Onchocerca
Which is a resident parasite in dogs?
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions...
Which causes a condition known as river blindness? Onchocerca
Which is transmitted via the bite of the blackfly? Onchocerca
Which can be observed moving beneath the conjunctiva? Loa Loa
Which can be observed swimming in the AC? Onchocerca
Which is a resident parasite in dogs? Toxocara
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

Is onchocerciasis a serious condition? Indeed it is (it ain't called river blindness for nothing!) Is it common? Yep—it's among the most common causes of infectious visual morbidity. Where in the world is it found? While it can be found in both Latin America and the Middle East, the locale where it is really a problem is sub-Saharan Africa. In fact, it's sometimes called African river blindness.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara

Arthropods
- Onchocerca

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Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

Is onchocerciasis a serious condition? Indeed it is (it ain’t called river **blindness** for nothing!)

Is it common?
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

Is onchocerciasis a serious condition?
Indeed it is (it ain’t called river blindness for nothing!)

Is it common?
Yep—it’s the second most common cause of infectious visual morbidity
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
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Arthropods

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What’s the most common cause of infectious visual morbidity?
(You know this one!)
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa
- Re helminthic ocular conditions…
  Which causes a condition known as river blindness?
  Onchocerca (transmitted via the bite of the blackfly)
  Which can be observed moving beneath the conjunctiva?
  Loa Loa (can be observed swimming in the AC)
  Which is a resident parasite in dogs?
  Toxocara

Arthropods

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(You know this one!)
Trachoma (told ya!)
Parasitic pathogens

 Protozoa
   - Acanthamoeba
   - Toxoplasma

 Helminths
   - Toxocara
   - Onchocerca

 Arthropods

Is onchocerciasis a serious condition? Indeed it is (it ain’t called river blindness for nothing!)

OK fair, I get the ‘blindness’ part of the name now. But why is it called river blindness?

Is visual morbidity? Onchocerca

Why is it called river blindness? Onchocerca

Why is it called river blindness? Onchocerca

Why is it called river blindness? Onchocerca

Why is it called river blindness? Onchocerca
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
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- Loa Loa

Arthropods

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Where in the world is it found? While it can be found in both Latin America and the Middle East, the locale where it is really a problem is sub-Saharan Africa. In fact, it’s sometimes called African river blindness.

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Arthropods

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Where in the world does it occur?
**Parasitic pathogens**

- **Protozoa**
  - Acanthamoeba
  - Toxoplasma

- **Helminths**
  - Toxocara
  - Onchocerca
  - Loa Loa

- **Arthropods**

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Protozoa
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Helminths
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Arthropods

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Arthropods

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Where in the world does it occur?
While it can be found in both Latin America and the Middle East, the locale where it is really a problem is sub-Saharan Africa.

What proportion of cases are in Africa?
99%
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Toxocara
- Leishmania

Helminths
- Onchocerca
- Loa Loa
- Toxocara
- Microsporidia

Arthropods

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Onchocerciasis distribution
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How do humans acquire the worm?
Parasitic pathogens

Protozoa
- *Acanthamoeba*
- *Toxoplasma*

Helminths
- *Toxocara*
- *Onchocerca*

Arthropods

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Parasitic pathogens

Protozoa
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- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

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Common Parasitic Pathogens

Onchocerciasis: Skin nodules
Parasitic pathogens

Protozoa
- *Acanthamoeba*
- *Toxoplasma*

Helminths
- *Toxocara*
- *Onchocerca*

Arthropods

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Common Parasitic Pathogens

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Common Parasitic Pathogens

Uterus of an adult female worm chock-full of microfilariae
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara

Arthropods
- Onchocerca

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How big is the microfilariae form of the worm? About a third of a millimeter.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

---

**How big is the microfilariae form of the worm?**
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**Is onchocerciasis**

- protozoa: Acanthamoeba, Toxoplasma
- helminths: Toxocara, Onchocerca
- arthropods: Helminthic ocular conditions

Common Parasitic Pathogens

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Onchocerca: Microfilariae
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

How do humans acquire the worm? They are bitten by a blackfly (you knew that already) carrying the microfilariae form of the worm, which is transmitted by the bite.

How big is the microfilariae form of the worm? About a third of a millimeter.

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How big is the adult form of the worm? About a meter.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

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How big is the adult form of the worm?
Up to a meter

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How big is the adult form of the worm?
Up to a meter
Parasitic pathogens

Common Parasitic Pathogens

Protozoa
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- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

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How big is the microfilariae form of the worm? About a third of a millimeter

How big is the adult form of the worm? Up to a meter

No, seriously—how big is it? I'm not even kidding—the adult female can be up to a meter long.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

How do humans acquire the worm? They are bitten by a blackfly (you knew that already).

How big is the microfilariae form of the worm? About a third of a millimeter.

How big is the adult form of the worm? Up to a meter.

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Common Parasitic Pathogens
Common Parasitic Pathogens

Onchocerca: Three adult males, and a female
Parasitic pathogens

Protozoa

- Acanthamoeba
- Toxoplasma

Helminths

- Toxocara
- Onchocerca
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Which ophthalmic structures can be affected by the worm? - Sclerosing keratitis
- Glaucoma
- Uveitis
- Cataracts
- Chorioretinitis with late optic atrophy

Including the eye
Parasitic pathogens

Protozoa
- Acanthamoeba
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Which ophthalmic structures can be affected by the worm?
Any of them, from the lids to the retina, including the eye.

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How do humans acquire the worm? They are bitten by a blackfly (you knew that already) carrying the microfilariae form of the worm, which is transmitted by the bite.

What do the microfilariae do upon entering a host? They form the subcutaneous nodules that are classic for the condition. Over the course of the next year they grow into the adult form of the worm. The adults then start cranking out microfilariae by the millions, which disseminate throughout the body, including the eye.

Which ophthalmic structures can be affected by the worm? Any of them, from the lids to the retina, including the eye.

In what specific ways can onchocerciasis cause blindness?

Which is transmitted via the bite of the blackfly?

Which can be observed swimming in the AC?

Which is a resident parasite in dogs?
Parasitic pathogens

Protozoa
- *Acanthamoeba*
- *Toxoplasma*

Helminths
- *Toxocara*
- *Onchocerca*
- *Loa Loa*

Arthropods

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Which ophthalmic structures can be affected by the worm?
Any of them, from the lids to the retina including the eye.

In what specific ways can onchocerciasis cause blindness?
- Sclerosing keratitis
- Glaucoma
- Uveitis
- Cataracts
- Chorioretinitis with late optic atrophy

Is onchocerciasis a serious condition?
Indeed it is (it ain't called river blindness for nothing!)

Is it common?
Yep—it's among the most common causes of infectious visual morbidity.

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Helminths
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- Chorioretinitis with late optic atrophy

All this being said, onchocerciasis appears in only two BCSC books: *Cornea* and *Uveitis*, and gets more love in the *Cornea* book. Thus, if you remember nothing else about it, remember that it can cause a severe sclerosing keratitis!
Common Parasitic Pathogens

Onchocerciasis: Sclerosing keratitis
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca

Arthropods
- ?
- ?

Two bugs addressed in the BCSC
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirius
- Demodex

Two bugs addressed in the BCSC
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca

Arthropods
- Phthirus
- Demodex

What is the common name of Phthirus pubis?
Common Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

- Helminths
  - Toxocara
  - Onchocerca

- Arthropods
  - Phthirus
  - Demodex

What is the common name of Phthirus pubis? The crab louse—’crabs’ for short
Hi there!
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca

Arthropods
- Phthirus
- Demodex

What is the common name of Phthirus pubis?
The crab louse—’crabs’ for short

What ophthalmic condition does it cause?
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca

Arthropods
- Phthirus
- Demodex

**What is the common name of Phthirus pubis?**
The crab louse—’crabs’ for short

**What ophthalmic condition does it cause?**
If it takes hold in the lashes, blepharoconjunctivitis will result
Common Parasitic Pathogens

Phthirus pubis on the eyelid
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Protozoa

Helminths
- Toxocara
- Onchocerca

Helminths

Arthropods
- Phthirus
- Demodex

Arthropods

What is the common name of Phthirus pubis?
The crab louse—’crabs’ for short

What ophthalmic condition does it cause?
If it takes hold in the lashes, blepharoconjunctivitis will result

How is Phthirus infestation of the lashes and eyebrows acquired?

If it takes hold in the lashes
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca

Arthropods
- Phthirus
- Demodex

What is the common name of Phthirus pubis?
The crab louse—’crabs’ for short

What ophthalmic condition does it cause?
If it takes hold in the lashes, blepharoconjunctivitis will result

How is Phthirus infestation of the lashes and eyebrows acquired?
It’s a venereal disease. Use your imagination.
Parasitic pathogens

Common Parasitic Pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

- Helminths
  - Toxocara
  - Onchocerca
  - Loa Loa

- Arthropods
  - Phthirus

**Awkward. How about Demodex—is it acquired in like manner?**
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
  - Demodex

Awkward. How about Demodex—is it acquired in like manner? No, it's part of the normal fauna of the lashes and adnexa.
Common Parasitic Pathogens

Demodex
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

Awkward. How about Demodex—is it acquired in like manner? No, it’s part of the normal fauna of the lashes and adnexa.

How common is Demodex infestation?
**Parasitic pathogens**

**Protozoa**
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

**Helminths**
- Toxocara
- Onchocerca
- Loa Loa

**Arthropods**
- Phthirus
- **Demodex**

**Common Parasitic Pathogens**

Awkward. How about Demodex—is it acquired in like manner? No, it’s part of the normal fauna of the lashes and adnexa.

How common is Demodex infestation? Very (it approaches 100% in the elderly).
Awkward. How about Demodex—is it acquired in like manner? No, it's part of the normal fauna of the lashes and adnexa.

How does Demodex infestation manifest clinically?
Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

- Helminths
  - Toxocara
  - Onchocerca
  - Loa Loa

- Arthropods
  - Phthirus
  - **Demodex**

**Awkward. How about Demodex—is it acquired in like manner?**
No, it's part of the normal fauna of the lashes and adnexa.

**How does Demodex infestation manifest clinically?**
As waxy sleeves on the proximal lashes.
Common Parasitic Pathogens

Demodex: Eyelash sleeves
These are *Demodex* mites next to an eyelash within the follicle opening. Note their size.
These are *Demodex* mites next to an eyelash within the follicle opening. Note their size.

Take-home point: *Demodex* are NOT visible at the slit lamp. The only slit-lamp sign of *Demodex* is sleeving of the lash base.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

Awkward. How about Demodex—is it acquired in like manner? No, it's part of the normal fauna of the lashes and adnexa.

How does Demodex infestation manifest clinically? As waxy sleeves on the proximal lashes.

What ophthalmic condition does it cause?
Awkward. How about Demodex—is it acquired in like manner? No, it's part of the normal fauna of the lashes and adnexa

How does Demodex infestation manifest clinically? As waxy sleeves on the proximal lashes

What ophthalmic condition does it cause? Blepharoconjunctivitis