Common Parasitic Pathogens

Parasitic pathogens

Three types of parasitic pathogen

?  ?  ?
Protozoa

Parasitic pathogens

Helminths

Arthropods

Three types of parasitic pathogen
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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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 The term *protozoa* is considered outdated by modern biologists, but it persists in the ophthalmic literature.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?
Broadly speaking, what are protozoa?

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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?
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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.
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.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
Helminths
Arthropods

Finally—what are 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 (ie, life-cycle stages). What are they?

- The motile trophozoite (infectious)
- The hard-to-kill cyst
Acanthamoeba is notorious for causing what sort of ocular infection?
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Acanthamoeba exist in two forms (ie, life-cycle stages). What are they?

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Common Parasitic Pathogens

Trophozoite form

Acanthamoeba
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Common Parasitic Pathogens

Acanthamoeba

Trophozoite form

Cyst form
Acanthamoeba is notorious for causing what sort of ocular infection? A devastating, sight-threatening keratitis.

Acanthamoeba exist in two (2) life-cycle stages. What are they? Which form is infectious?

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

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

Protozoa

A devastating, sight-threatening keratitis

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What medium is used 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.
Acanthamoeba is notorious for causing what sort of ocular infection? 
A devastating, sight-threatening keratitis

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--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 trophozoite form of the amoeba will graze, in the process leaving observable trails in the agar.
Acanthamoeba: Feeding tracks on non-nutrient agar E coli plate
**Common Parasitic Pathogens**

**Parasitic pathogens**

- Protozoa
  - *Acanthamoeba*
- Helminths
- Arthropods

**Protozoa**

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

- Non-nutrient agar with E. coli overlay

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

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Toxoplasma
Parasitic pathogens

- Protozoa
  - *Acanthamoeba*
- Helminths
- Arthropods

**Common Parasitic Pathogens**

**Parasitic pathogens**

- Toxoplasma
- *Acanthamoeba*
- Helminths
- Arthropods

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

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

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

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Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- Acanthamoeba

Helminths

- Toxoplasma

Arthropods

- Microsporidia
- Leishmania

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HSV keratitis

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

*Acanthamoeba*: (Pseudo)dendrites
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’?
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**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

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

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**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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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.
Acanthamoeba: Ring-shaped infiltrate
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

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

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

Acanthamoeba

Toxoplasma

Helminths

Arthropods

Common Parasitic Pathogens

Parasitic pathogens

Acanthamoeba

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HSV keratitis

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What medium is used when culturing for Acanthamoeba?

Non-nutrient agar with E. coli overlay

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.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

Helminths

Arthropods

Protozoa

Acanthamoeba

Toxoplasma

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Acanthamoeba keratitis?
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Common Parasitic Pathogens

HSV dendrites: Terminal bulbs (look carefully)
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- **Acanthamoeba**

Helminths

Arthropods

**Toxoplasma**

**Microsporidia**

**Leishmania**

**Acanthamoeba**

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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!

What is notable about Acanthamoeba? It is notorious for causing what sort of ocular infection?
- A devastating, sight-threatening keratitis

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?
- Non-nutrient agar with E. coli overlay

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

- The hard-to-kill cyst
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- *Acanthamoeba*
- *Toxoplasma*

Helminths

Arthropods

*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

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 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

HSV dendrites usually have terminal bulbs, whereas *Acanthamoeba* dendrites don’t. Evaluate all dendrites carefully for the presence of terminal bulbs!
What is the most common misdiagnosis of early Acanthamoeba keratitis?

Acanthamoeba keratitis

Why HSV?

-- Because early Acanthamoeba keratitis is often dendritic in appearance
-- HSV keratitis is usually less painful
-- Dendrites of HSV keratitis usually have terminal bulbs, whereas Acanthamoeba keratitis does not.

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.

HSV keratitis

Dendritic in appearance?!

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

A canthamoeba is notorious for causing what sort of ocular infection?

A devastating, sight-threatening keratitis

Acanthamoeba exists 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’?

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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

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

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

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.

Acanthamoeba 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.

Protozoa

Acanthamoeba

Toxoplasma

Helminths

Arthropods

Common Parasitic Pathogens

Parasitic pathogens

Microsporidia

Leishmania
**Common Parasitic Pathogens**

**Parasitic pathogens**

- **Protozoa**
  - *Acanthamoeba*
  - *Toxoplasma*

- **Helminths**

- **Arthropods**

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**Acanthamoeba**

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

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

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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?**

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**Why 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
- 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
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

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Protozoa

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- **Toxoplasma**
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Toxoplasma gondii
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*Toxoplasma gondii*

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Parasitic pathogens

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

Parasitic pathogens

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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
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

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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

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?

What animal is its definitive host?
The cat
Parasitic pathogens

Common Parasitic Pathogens

Protozoa

- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

- Leishmania

Arthropods

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Parasitic pathogens

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Helminths

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Common Parasitic Pathogens

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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)
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

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Common Parasitic Pathogens

Parasitic pathogens

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

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- Toxoplasma
- Microsporidia

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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
What sort of ocular infection is caused by Microsporidia?

Microsporidia keratoconjunctivitis

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
What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

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

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths

Arthropods

What sort of ocular infection is caused by Microsporidia?
Keratoconjunctivitis

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

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Bilateral irritation, photophobia, decreased vision, and conjunctival injection
Acute/Hyperacute Conjunctivitis

*Microsporidia* keratoconjunctivitis
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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

Helminths
- Leishmania

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)
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?
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?
Via a bite by the (female) sandfly
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- ?
- ?

Arthropods
- 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)
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
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

What does DUSN stand for in this context?

The three helminths implicated in DUSN are covered in slide-set R15.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia
  - Leishmania

Helminths
  - Toxocara
  - Onchocerca
  - Loa Loa

Arthropods

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

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

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Next Q

The three helminths implicated in DUSN are...?
are covered in slide-set R15
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa
- Baylisascaris; Ancylostoma

Arthropods

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

Arthropods

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 in transmitted by the blackfly
- Loa Loa
- Leishmania in transmitted by the sandfly

Arthropods

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*
Common Parasitic Pathogens

Loa Loa. Yikes
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?
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? 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
- Onchocerca

Arthropods

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Protozoa
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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
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

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

What’s the most common cause of infectious visual morbidity? (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 onchocerciasis a serious condition? Onchocerca

But why is it called river blindness? Onchocerca

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.

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

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

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?
The blackfly lives only near fast-flowing rivers, so cases tend to cluster around them

Is visual morbidity

River blindness? Onchocerca
Cervical lymphadenopathy? Leishmania
Trachoma? Toxoplasma
Trichinellosis? Toxocara

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But why is it called river blindness?
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Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara

Arthropods
- Loa Loa
- Onchocerca

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

Where in the world does it occur?
Parasitic pathogens

Common Parasitic Pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
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- Onchocerca

Arthropods

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Where in the world does it occur?
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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
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

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

Helminths
- Toxocara
- Onchocerca

Arthropods

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99%
Onchocerciasis distribution
Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
- Helminths
  - Toxocara
  - Onchocerca
- 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. In fact, it’s sometimes called **African** river blindness.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
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Helminths
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- Onchocerca

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. In fact, it's sometimes called African river blindness.

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.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

- Loa Loa

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Protozoa
- Acanthamoeba
- Toxoplasma

Helminths

Arthropods

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Parasitic pathogens

Protozoa
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- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods

Common Parasitic Pathogens

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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.

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.

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 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. In fact, it's sometimes called African river blindness.

How do they get the bug?
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.
Common Parasitic Pathogens

Onchocerciasis: Skin nodules
Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
- Helminths
  - Toxocara
  - Onchocerca
- Arthropods

**Common Parasitic Pathogens**

**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.

**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 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. In fact, it’s sometimes called African river blindness.

**How do we get rid of it?**
Medications and treatment are available.
Uterus of an adult female worm chock-full of microfilariae
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!)

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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. In fact, it's sometimes called *African river blindness.*

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.

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

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

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

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.

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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.

How big is the microfilariae form of the worm?
About a third of a millimeter
Onchocerca: Microfilariae
Common Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

Toxoplasma

Helminths

Toxocara

Onchocerca

Loa Loa

Arthropods

Onchocerca

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

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.

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

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Common Parasitic Pathogens

- Protozoa
- Helminths
- Arthropods

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

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 the microfilariae 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.

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

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 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. In fact, it's sometimes called African river blindness.

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 the microfilariae 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.

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
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.

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, these nodules 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.

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.

How big is the adult form of the worm? No, seriously—how big is it? Up to a meter. Indeed it is (it ain’t called river blindness for nothing!)

Is onchocerciasis a serious condition? Yes—indeed it is (it ain’t called river blindness for nothing!). It’s among the most common causes of infectious visual morbidity. 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.

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. In fact, it’s sometimes called African river blindness.
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Loa Loa
- 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 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. In fact, it’s sometimes called African river blindness.

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.

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 a meter long
Common Parasitic Pathogens

*Onchocerca*: Three adult males, and a female
Common Parasitic Pathogens

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 then travels to the host's tissues.

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.

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.

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. In fact, it’s sometimes called African river blindness.
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Protocols for acquiring the worm:
- Bitten by a blackfly carrying the microfilariae form of the worm

What do the microfilariae do?
- Form subcutaneous nodules
- Grow into the adult form of the worm
- 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

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

Is it common?
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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. It's sometimes called African river blindness.

How do humans acquire the worm?
- Bitten by a blackfly carrying the microfilariae form of the worm

What do the microfilariae do upon entering a host?
- Grow into the adult form of the worm
- Disseminate throughout the body, including the eye
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca

Arthropods
- Loa Loa

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

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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 a 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.

In what specific ways can onchocerciasis cause blindness? --

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Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

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

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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. In fact, it's sometimes called African river blindness.

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 nodule that is classic for the condition. Over the course of the next year, the microfilariae grow into the adult form of the worm. The adult worm then starts producing 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

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

Protozoa
- Acanthamoeba
- Toxoplasma

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Protozoa

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.

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 adult worm microfilariae by the millions, disseminating throughout the body, including the eye.

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

In what specific ways can onchocerciasis cause blindness?
- Sclerosing keratitis
- Glaucoma
- Uveitis
- Cataracts
- 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
- Loa Loa

Arthropods

Two bugs addressed in the BCSC
Common Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

Two bugs addressed in the BCSC
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

If it takes hold in the lashes, blepharoconjunctivitis will result.
Parasitic pathogens

**Common Parasitic Pathogens**

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

- **Helminths**
  - Toxocara
  - Onchocerca

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

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**What is the common name of Phthirus pubis?**

The crab louse—‘crabs’ for short
Hi there!
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?
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

Helminths
- Toxocara
- Onchocerca

Arthropods
- Phthirus
- Demodex

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

If it takes hold in the lashes, blepharoconjunctivitis will result

How is Phthirus infestation of the lashes and eyebrows acquired?
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.
Awkward. How about Demodex—is it acquired in like manner?
Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia
- Leishmania

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirius
- 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
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

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)
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?**
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?
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?
Blepharoconjunctivitis.