Common Ocular Parasitic Pathogens

Parasitic pathogens

Three types of parasitic pathogen

?  ?  ?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Three types of parasitic pathogen

Protozoa  Helminths  Arthropods
Broadly speaking, what are protozoa?
Broadly speaking, what are protozoa? They are unicellular eukaryotes capable of some form of motility. Protozoa feed on organic material, and many are parasites. And while the term is considered outdated by many modern biologists, it persists in the classification of ophthalmic infections.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa  Helminths  Arthropods

Broadly speaking, what are protozoa?
They are unicellular eukaryotes capable of some form of motility. Protozoa feed on other eukaryotes or prokaryotes.

How do eukaryotes and prokaryotes differ?

opthalmic infections.
Broadly speaking, what are protozoa? They are unicellular eukaryotes capable of some form of motility. Protozoa feed on or cause ophthalmic infections. How do eukaryotes and prokaryotes differ? Eukaryotic cells have a membrane-bound nucleus, whereas prokaryotic cells do not.
Broadly speaking, what are protozoa? They are unicellular eukaryotes capable of some form of motility. Protozoa feed on organic material, and many are parasites. And while the term is considered outdated by many modern biologists, it persists in the classification of ophthalmic infections.

How do eukaryotes and prokaryotes differ? Eukaryotic cells have a membrane-bound nucleus, whereas prokaryotic cells do not.

How do eukaryotic cells differ from prokaryotic cells? Eukaryotic cells have a membrane-bound nucleus, whereas prokaryotic cells do not.
Common Ocular Parasitic Pathogens

Parasitic pathogens

- Protozoa
- Helminths
- Arthropods

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 Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Finally—what are arthropods?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

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

Parasitic pathogens

Protozoa

Helminths

Arthropods
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

Acanthamoeba is notorious for causing what sort of ocular infection?

A devastating, sight-threatening keratitis
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

Acanthamoeba is notorious for causing what sort of ocular infection?
A devastating, sight-threatening keratitis
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

Helminths

Arthropods

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, and which is infectious?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

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, and which is infectious?
The motile trophozoite (infectious) and hard-to-kill cyst
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

Acanthamoeba is notorious for causing a devastating, sight-threatening keratitis.

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

The motile trophozoite (infectious) and hard-to-kill cyst

What medium is used when culturing for Acanthamoeba?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

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, and which is infectious?
The motile trophozoite (infectious) and hard-to-kill cyst

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

Parasitic pathogens

Protozoa

Acanthamoeba

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, and which is infectious?
The motile trophozoite (infectious) and hard-to-kill cyst

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

What constitutes a positive ‘culture’?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba

A devastating, sight-threatening keratitis

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

The motile trophozoite (infectious) and 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
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Arthropods

Helminths

What is the most common misdiagnosis of early Acanthamoeba keratitis?

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa  Helminths  Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa  Helminths  Arthropods

Acanthamoeba

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

Why?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

- Acanthamoeba

Helminths

Arthropods

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why?

Early Acanthamoeba keratitis is limited to the epithelium and is very often dendritic in appearance (the classic 'two words' is a relatively late finding)
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why?

Early Acanthamoeba keratitis is limited to the epithelium and is very often dendritic in appearance (the classic ‘ring infiltrate’ is a relatively late finding)
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa  
- *Acanthamoeba*

Helminths

Arthropods

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

Why?
Early Acanthamoeba keratitis is limited to the epithelium and is very often *dendritic in appearance* (the classic ‘ring infiltrate’ is a relatively *late* finding)

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

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why?

Early Acanthamoeba keratitis is limited to the epithelium and is very often dendritic in appearance (the classic ‘ring infiltrate’ is a relatively late finding)

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. Be sure to evaluate any dendritic keratitis carefully for the presence/absence of terminal bulbs!
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

Why?

Early Acanthamoeba keratitis is limited to the epithelium and is very often dendritic in appearance (the classic ‘ring infiltrate’ is a relatively late finding)

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

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Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?

HSV keratitis

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

Parasitic pathogens

Protozoa

Helminths

Arthropods

*Acanthamoeba*

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

**HSV 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.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

| Acanthamoeba |

Helminths

Arthropods

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

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

Parasitic pathogens

Protozoa

Helminths

Arthropods

Acanthamoeba

What is the most common misdiagnosis of early Acanthamoeba keratitis?
HSV 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.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

Which ocular structures are most commonly involved in Toxoplasma infection?
Which ocular structures are most commonly involved in *Toxoplasma* infection?
The retina and (especially) the choroid.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- *Toxoplasma*
- Microsporidia

Helminths

Arthropods

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

The retina and (especially) the choroid

*What are the two common methods of contracting the infection?*

--- mean!}
Common Ocular Parasitic Pathogens

Parasitic pathogens

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

Which ocular structures are most commonly involved in Toxoplasma infection? The retina and (especially) the choroid

What are the two common methods of contracting the infection?
-- Ingestion of undercooked pork containing cysts
-- Ingestion of cysts directly from cat feces (well, not directly directly; you know what I mean!)
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths

Arthropods

Which ocular structures are most commonly involved in Toxoplasma infection?
The retina and (especially) the choroid

What is the classic description of a posterior toxoplasmosis lesion?
- Ingestion of undercooked pork containing cysts
- Ingestion of cysts directly from cat feces (well, not directly directly; you know what I mean!)
Which ocular structures are most commonly involved in Toxoplasma infection?
The retina and (especially) the choroid

What is the classic description of a posterior toxoplasmosis lesion?
“Headlight in the fog”

- Ingestion of undercooked pork containing cysts
- Ingestion of cysts directly from cat feces (well, not directly; you know what I mean!)
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

Helminths

Arthropods

Note: The *External Disease* 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.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba
Toxoplasma
Microsporidia

What sort of ocular infection is caused by Microsporidia?

Keratitis

AIDS patients

Electron microscopy of corneal scrapings

Topical fumagillin
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

Acanthamoeba
Toxoplasma
Microsporidia

What sort of ocular infection is caused by Microsporidia? Keratitis

Microsporidia

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

How is Microsporidia keratitis diagnosed?
Electron microscopy of corneal scrapings

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

Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

Parasitic pathogens

What sort of ocular infection is caused by Microsporidia?
Keratitis

Who (ie, what pt population) gets Microsporidia keratitis?
Common Ocular Parasitic Pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

What sort of ocular infection is caused by Microsporidia?
Keratitis

Who (ie, what pt population) gets Microsporidia keratitis?
AIDS patients
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

- Acanthamoeba
- Toxoplasma
- Microsporidia

What sort of ocular infection is caused by Microsporidia? Keratitis

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

How is Microsporidia keratitis diagnosed?

Topical fumagillin
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa

- Acanthamoeba
- Toxoplasma
- Microsporidia

What sort of ocular infection is caused by Microsporidia?
Keratitis

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

How is Microsporidia keratitis diagnosed?
Electron microscopy of corneal scrapings
What sort of ocular infection is caused by Microsporidia?
Keratitis

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

How is Microsporidia keratitis diagnosed?
Electron microscopy of corneal scrapings

What is the treatment for Microsporidia keratitis?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

What sort of ocular infection is caused by Microsporidia?
Keratitis

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

How is Microsporidia keratitis diagnosed?
Electron microscopy of corneal scrapings

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

Protozoa

Parasitic pathogens

What sort of ocular infection is caused by Microsporidia?
Keratitis

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

How is Microsporidia keratitis diagnosed?
Electron microscopy of corneal scrapings

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

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- ?

Arthropods
- ?
- ?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

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

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods

Re helminthic ocular conditions...
Which causes a condition known as river blindness? Onchocerca
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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?
Common Ocular Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

- 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*
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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 Ocular Parasitic Pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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*
Common Ocular Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

- 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 Ocular Parasitic Pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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 Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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 Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

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*
Common Ocular Parasitic Pathogens

Parasitic pathogens

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

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

- Arthropods
  - ?
  - ?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex
Common Ocular Parasitic Pathogens

Parasitic pathogens

- Protozoa
  - Acanthamoeba
  - Toxoplasma
  - Microsporidia

- Helminths
  - Toxocara
  - Onchocerca
  - Loa Loa

- Arthropods
  - Phthirus
  - Demodex

How is Phthirus infestation of the lashes and eyebrows acquired?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

What must be considered if a child presents with Phthirus lash infestation?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

What must be considered if a child presents with Phthirus lash infestation?
That the child is a victim of sexual abuse
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

How about Demodex?
How is Phthirus infestation of the lashes and eyebrows acquired?
It's a venereal disease. Use your imagination.

How about Demodex?
Nothing so dramatic; it's part of the normal fauna of the lashes and adnexa.
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

How about Demodex?
Nothing so dramatic; it’s part of the normal fauna of the lashes and adnexa.

Just how common is Demodex infestation?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

How about Demodex?
Nothing so dramatic; it’s part of the normal fauna of the lashes and adnexa

Just how common is Demodex infestation?
Very; it approaches 100% in the elderly
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

How about Demodex?
Nothing so dramatic; it's part of the normal fauna of the lashes and adnexa

How does Demodex infestation manifest clinically?
Common Ocular Parasitic Pathogens

Parasitic pathogens

Protozoa
- Acanthamoeba
- Toxoplasma
- Microsporidia

Helminths
- Toxocara
- Onchocerca
- Loa Loa

Arthropods
- Phthirus
- Demodex

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

How about Demodex?
Nothing so dramatic; 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