The Tear Film

What roles does the tear film (specifically, the answer this first *tear film) play in ocular health and function?*

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--***?***

--***?***

--***?***

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of [ ] to the [ ] cornea

--?

--?

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--?

--?

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--?

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

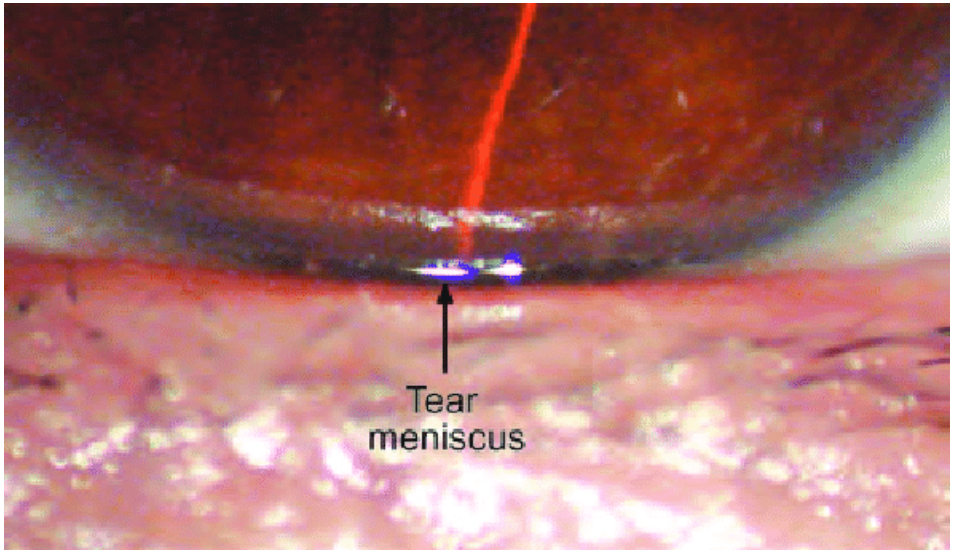
Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear) resting on the lower-lid margin

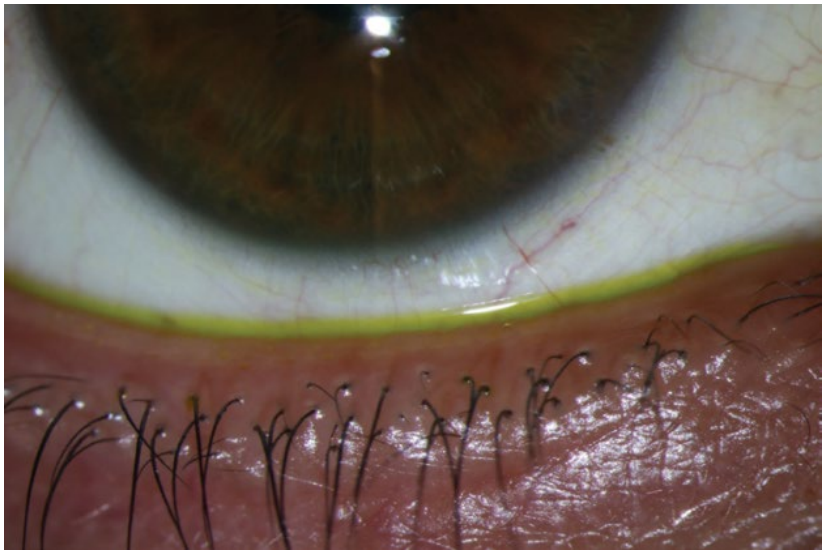
The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

The Tear Film





Tear lake (strip; meniscus)

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the two words

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL)

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the two words (not 'ocular surface')- (the lower lid goes up a little, but not much).

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much).

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear *meniscus*) resting on the lower-lid margin

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?

Th
--F
--A
--F more
ac

W ve.')
Th esting
on

Ho where it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

Th
--F
--A
--F more
ac

W ve.')
Th esting
on

Ho where it's needed?
Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?

Th
--F
--A
--F more
ac

W ve.')
Th esting
on

Ho where it's needed?
Courtesy of the action of the upper lid (UL). **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

Th
--F
--A
--F more
ac

W ve.')
Th esting
on

Ho where it's needed?
Courtesy of the action of the upper lid (UL). **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they?

--?
--?

Ho *where it's needed?*

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they?

--Orbital
--Palpebral

it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they?
How is each defined?

--Orbital: ***?***
--Palpebral: ***?***

it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--Orbital: The portion overlying the several words
--Palpebral: The portion overlying the one word

Ho *where it's needed?*

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

Th

--F

--A

--F more

ac

W *ve.')*

Th esting

on

Ho *where it's needed?*

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they?
How is each defined?

--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids

There's a fundamental distinction between the orbital and palpebral portions vis a vis blinking. What is it?

Courtesy o

across mos

little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids

There's a fundamental distinction between the orbital and palpebral portions vis a vis blinking. What is it?
The palpebral portion is responsible for [two words]

Courtesy o

a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids

There's a fundamental distinction between the orbital and palpebral portions vis a vis blinking. What is it?
The palpebral portion is responsible for normal blinking

Courtesy o

across most of the extent of the "interpalpebral fissure" (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--**Orbital: The portion overlying the bones of the orbit**
--**Palpebral: The portion overlying the lids**

There's a fundamental distinction between the orbital and palpebral portions vis a vis blinking. What is it?
The palpebral portion is responsible for normal blinking , whereas the orbital portion comes into play only during several words

Courtesy o

across most of the extent of the "interpalpebral fissure" (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined?

--**Orbital: The portion overlying the bones of the orbit**
--**Palpebral: The portion overlying the lids**

There's a fundamental distinction between the orbital and palpebral portions vis a vis blinking. What is it?
The palpebral portion is responsible for normal blinking , whereas the orbital portion comes into play only during effortful/voluntary eye closure

Courtesy o down across most of the extent of the "interpalpebral fissure" (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

Th

--F

--A

--F more

ac

W

Th esting

on

Ho where it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined? ***The palpebral portion is subdivided into two parts—what are they?***
--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids
----***?***
----***?***

Next Q

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined? ***The palpebral portion is subdivided into two parts—what are they?***
--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids
----Preseptal
----Pretarsal

Th
--F
--A
--F
ac
more

W
ve.')
Th
esting
on

Ho
where it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined? ***The palpebral portion is subdivided into two parts—what are they? How are*** *they defined?*
--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids
----Preseptal: ***?***
----Pretarsal: ***?***

Th
--F
--A
--F
ac
W
Th
on
Ho

more
ve.')
esting
where
it's needed?

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

The 'multiple bands' are organized into two basic portions—what are they? How is each defined? ***The palpebral portion is subdivided into two parts—what are they? How are*** *they defined?*
--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids
----Preseptal: The part overlying the duh
----Pretarsal: The part overlying the duh

Th
--F
--A
--F more
ac

W ve.')
Th esting
on

Ho where
it's needed?
Courtesy of the action of the upper lid (UL). **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular he

What muscle is responsible for blinking?
The orbicularis oculi

What is the basic arrangement of the fibers of the orbicularis?
As multiple concentric bands encircling all or part of the orbital aperture

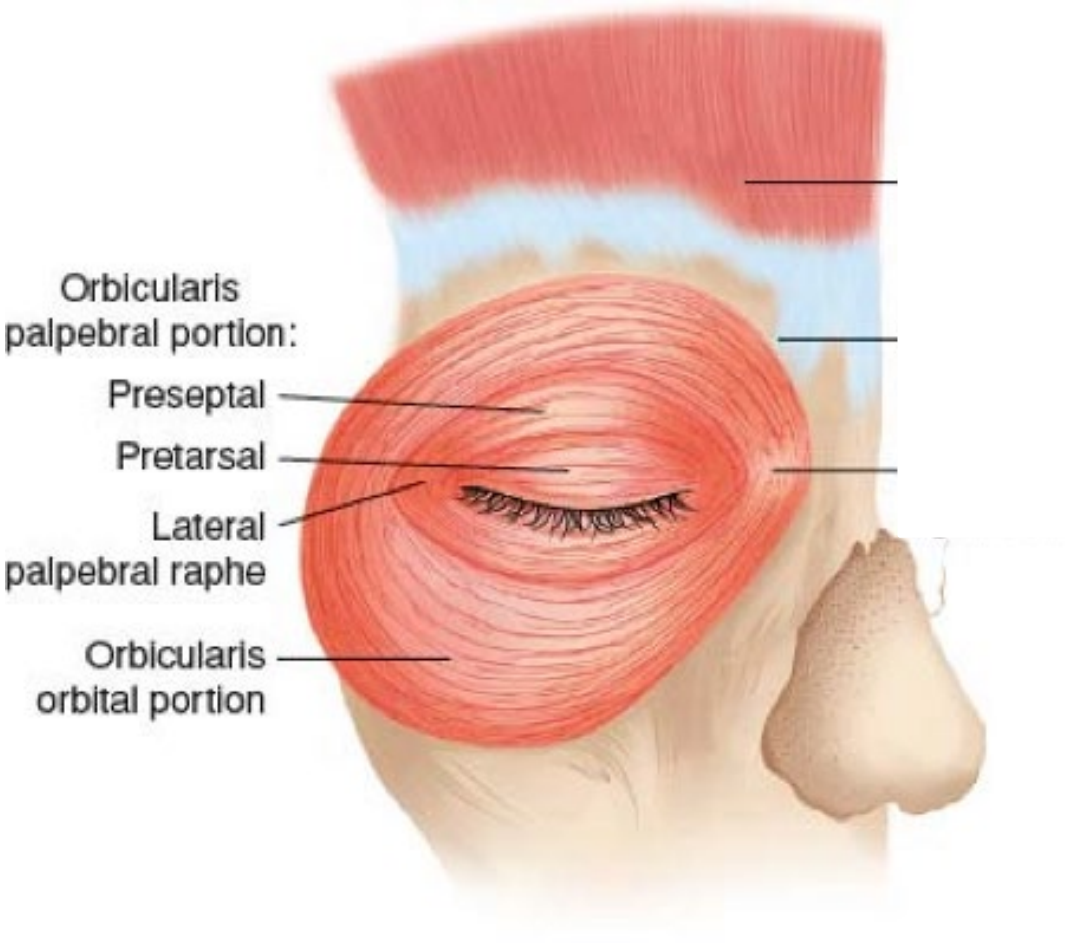
The 'multiple bands' are organized into two basic portions—what are they? How is each defined? ***The palpebral portion is subdivided into two parts—what are they? How are*** *they defined?*
--Orbital: The portion overlying the bones of the orbit
--Palpebral: The portion overlying the lids
----Preseptal: The part overlying the orbital septum
----Pretarsal: The part overlying the tarsal plates

Th
--F
--A
--F
ac
W
Th
on
Ho

more
ve.')
esting
where
it's needed?*

Courtesy of the action of the upper lid (UL), **During a blink**, the UL travels down across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary-attraction force on the aqueous in the tear lake, thereby pulling it up across the ocular surface. (The oil layer follows along.)

The Tear Film



Orbicularis oculi mm

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid margin.

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid margin.

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves direction towards the

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid margin.

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid margin.

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the lake. As it goes back up, the UL exerts a capillary attraction force on the aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the [redacted] for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid margin.

How does the tear volume get from the tear strip up onto the ocular surface where it's needed?
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

**Punctae? Puncti?*

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')

So that's how tear gets to the punctas, but how do they get into *and* through *them?*

Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la

aque

layer

If the lower lid (LL) isn't really going up, what does it do?

It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas **for removal from the surface**.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')

So that's how tear gets to the punctas, but how do they get into *and* through *them?*
Again, it's all about the blink. Contracture of the orbicularis muscle compresses the lacrimal sac and canalicular system, thereby forcing tears within the system down the the way out (two words) .

Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas **for removal from the surface**.

The Tear Film

What roles does the tear film (specifically, the precorneal *tear film) play in ocular health and function?*
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')

So that's how tear gets to the punctas, but how do they get into *and* through *them?*
Again, it's all about the blink. Contracture of the orbicularis muscle compresses the lacrimal sac and canalicular system, thereby forcing tears within the system down the nasolacrimal duct .

Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas **for removal from the surface**.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clearing debris from the corneal surface

--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')

So that's how tear gets to the punctas, but how do they get into *and* through *them?*
Again, it's all about the blink. Contracture of the orbicularis muscle compresses the lacrimal sac and canalicular system, thereby forcing tears within the system down the nasolacrimal duct . When the orbicularis relaxes, the lacrimal sac and canalicular system 're-inflate,' thereby creating a negative pressure that sucks tears through the puncta, down the canaliculi, and into the sac.

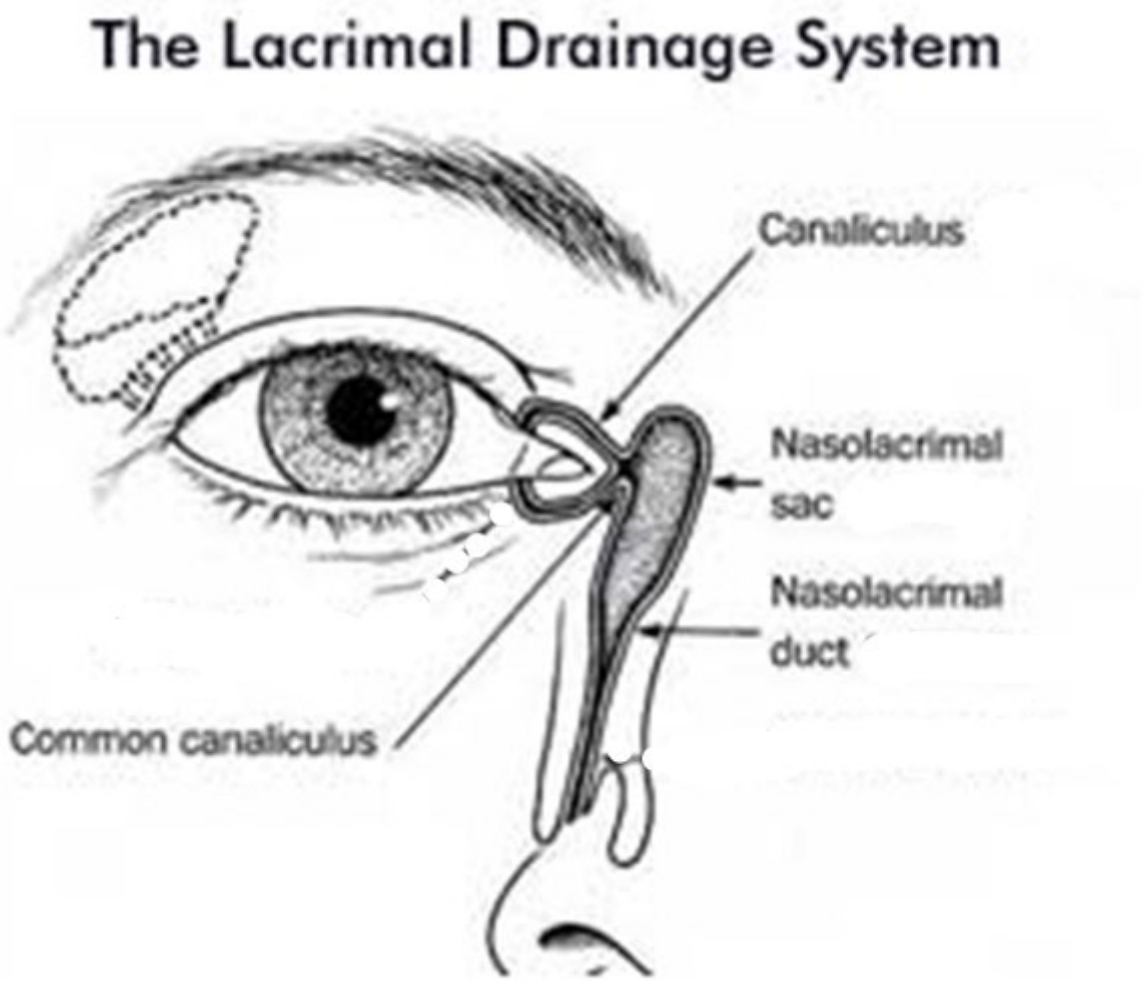
Courtesy of the action of the upper lid (UL) . During a blink, the UL travels down across most of the extent of the interpalpebral fissure (**the lower lid goes up a little, but not much**). As it goes down the UL wipes debris off the surface and into the la

aque

layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas **for removal from the surface**.

The Tear Film



Basic components of the nasolacrimal drainage system

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?

How does the t *here it's needed?*
Courtesy of the wn across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?
Back toward the orbital apex

How does the t *here it's needed?*
Courtesy of the wn across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid

How does the t *here it's needed?*
Courtesy of the wn across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?
Back toward the orbital apex

What is the significance of this movement?

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clearing debris from the corneal surface
--Provides a glassy-smooth refracting surface at the air-cornea interface (or more accurately, the air-tear film interface)

Where does the tear film reside? (The answer is not 'on the surface of the eye.')
The bulk of tear volume is in the tear strip or lake (aka the tear meniscus) resting on the lower-lid

How does the t *here it's needed?*
Courtesy of the *wn* across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la*ke. As it goes back up, the UL exerts a capillary attraction force on the aque* layer

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?
Back toward the orbital apex

What is the significance of this movement?
We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clea
--Provides a gla
accurately, the a

Where does the
The bulk of tear
on the lower-lid

How does the t
it's needed?
Courtesy of the
across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

What is the typical blink rate (blinks/minute) when at rest?

What is the significance of this movement?
We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clea
--Provides a gla
accurately, the a

Where does the
The bulk of tear
on the lower-lid

How does the t
it's needed?
Courtesy of the
across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

What is the typical blink rate (blinks/minute) when at rest?
About 10

What is the significance of this movement?
We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clea

--Provides a gla

accurately, the a

Where does the

The bulk of tear

on the lower-lid

How does the t

it's needed?

Courtesy of the

across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la

aque

layer

What is the typical blink rate (blinks/minute) when at rest?

About 10

*There is a **very** common activity during which the blink rate doubles, to about 20/minute—what is it?*

What is the significance of this movement?

We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?

It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?

There are three:

--Facilitates diffusion of oxygen to the avascular cornea

--Assists in clea

--Provides a gla

accurately, the a

Where does the

The bulk of tear

on the lower-lid

How does the t

it's needed?

Courtesy of the

across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la

aque

layer

What is the typical blink rate (blinks/minute) when at rest?

About 10

*There is a **very** common activity during which the blink rate doubles, to about 20/minute—what is it?*

Conversation

What is the significance of this movement?

We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?

It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clea
--Provides a gla
accurately, the a

Where does the
The bulk of tear
on the lower-lid

How does the t
it's needed?
Courtesy of the
across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

What is the typical blink rate (blinks/minute) when at rest?
About 10

*There is a **very** common activity during which the blink rate doubles, to about 20/minute—what is it?*
Conversation

*There is a **very** common activity during which the blink rate* halves, *to about 5/minute—what is it?*

What is the significance of this movement?
We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

What roles does the tear film (specifically, the precorneal tear film) play in ocular health and function?
There are three:
--Facilitates diffusion of oxygen to the avascular cornea
--Assists in clea
--Provides a gla
accurately, the a

Where does the
The bulk of tear
on the lower-lid

How does the t
it's needed?
Courtesy of the
across most of the extent of the interpalpebral fissure (the lower lid goes up a little, but not much). As it goes down the UL wipes debris off the surface and into the la
aque
layer

What is the typical blink rate (blinks/minute) when at rest?
About 10

*There is a **very** common activity during which the blink rate doubles, to about 20/minute—what is it?*
Conversation

*There is a **very** common activity during which the blink rate* halves*, to about 5/minute—what is it?*
Reading/near work

What is the significance of this movement?
We'll answer this shortly

If the lower lid (LL) isn't really going up, what does it do?
It mainly moves horizontally towards the nose . In doing so, it pushes the tear lake (and the debris it contains) toward the punctas* for removal from the surface.

The Tear Film

The tear film is comprised of # *basic components.*

The Tear Film

The tear film is comprised of three basic components.

The Tear Film

The tear film is comprised of three basic components. What are they?

--?

--?

--?

The Tear Film

The tear film is comprised of three basic components. What are they?

--Lipid

--Aqueous

--Mucin

The Tear Film

The tear film is comprised of three basic components. What are they?

--Lipid

--Aqueous

--Mucin

How are the three components physically related to one another?

The Tear Film

The tear film is comprised of three basic components. What are they?

--Lipid

--Aqueous

--Mucin

How are the three components physically related to one another?

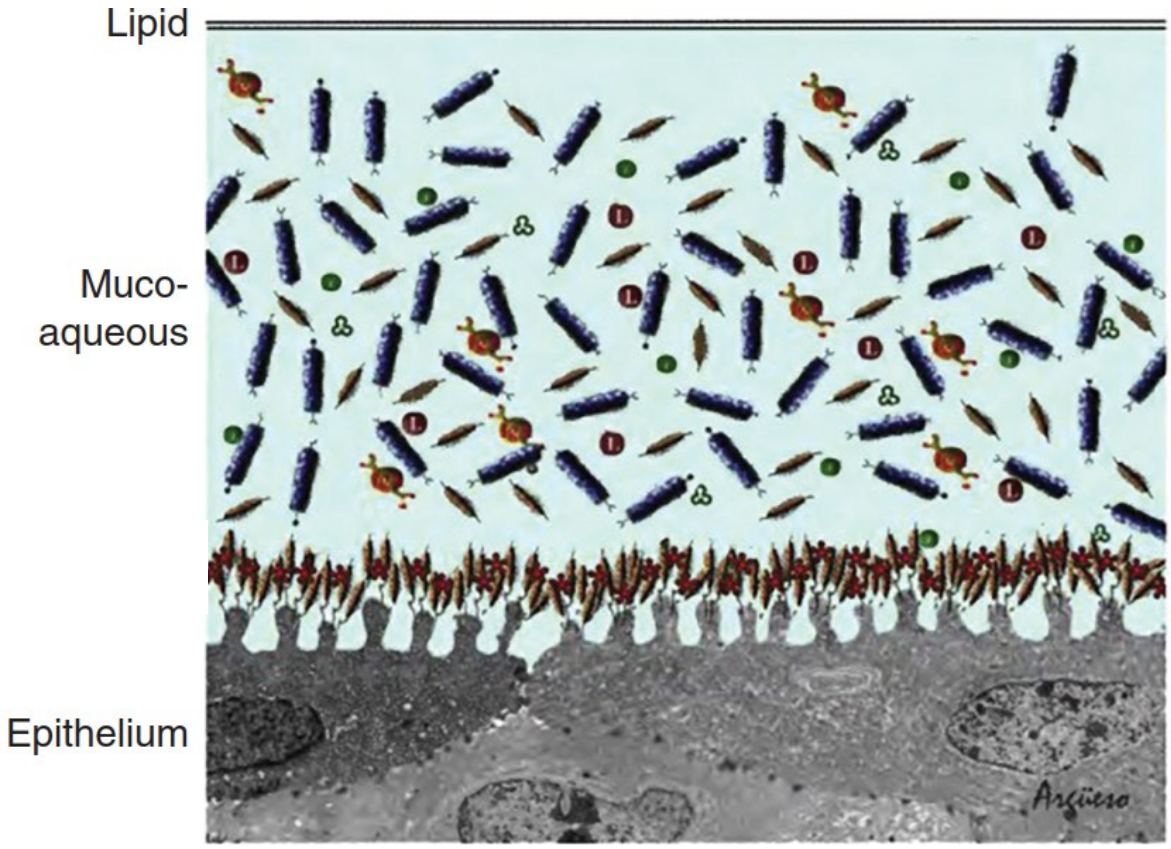
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ phase’), which in turn is covered by a lipid layer

The Tear Film

The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ mucoaqueous phase’), which in turn is covered by a lipid layer

The Tear Film



Two-phase model of the tear film. Schematic drawing of the structure of the tear film showing the outer lipid layer and the mucoaqueous layer.

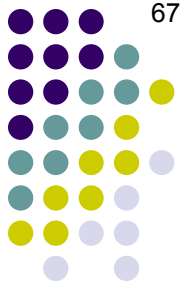
The Tear Film

The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ mucoaqueous phase’), which in turn is covered by a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*

The Tear Film

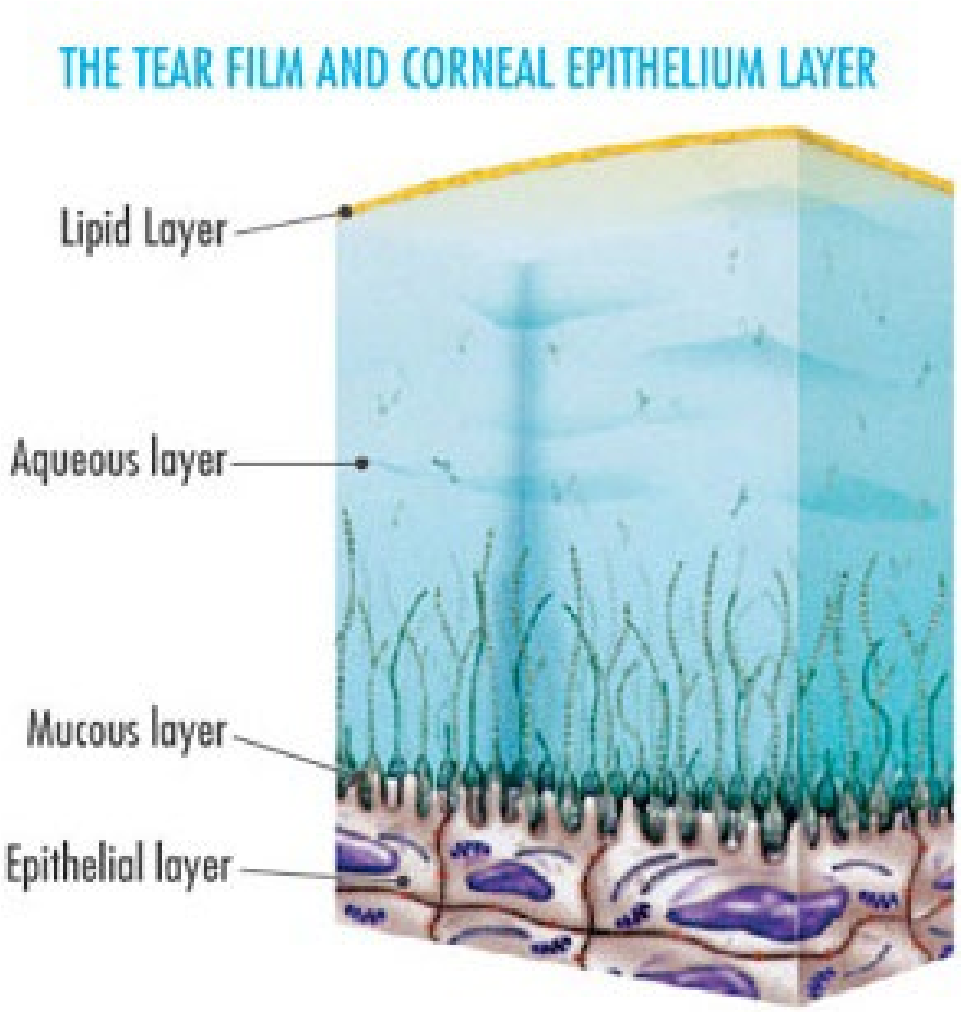


The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ mucoaqueous phase’), which in turn is covered by a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

The Tear Film



The *tripartite model* of the tear film

The Tear Film

The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ mucoaqueous phase’), which in turn is covered by a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

The Tear Film

The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ‘ mucoaqueous phase’), which in turn is covered by a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it’s incorrect

The Tear Film

The tear film is comprised of three basic components. What are they?
--Lipid
--Aqueous
--Mucin

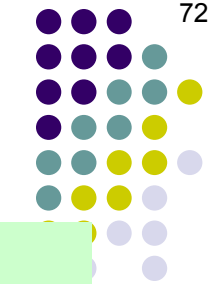
How are the three components physically related to one another?
The aqueous and mucus components are intermixed into a single, gel-like layer (the ' **mucoaqueous phase**'), which in turn is covered by a **lipid layer**

To be crystal clear: The current widely accepted conception is that of a *2-phase model* in which a lipid layer overlies a mucocutaneous phase

As a
The
layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, **consensus now is it's incorrect**

The Tear Film



The tear

Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--?

--?

--?

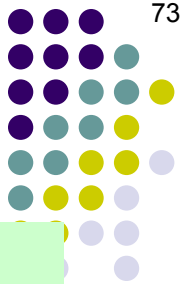
As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear

Lipid

--Aqueou

--Mucin

How are

The aque
gel-like la
a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film [redacted], thereby keeping it on the eye longer

--?

--?

As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear

Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--?

--?

As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear f

Lipid

--Aqueou

--Mucin

How are t

The aque

gel-like la

a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film [two words] , thereby keeping it on the eye longer

--?

As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear

Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

--?

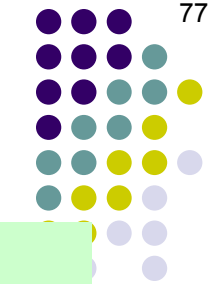
As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear
--Lipid
--Aqueou
--Mucin

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--?

How are
The aque
gel-like la
a lipid lay

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth [redacted] surface

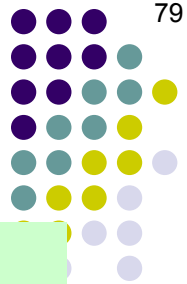
As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear
--Lipid
--Aqueou
--Mucin

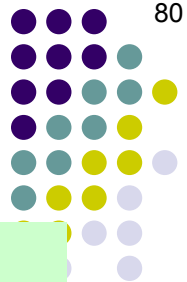
The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

How are
The aque
gel-like la
a lipid lay

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear

Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

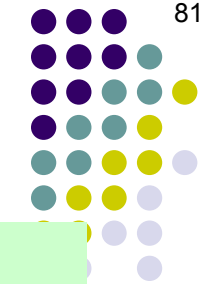
As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?
The meibomian glands

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear

--Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the [specific structure]

The Tear Film

The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

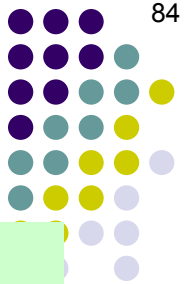
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

The Tear Film



The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the **tarsal plates**

Upper lid, lower lid, or both?

The Tear Film

The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

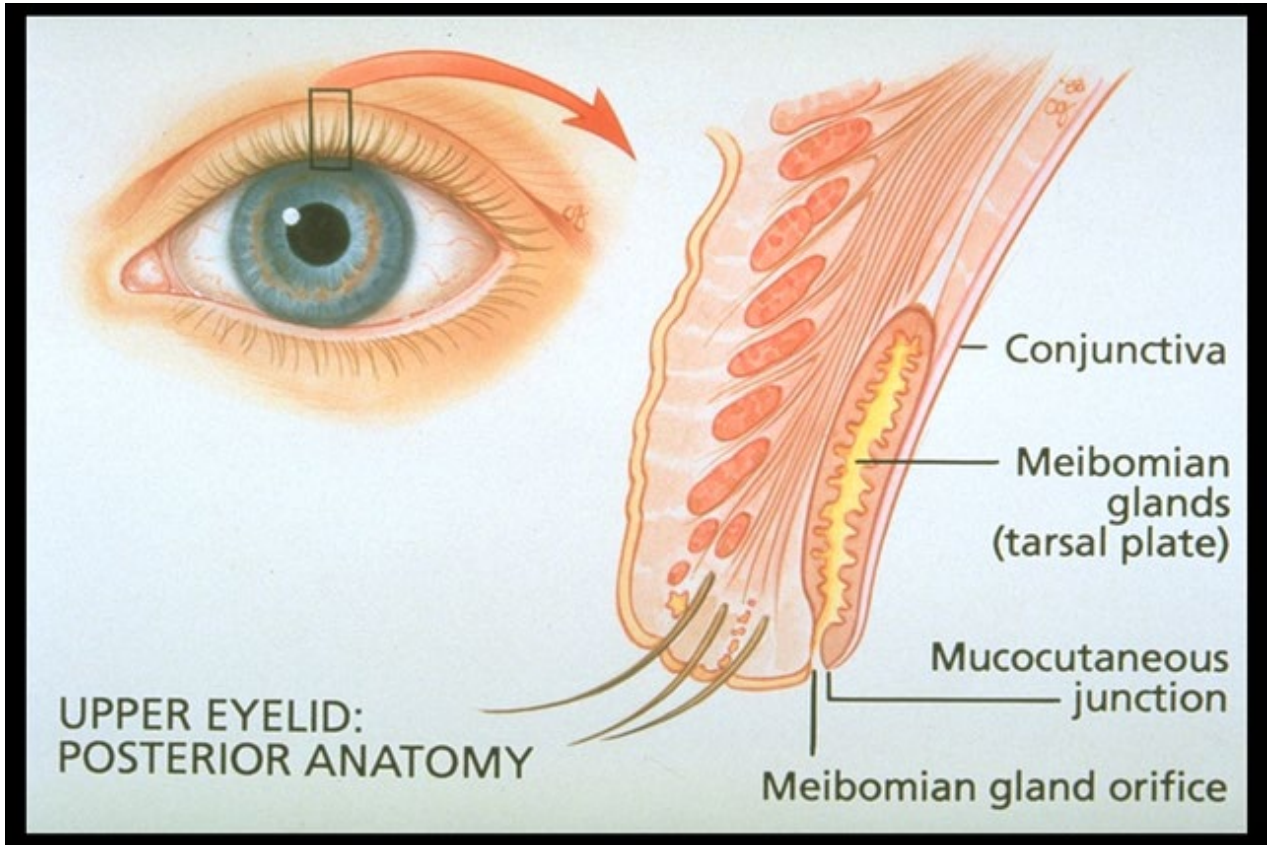
The **meibomian glands**

The meibomian glands are embedded within the **tarsal plates**

Upper lid, lower lid, or both?

Both

The Tear Film



Meibomian glands

The Tear Film

The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

The product of a meibomian gland is called duh

The Tear Film

The tear
--**Lipid**
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

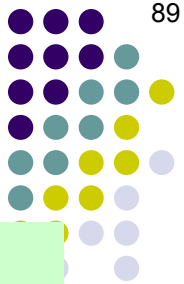
The meibomian glands are embedded within the tarsal plates

The product of a meibomian gland is called *meibum*

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film



The tear

--Lipid

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

The product of a meibomian gland is called *meibum*

There are up to twice as many meibomian glands in the upper *vs* lower lids

The Tear Film

The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?
The **meibomian glands**

The meibomian glands are embedded within the tarsal plates
The product of a meibomian gland is called *meibum*
There are up to twice as many meibomian glands in the upper lids

The Tear Film

The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

The product of a meibomian gland is called *meibum*

There are up to twice as many meibomian glands in the upper lids

How many MGs are we talking about for each lid?

--Uppers:?

--Lowers:?

(Looking for a range for each)

The Tear Film

The tear

--**Lipid**

--Aqueou

--Mucin

How are

The aque

gel-like la

a lipid lay

As an asi

The idea

layers ea

aqueous,

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

The product of a meibomian gland is called *meibum*

There are up to twice as many meibomian glands in the upper lids

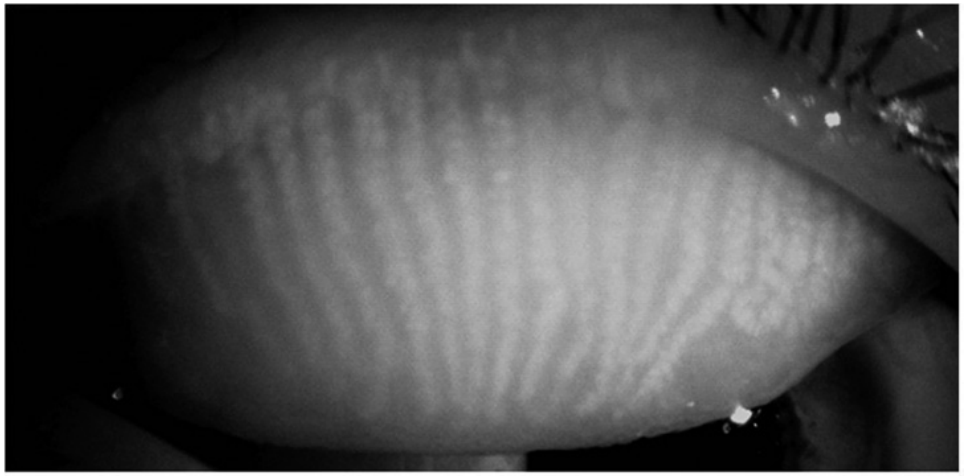
How many MGs are we talking about for each lid?

--Uppers: 30-40

--Lowers: 20-30

The Tear Film

Upper lid



Lower lid

Meibomian glands

The Tear Film

The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

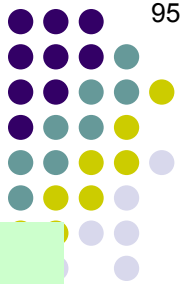
There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?
The **meibomian glands**

The meibomian glands are embedded within the tarsal plates
The product of a meibomian gland is called *meibum*
There are up to twice as many meibomian glands in the upper lids
The meibomian glands are innervated primarily by the sympathetic? parasympathetic? somatic? system

The Tear Film



The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

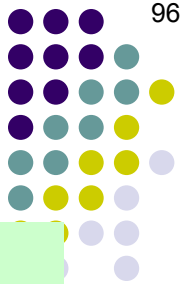
There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?
The **meibomian glands**

The meibomian glands are embedded within the tarsal plates
The product of a meibomian gland is called *meibum*
There are up to twice as many meibomian glands in the upper lids
The meibomian glands are innervated primarily by the parasympathetic system

The Tear Film



The tear
--Lipid
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

There is a problem with the tripartite model—
While once widely accepted, consensus now

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?

The **meibomian glands**

The meibomian glands are embedded within the tarsal plates

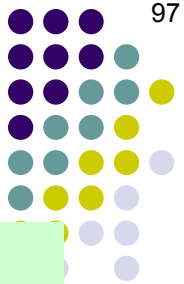
The product of a meibomian gland is called *meibum*

There are up to twice as many meibomian glands in the upper lids

The meibomian glands are innervated primarily by the **parasympathetic system**

What role does parasympathetic input play in meibum secretion?

The Tear Film



The tear
--**Lipid**
--Aqueou
--Mucin

How are
The aque
gel-like la
a lipid lay

As an asi
The idea
layers ea
aqueous,

There is a problem with the tripartite model—
While once widely accepted, consensus now

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Which gland(s) produce the lipids constituting this layer?
The **meibomian glands**

The meibomian glands are embedded within the tarsal plates
The product of a meibomian gland is called *meibum*
There are up to twice as many meibomian glands in the upper lids
The meibomian glands are innervated primarily by the **parasympathetic system**

What role does parasympathetic input play in meibum secretion?
It is unclear at this time

The Tear Film

Lipid

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Recall this from earlier in the set…

(No question yet—keep going)

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?
Back toward the orbital apex

What is the significance of this movement?
We'll answer this shortly

The Tear Film

Lipid

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?
--Inhibit tear film evaporation , thereby keeping it on the eye longer
--Reduce tear film surface tension , thereby keeping it on the eye longer
----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake
--Facilitate visual acuity by providing a smooth refracting surface

Recall this from earlier in the set…*We're now ready to address this question. Given the context you might presume the answer has something to do with meibomian gland function—and you'd be right.*

(No question yet—keep going)

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?
Back toward the orbital apex

What is the significance of this movement?
We'll answer this shortly

The Tear Film

Lipid

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Recall this from earlier in the set…*We're now ready to address this question. Given the context you might presume the answer has something to do with meibomian gland function—and you'd be right. So: What role does orbital-apex directed movement of the orbicularis play in meibomian gland function?*

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?

Back toward the orbital apex

What is the significance of this movement?

We'll answer this shortly

The Tear Film

Lipid

The lipid component/layer makes key contributions to the stability and effectiveness of the tear film—what are they?

--Inhibit tear film evaporation , thereby keeping it on the eye longer

--Reduce tear film surface tension , thereby keeping it on the eye longer

----Without a lipid layer, surface tension (along with gravity) would pull the tear film down the eye to the lake

--Facilitate visual acuity by providing a smooth refracting surface

Recall this from earlier in the set…*We're now ready to address this question. Given the context you might presume the answer has something to do with meibomian gland function—and you'd be right. So: What role does orbital-apex directed movement of the orbicularis play in meibomian gland function?*

It pulls the tarsal-plate portion of the lids against the globe. In doing so, the meibomian glands get squeezed, causing them to express meibum into the tear lake.

In addition to moving down (UL) and horizontally (LL), the lids move in another direction of clinical significance—what is it?

Back toward the orbital apex

What is the significance of this movement?

We'll answer this shortly

The Tear Film

The tear film

--Lipid

--**Aqueous**

--Mucin

What gland-type secretes the aqueous portion of the tear film?

How are the

The aqueou

gel-like laye

a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*

The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?

While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--*?*
--*?*

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The [redacted] lacrimal gland
--The [redacted] lacrimal glands

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The main lacrimal gland
--The accessory lacrimal glands

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The main lacrimal gland
--The accessory lacrimal glands

Are they innervated?

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The main lacrimal gland
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves of the sympathetic? parasympathetic? somatic? system

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The main lacrimal gland
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves of the parasympathetic system

As an aside: Briefly, what is the tripartite model *of the tear film?*
The idea that the tear film is composed of three separate and distinct layers each comprised of one component, ie, separate mucus, aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

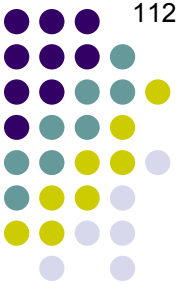
What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?

The Tear Film



The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

It's divided into two lobes—what are they called?

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

It's divided into two lobes—what are they called?
The orbital and palpebral lobes

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

It's divided into two lobes—what are they called?
The orbital and palpebral lobes

What structure does the dividing?

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

It's divided into two lobes—what are they called?
The orbital and palpebral lobes

What structure does the dividing?
The two words of the two different words

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like laye
a lipid layer

As an aside: Briefly, what is the trip
The idea that the tear film is compo
layers each comprised of one com
aqueous, and lipid layers

There is a problem with the tripartite model—what is it?
While once widely accepted, consensus now is it's incorrect

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--**The main lacrimal gland**
--The accessory lacrimal glands

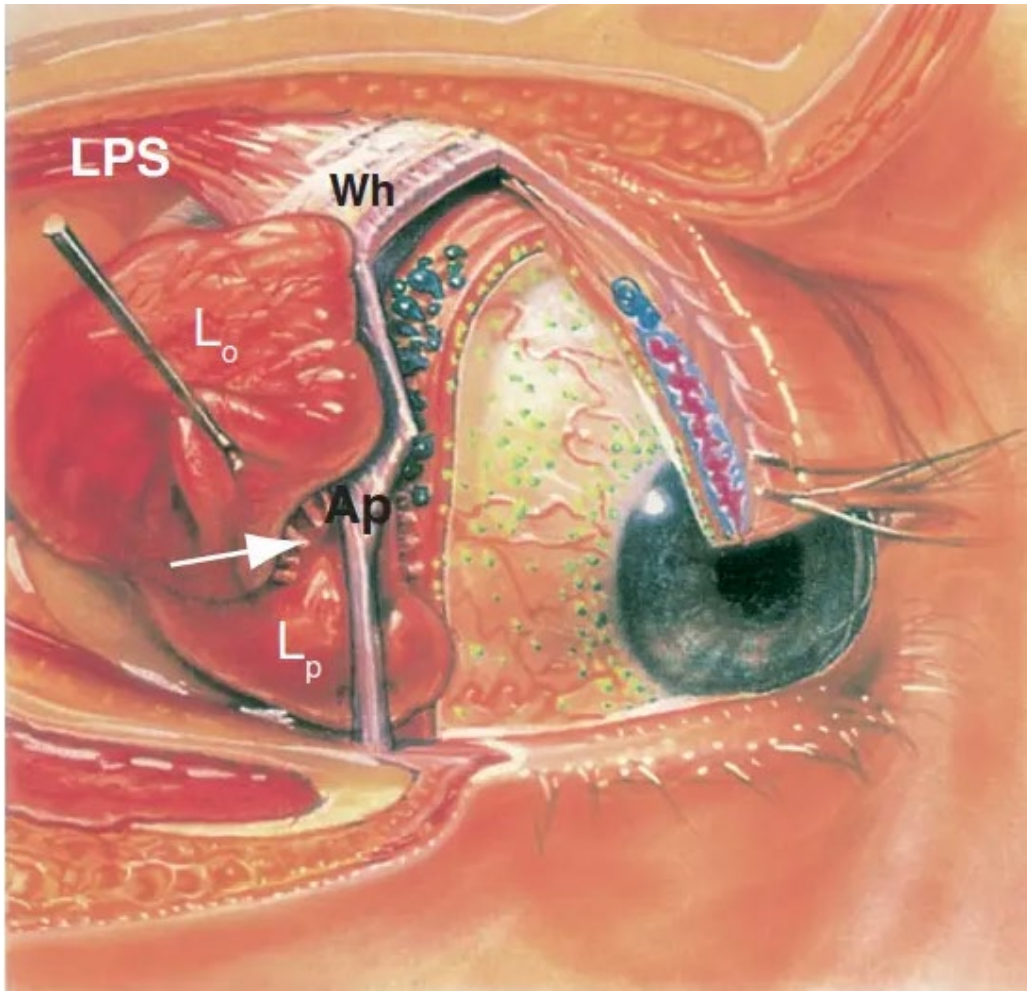
Are they innervated?
Yes, primarily by nerves

Where is the main lacrimal gland located?
The superotemporal orbit

It's divided into two lobes—what are they called?
The orbital and palpebral lobes

What structure does the dividing?
The lateral horn of the levator aponeurosis

The Tear Film



The orbital lobe of the lacrimal gland (L_o) and the palpebral lobe of the lacrimal gland (L_p) are separated by the lateral horn of the levator aponeurosis (Ap)
(FYI: LPS = levator palpebralis superioris; Wh = Whitnall's ligament)

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?

--Glands of
--Glands of

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?

--Glands of Krauss
--Glands of Wolfring

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found
--Glands of Wolfring

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of [redacted] as there are glands of [redacted]

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring

The Tear Film

What gland-type secretes the aqueous portion of the tear film?
Lacrimal gland

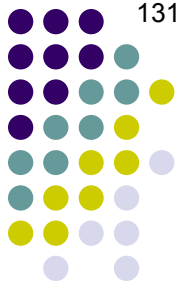
How many lacrimal glands are there (in each orbit)?
Lots! But we think of them as being in one of two groups:
--The "main" lacrimal gland
--**The accessory lacrimal glands**

There are two eponymous accessory glands—what are they?
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



The tear film
--Lipid
--**Aqueous**
--Mucin

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?
--?
--?
--?

How are the
The aqueou
gel-like
a lipid

ystem

As an
The ide
layers
aqueou

film?
and distinct
ucus,

There
While

ect

There
What is the primary location for each?
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

Aqueous

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

--Electrolytes

--Solutes

--Proteins

What is the primary location for each?

--Glands of Krauss, found in the fornices

--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

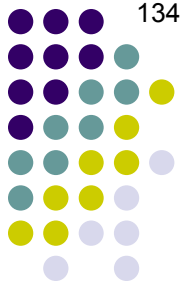
Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

The Tear Film



The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

Tear film one of them is about equal to that of serum

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

Tear film Na^+ is about equal to that of serum

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice *vs* half what it is in serum

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

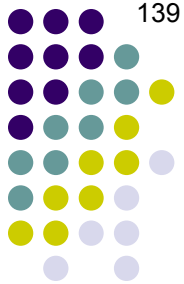
Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?

Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?

The Tear Film



The tear film
--Lipid
--Aqueous
--Mucin

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

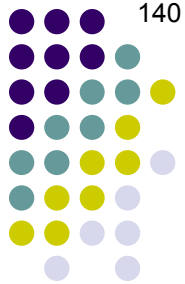
Electrolytes

How are the
The aqueou
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film

The Tear Film



The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

The Tear Film

In a sentence or two, what is osmolarity*?*

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid)

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

In DES, do you expect tear osmolarity to be higher, or lower than normal?

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

In DES, do you expect tear osmolarity to be higher, or lower than normal?
Higher

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

In DES, do you expect tear osmolarity to be higher, or lower than normal?
Higher. Think of it this way: If the tear film is inadequate—if there's not enough fluid there—it means the solute-particles are dissolved in a smaller amount of fluid, which in turn means the *concentration* of the particles will be higher.

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

In DES, do you expect tear osmolarity to be higher, or lower than normal?
Higher. Think of it this way: If the tear film is inadequate—if there's not enough fluid there—it means the solute-particles are dissolved in a smaller amount of fluid, which in turn means the *concentration* of the particles will be higher.

What tear-osmolarity value is widely acknowledged as indicative of at least mild DES?

To regulate tear-film **osmolarity**

The Tear Film

In a sentence or two, what is osmolarity*?*
The concentration of solutes in a fluid—literally, the number of solute-particles in a given amount of solvent (fluid). With regard to the tear film, it is expressed in milliosmoles per liter (mOsm/L).

What is normal tear osmolarity value? (It's a range.)
296 ± 10

In DES, do you expect tear osmolarity to be higher, or lower than normal?
Higher. Think of it this way: If the tear film is inadequate—if there's not enough fluid there—it means the solute-particles are dissolved in a smaller amount of fluid, which in turn means the *concentration* of the particles will be higher.

What tear-osmolarity value is widely acknowledged as indicative of at least mild DES?
308

To regulate tear-film **osmolarity**

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?

Next Q

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated two-words gradient

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient. The corneal epi cell membranes are freely permeable to water but not solutes; ie, they are semi-permeable. Recall the rule regarding semi-permeable membranes: three words.

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient. The corneal epi cell membranes are freely permeable to water but not solutes; ie, they are semi-permeable. Recall the rule regarding semi-permeable membranes: *Solvent follows solute* .

The Tear Film

The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient. The corneal epi cell membranes are freely permeable to water but not solutes; ie, they are semi-permeable. Recall the rule regarding semi-permeable membranes: *Solvent follows solute* . What this means is, if tear-film osmolarity gets too high, water within the epi cells will be pulled out of them via the osmotic gradient.

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient. The corneal epi cell membranes are freely permeable to water but not solutes; ie, they are semi-permeable. Recall the rule regarding semi-permeable membranes: *Solvent follows solute* . What this means is, if tear-film osmolarity gets too high, water within the epi cells will be pulled out of them via the osmotic gradient. This in turn severely stresses the epi cells, causing them to release [two words] that disrupt the integrity of the ocular surface—and off we go down the DES highway.

The Tear Film

The tear film
--Lipid
--Aqueous
--Mucin

How are the
The aqueou

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute important 'microconstituents' of the tear film. What are these?

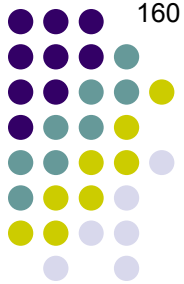
Electrolytes
--Solutes

Na^+ and K^{2+} figure prominently among the tear-film electrolytes. How do their concentrations in the tear film compare to that of serum?
Tear film Na^+ is about equal to that of serum, whereas tear film K^{2+} is about twice what it is in serum

What is the primary role of electrolytes in the tear film?
To regulate tear-film osmolarity

Why is tear-film osmolarity important?
Because of its associated osmotic-pressure gradient. The corneal epi cell membranes are freely permeable to water but not solutes; ie, they are semi-permeable. Recall the rule regarding semi-permeable membranes: *Solvent follows solute* . What this means is, if tear-film osmolarity gets too high, water within the epi cells will be pulled out of them via the osmotic gradient. This in turn severely stresses the epi cells, causing them to release inflammatory mediators that disrupt the integrity of the ocular surface—and off we go down the DES highway.

The Tear Film



What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

Aqueous

In addition to secreting its aqueous component, the lacrimal glands

What are the main solutes in the tear film?

Solutes

What is the primary

--Glands of Krauss, found in the fornices

--Glands of Wolfring, found near the tarsal plates

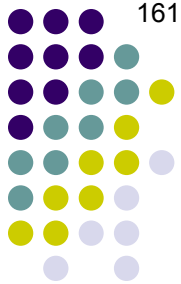
Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



Aqueous

Lacrimal gland

What gland-type secretes the aqueous portion of the tear film?

Solutes

What are the main solutes in the tear film?
The usual suspects: Glucose, lactate, the amino acids, etc.

What is the primary
--Glands of Krauss, found in the fornices
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film

Aqueous

Lacrimal gland

What gland-type secretes the aqueous portion of the tear film?

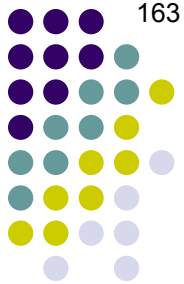
Solutes

In addition to secreting its aqueous component, the lacrimal glands

What are the main solutes in the tear film?
The usual suspects: Glucose, lactate, the amino acids, etc.

What is the relationship between solute concentrations in the tear film and their respective concentrations in serum?

The Tear Film



The tear film

--Lipid

--**Aqueous**

--Mucin

How are the

The aqueou

gel-like

a lipid

As an

The ide

layers

aqueou

There

While

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute

--**Solutes**

--Proteins

What are the main solutes in the tear film?
The usual suspects: Glucose, lactate, the amino acids, etc.

What is the relationship between solute concentrations in the tear film and their respective concentrations in serum?
They are roughly equivalent

What is the primary

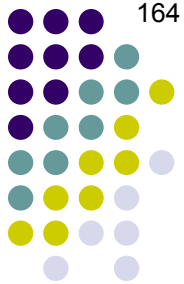
--Glands of Krauss, found in the fornices

--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

Aqueous

In addition to secreting its aqueous component, the lacrimal glands

What are the main solutes in the tear film?

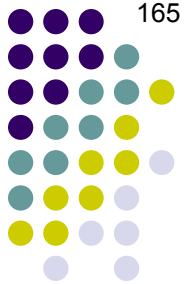
What is the primary protein on the tear film?

Proteins

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



The tear film

--Lipid

--**Aqueous**

--Mucin

How are the

The aqueou

gel-like

a lipid

As an

The ide

layers

aqueou

There

While

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute

--**Electroly**

--**Solutes**

--**Proteins**

What are the main solutes in the tear film?

What is the primary protein on the tear film?

Immunoglobulin

There

What is the primary

--Glands of Krauss

--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

these?

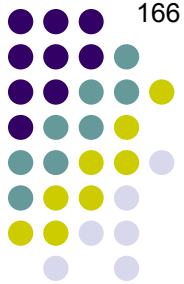
film?

and distinct

ucus,

ect

The Tear Film



What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

Aqueous

In addition to secreting its aqueous component, the lacrimal glands

What are the main solutes in the tear film?

What is the primary protein on the tear film?

Immunoglobulin, specifically

Proteins

Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film

Aqueous

Lacrimal gland

What gland-type secretes the aqueous portion of the tear film?

In addition to secreting its aqueous component, the lacrimal glands

Proteins

What are the main solutes in the tear film?

What is the primary protein on the tear film?

Immunoglobulin, specifically IgA

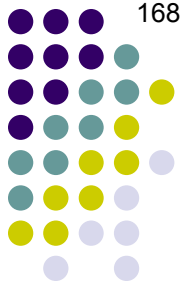
Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

Aqueous

In addition to secreting its aqueous component, the lacrimal glands

What are the main solutes in the tear film?

What is the primary protein on the tear film?

Immunoglobulin, specifically IgA

Is it just hanging out in the tear film, or does it contribute to local host-defenses?

Proteins

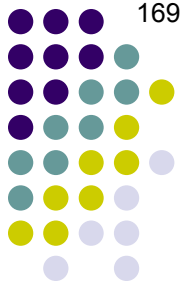
Are these large, singular structures a la the main lac gland?

No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?

There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

The Tear Film



The tear film
--Lipid
--**Aqueous**
--Mucin

How are the
The aqueou
gel-like
a lipid

As an
The ide
layers
aqueou

There
While

What gland-type secretes the aqueous portion of the tear film?

Lacrimal gland

In addition to secreting its aqueous component, the lacrimal glands contribute

--**Electroly**
--**Solutes**
--**Proteins**

What are the main solutes in the tear film?

What is the primary protein on the tear film?
Immunoglobulin, specifically IgA

Is it just hanging out in the tear film, or does it contribute to local host-defenses?
It is an important defense component

There
What is the primary
--Glands of Krauss
--Glands of Wolfring, found near the tarsal plates

Are these large, singular structures a la the main lac gland?
No, they are two *sets* of (much smaller) glands distributed throughout the orbit

Which is more numerous—glands of Krauss, or of Wolfring?
There are about twice as many glands of Krauss as there are glands of Wolfring (ie, 2/3 Krauss, 1/3 Wolfring)

these?

film?

and distinct

ucus,

ect

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--?
--?

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
- [ ] mucins
- [two words] mucins

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

*aka membrane-[redacted], membrane-[redacted], and membrane-[redacted]

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While on

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells located in the [redacted] epithelium

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells located in the conjunctival epithelium

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

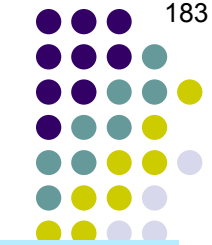
Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells located in the conjunctival epithelium

The 'membrane bound' mucins—to which membrane(s), ie, what cell types and locations, are they bound?

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film



The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells located in the conjunctival epithelium

The 'membrane bound' mucins—to which membrane(s), ie, what cell types and locations, are they bound?
The [redacted] of the [redacted]

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like l
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While once widely accepted, consensus now is it's incorrect

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydrophobic to a hydrophilic state

There are two types of mucin present in the tear film and on the ocular surface—what are they?
--Secreted mucins
--Membrane-bound* mucins

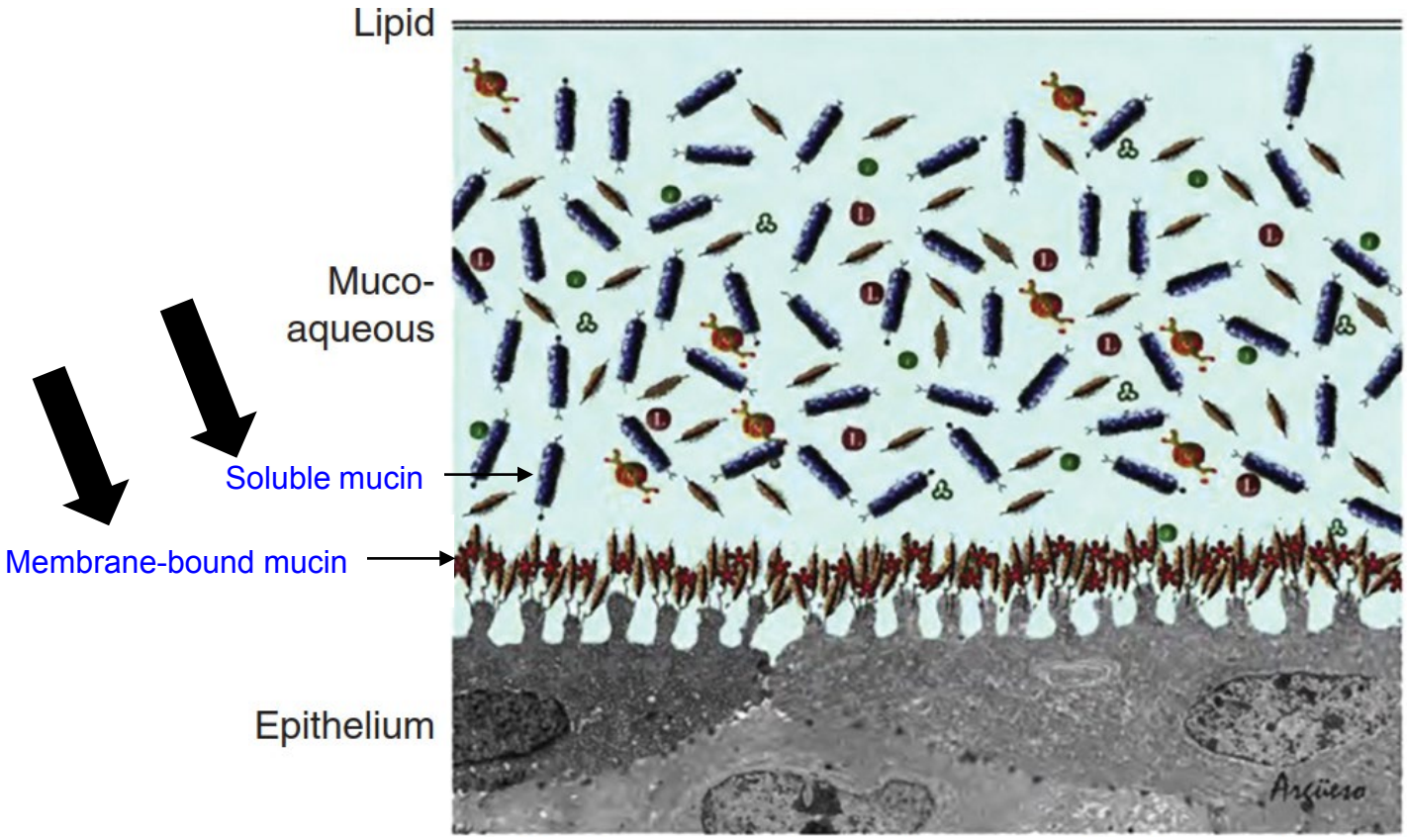
Which are found in the mucoaqueous layer/gel?
Secreted

Which cells are the chief producers of the secreted mucins?
Goblet cells located in the conjunctival epithelium

The 'membrane bound' mucins—to which membrane(s), ie, what cell types and locations, are they bound?
The epithelia of the cornea and conj

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film



We saw this depiction of the *two-phase model of the tear film* earlier in the set…But are now ready to note the presence and location of **soluble mucins** (found in the mucoaqueous layer of the tear film) and **membrane-bound mucins**

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

r surface—

types and

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well.

*How are
The aque
gel-like la
a lipid lay

*As an as
The idea
layers ea
aqueous

*There is
While onc

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

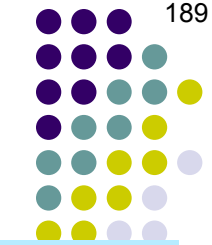
Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well. There's no way a solution consisting solely of water could coat such a surface—it would simply bead up and fall off. So how is the ocular surface to be kept moist?

r surface—

types and

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film



The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well. There's no way a solution consisting solely of water could coat such a surface—it would simply bead up and fall off. So how is the ocular surface to be kept moist?

As always, nature finds a way. First, the ocular surface isn't 'naked;' rather, it is coated by a filamentous gel-like structure called the _____.

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well. There's no way a solution consisting solely of water could coat such a surface—it would simply bead up and fall off. So how is the ocular surface to be kept moist?

As always, nature finds a way. First, the ocular surface isn't 'naked;' rather, it is coated by a filamentous gel-like structure called the *glycocalyx* .

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film

The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

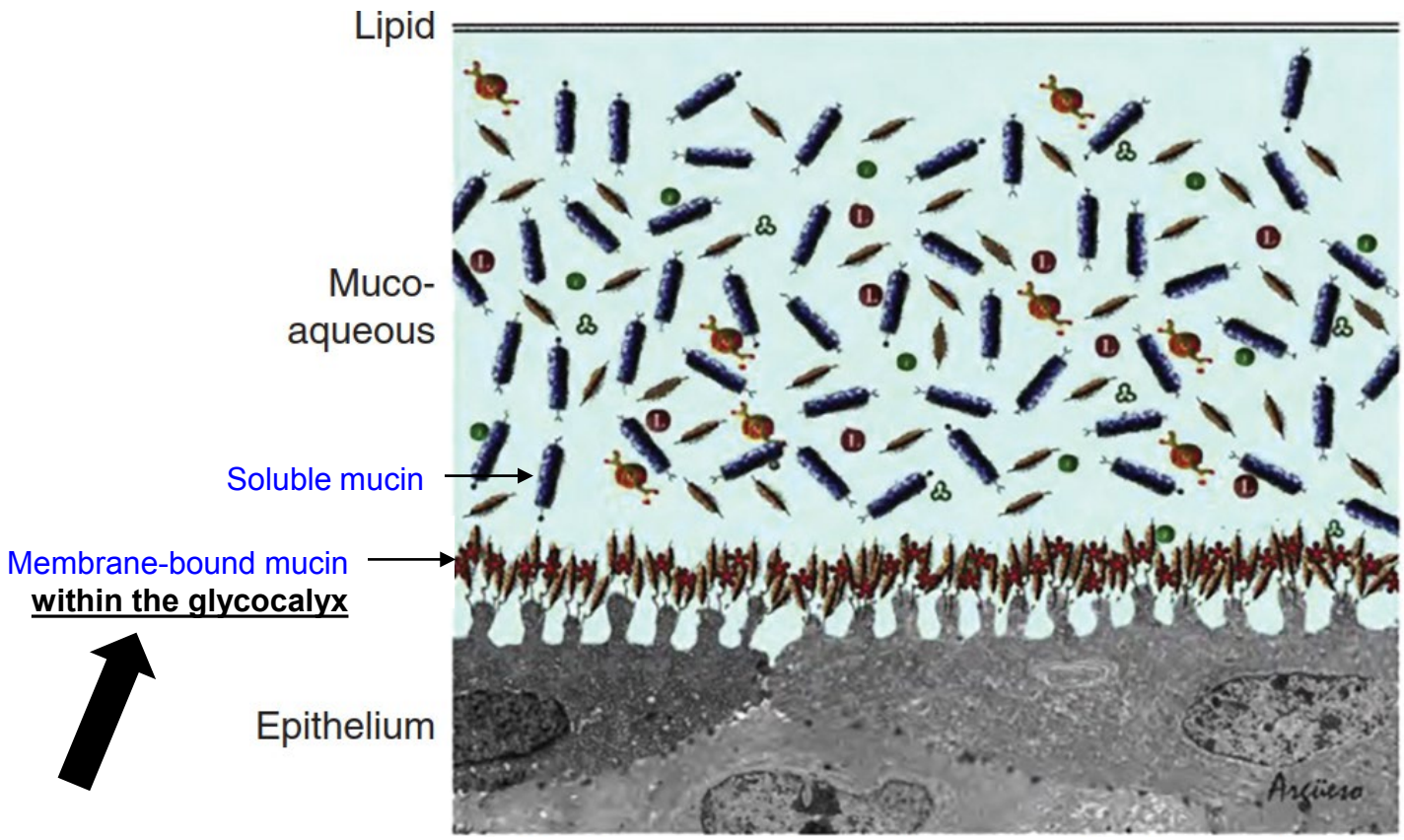
*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well. There's no way a solution consisting solely of water could coat such a surface—it would simply bead up and fall off. So how is the ocular surface to be kept moist?

As always, nature finds a way. First, the ocular surface isn't 'naked;' rather, it is coated by a filamentous gel-like structure called the *glycocalyx* . Glycocalyces are common throughout nature (eg, bacterial capsules are a glycocalyx) and on multiple cell lines in humans. They serves many purposes related to cell-cell recognition and communication, host defense, etc. In ocular-surface epi cells, the membrane-bound mucins constitute a sizable component of the glycocalyx.

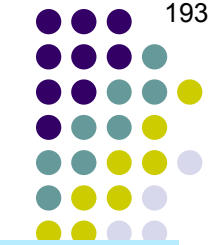
*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*

The Tear Film



We saw this depiction of the *two-phase model of the tear film* earlier in the set…But are now ready to note the presence and location of **soluble mucins** (found in the mucoaqueous layer of the tear film) and **membrane-bound mucins** (found in the cell's glycocalyx)

The Tear Film



The tear
--Lipid
--Aqueou
--**Mucin**

How are
The aque
gel-like la
a lipid lay

As an as
The idea
layers ea
aqueous

There is
While onc

What is the chief function of the mucin component of the mucoaqueous layer?
Facilitating surface wetting by transforming the epithelial surface from a hydro**phobic** to a hydro**philic** state

*'Transforming the epithelial surface from hydro**phobic** to hydro**philic**'—why is this important?*

Think about the ultrastructure of the membranous surface of K and conj epithelial cells. The cell membranes have all sorts of phospholipids, glycolipids, etc, sticking up out of them. Because of their lipid nature, these molecules are highly hydrophobic—and thus the 'naked' ocular surface would be as well. There's no way a solution consisting solely of water could coat such a surface—it would simply bead up and fall off. So how is the ocular surface to be kept moist?

As always, nature finds a way. First, the ocular surface isn't 'naked;' rather, it is coated by a filamentous gel-like structure called the *glycocalyx* . Glycocalyces are common throughout nature (eg, bacterial capsules are a glycocalyx) and on multiple cell lines in humans. They serves many purposes related to cell-cell recognition and communication, host defense, etc. In ocular-surface epi cells, the membrane-bound mucins constitute a sizable component of the glycocalyx. The ability of the tear film to coat the ocular surface is greatly facilitated by interactions between the membrane-bound mucins of the glycocalyx and the mucoaqueous-layer 'bound' secreted mucins.

*aka membrane- *spanning* , membrane- *anchored* , and membrane- *tethered*