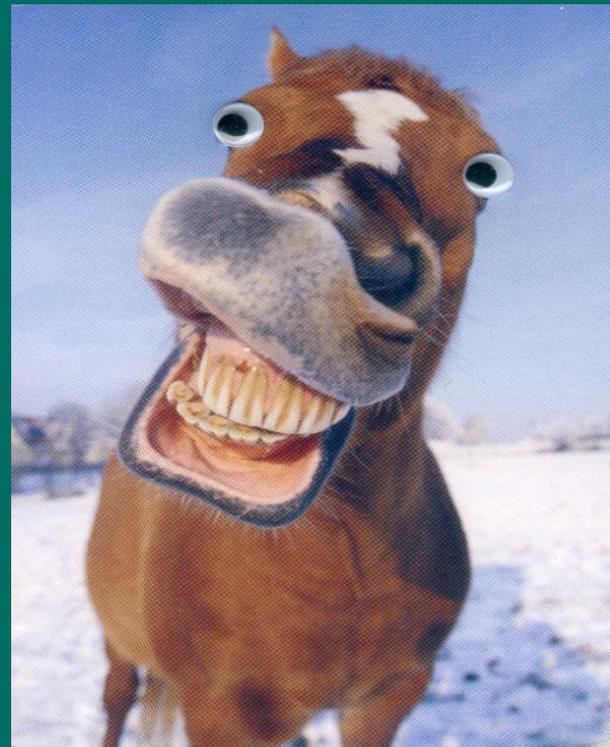
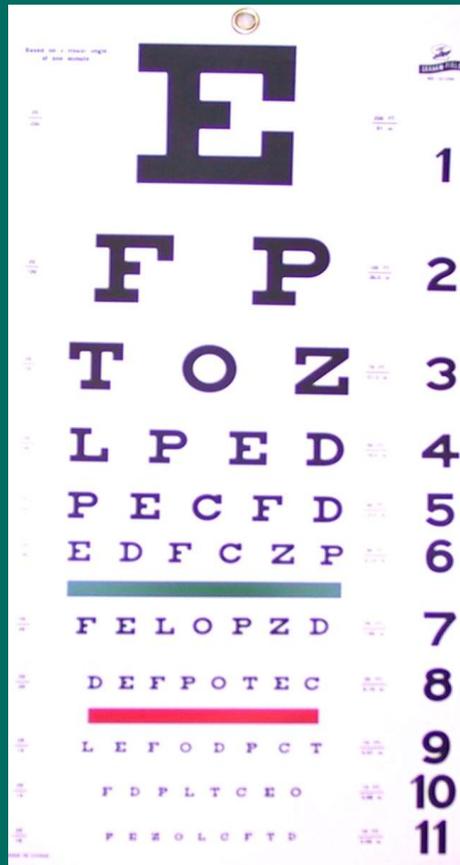




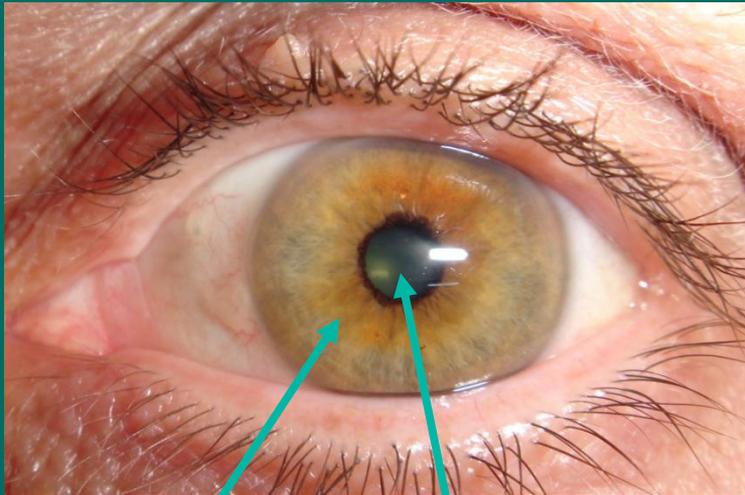
Vision and Retinal Problems in Horses

Equine Ophthalmology Service
University of Florida

Equine Vision: Just what do they see?



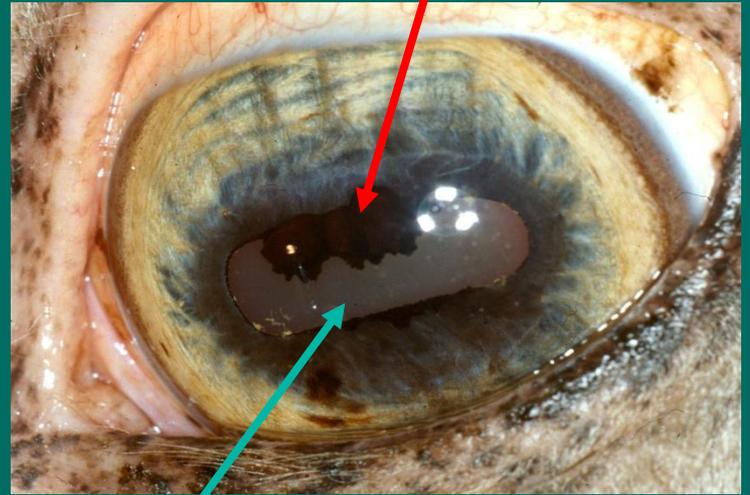
Anatomy of the eye



IRIS

PUPIL

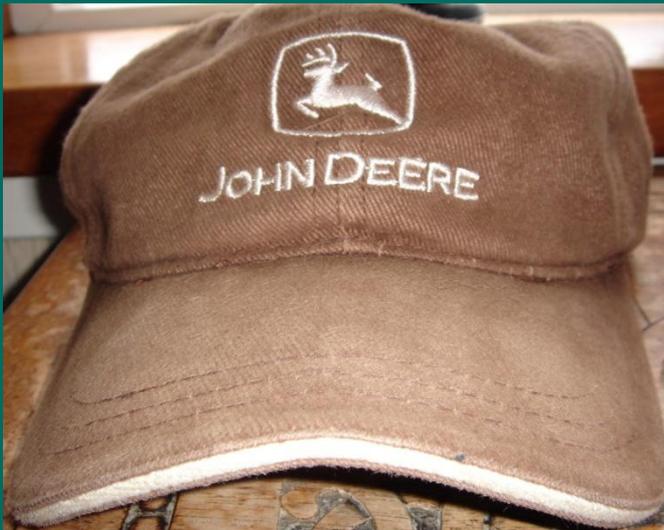
'GRANULAE IRIDICA'



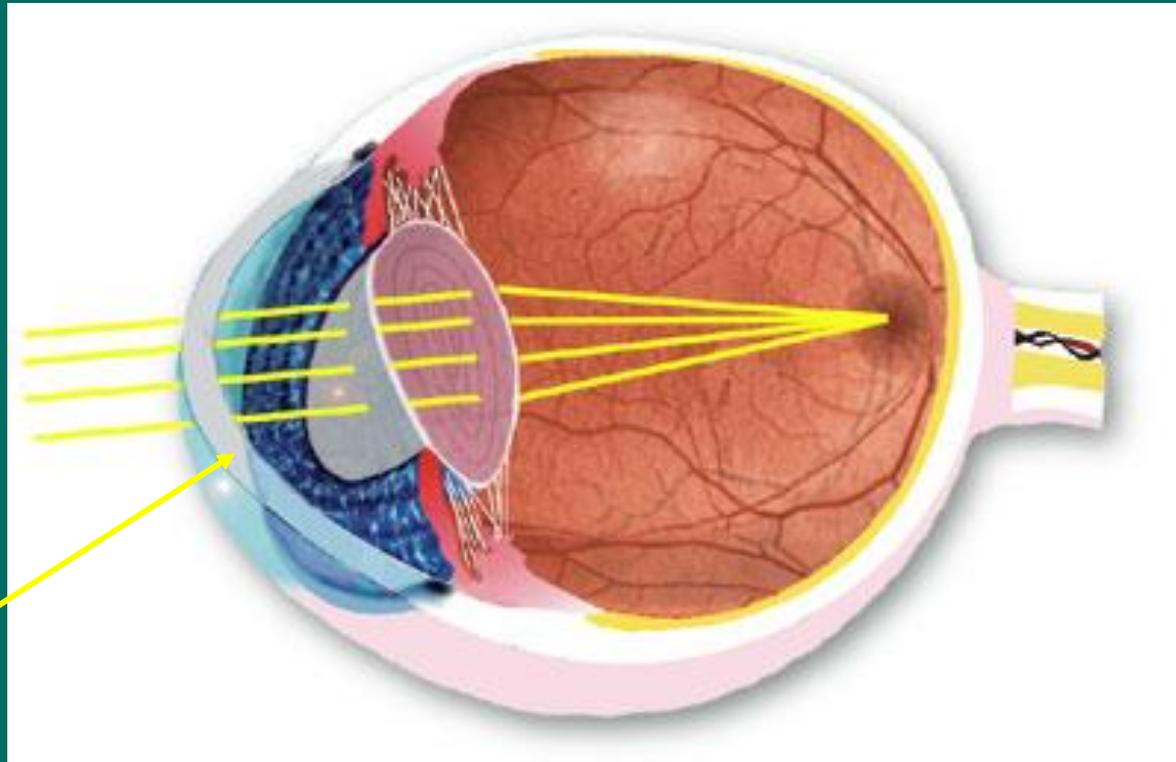
FLATTENED 'OVAL' PUPIL

Anatomy of the eye

'GRANULAE IRIDICA'



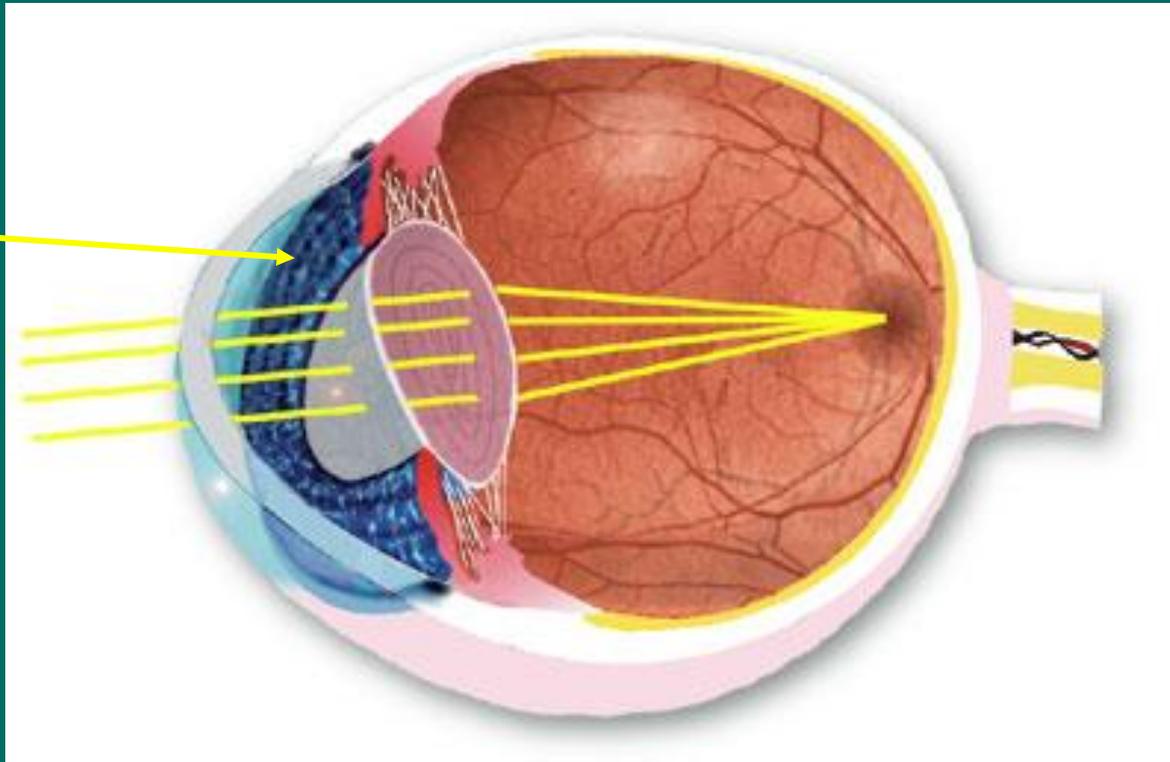
Anatomy of the eye



Cornea

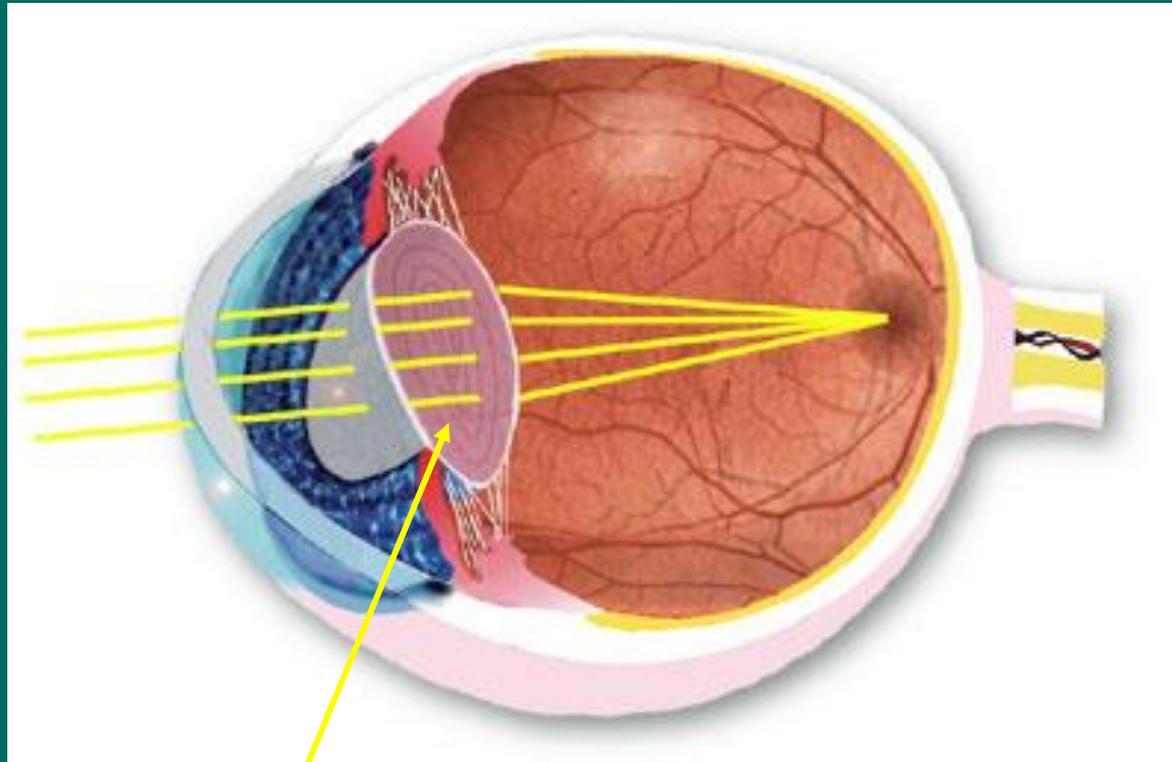
Anatomy of the eye

Iris



Acts as shutter
to control light
entering the eye

Anatomy of the eye

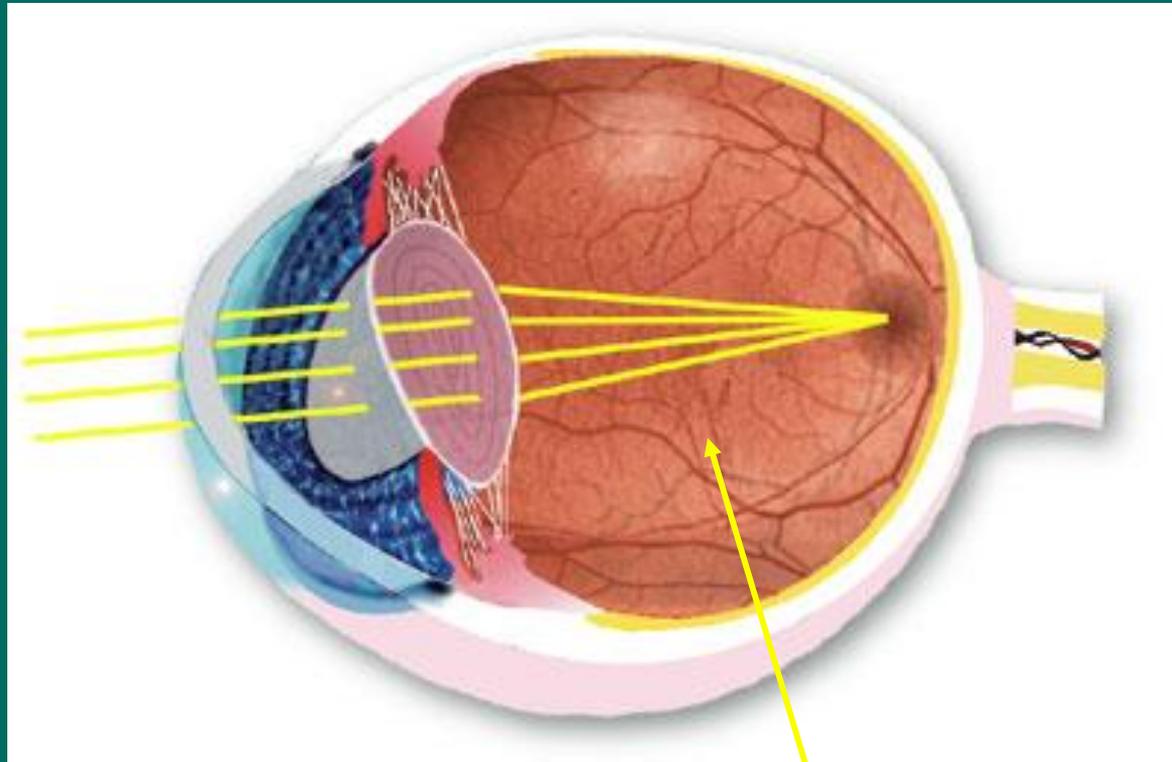


Lens

Changes shape to focus light onto back of the eye.

Limited focusing ability in horse

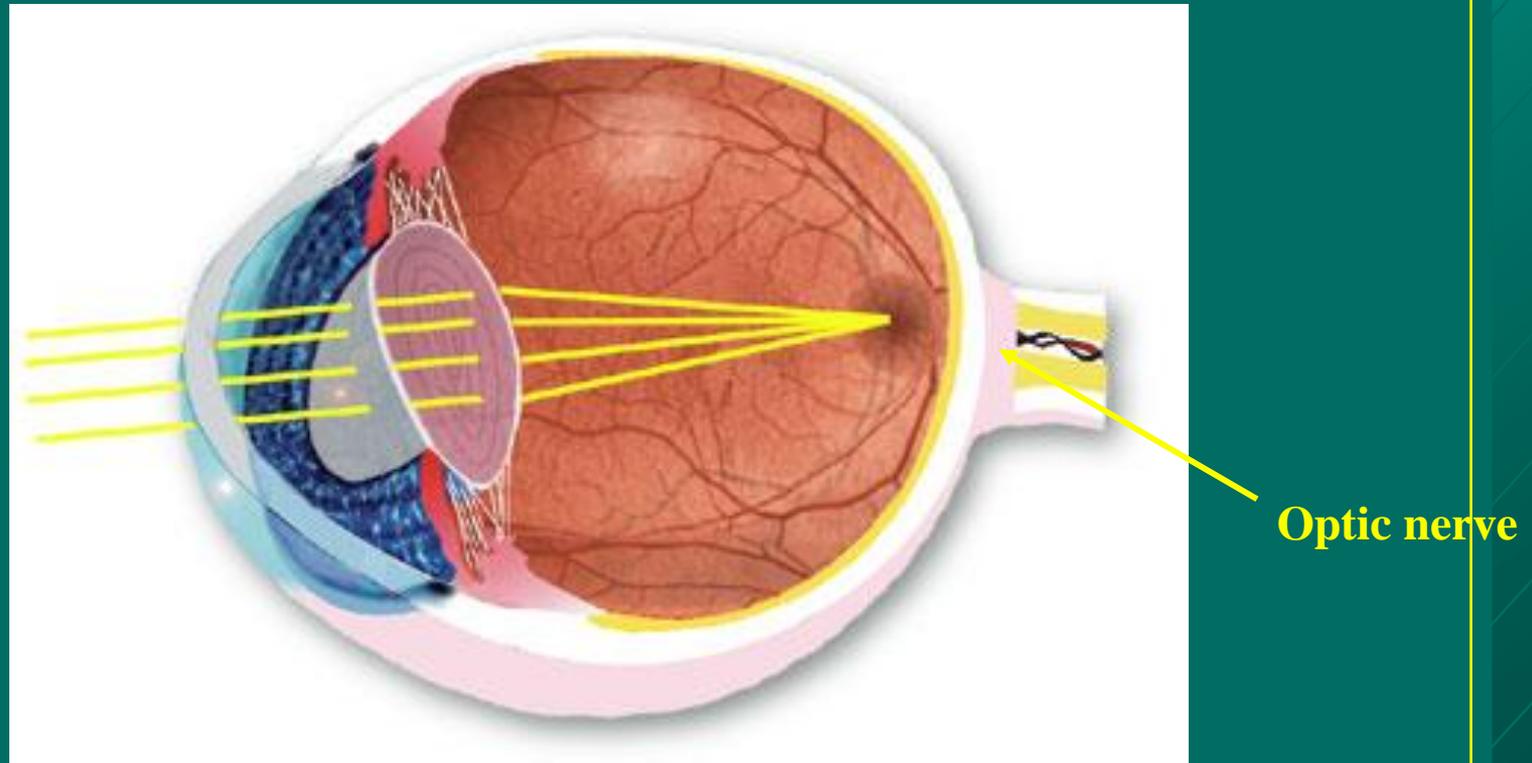
Anatomy of the eye



Receptors stimulated by
light: create electrical
signals

Retina

Anatomy of the eye



Gather electrical signals from retina and carry them to the brain. HENCE VISION

Equine Vision: What do they see?

What does evolution require them to see?



Equine Vision: What do they see?

They need to have.....

- Wide panoramic vision
- Good vision in low light
- Detect motion

Equine Vision: What do they see?

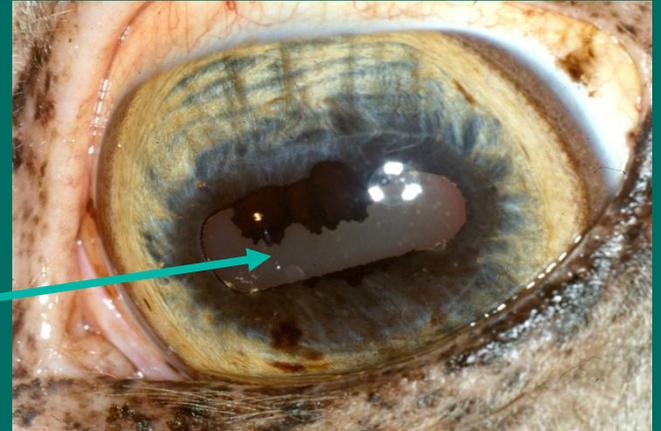
They need to have.....

- Wide panoramic vision
- Good vision in low light
- Detect motion
- ‘Acuity’ (Sharpness) not that important
- Binocular vision not that important
- Color not that important

Wide Panoramic Vision - Visual Field

Remember:

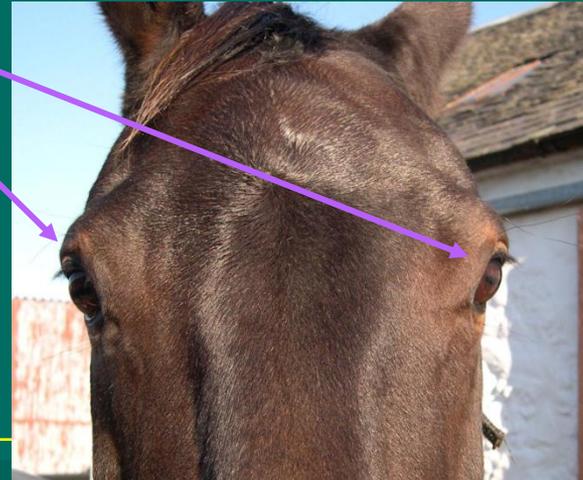
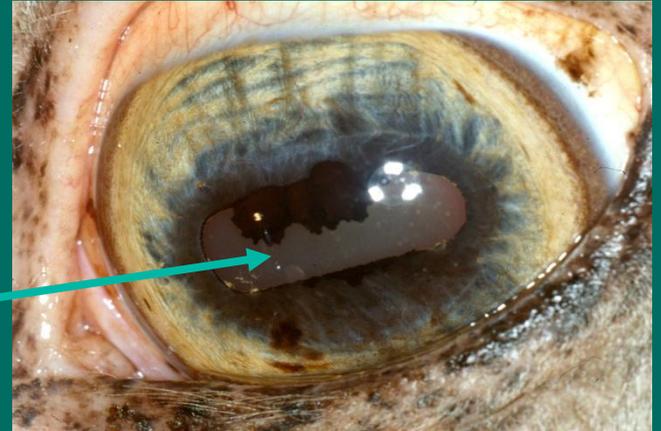
- Flattened 'oval' pupil



Wide Panoramic Vision - Visual Field

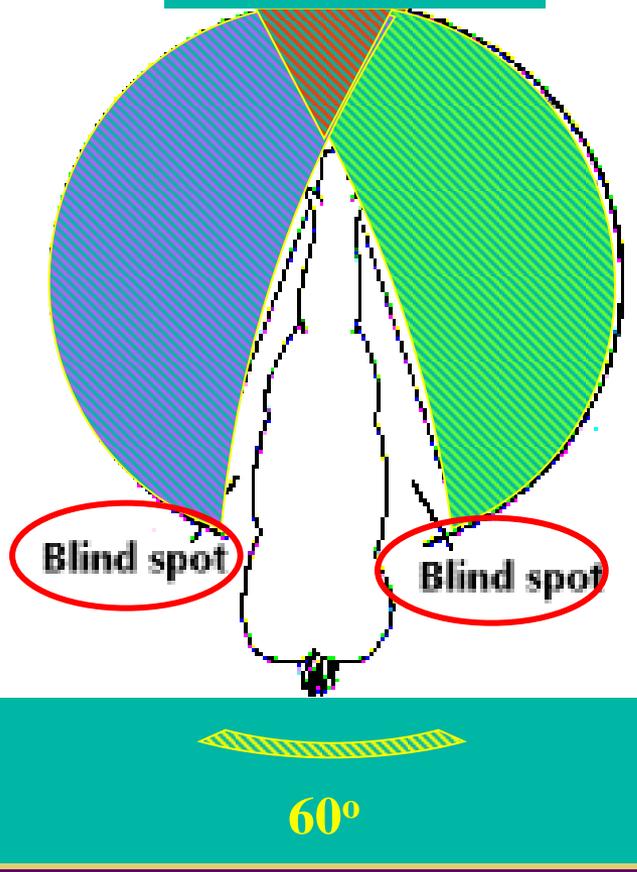
Remember:

- Flattened 'oval' pupil
- Eyes on side of head

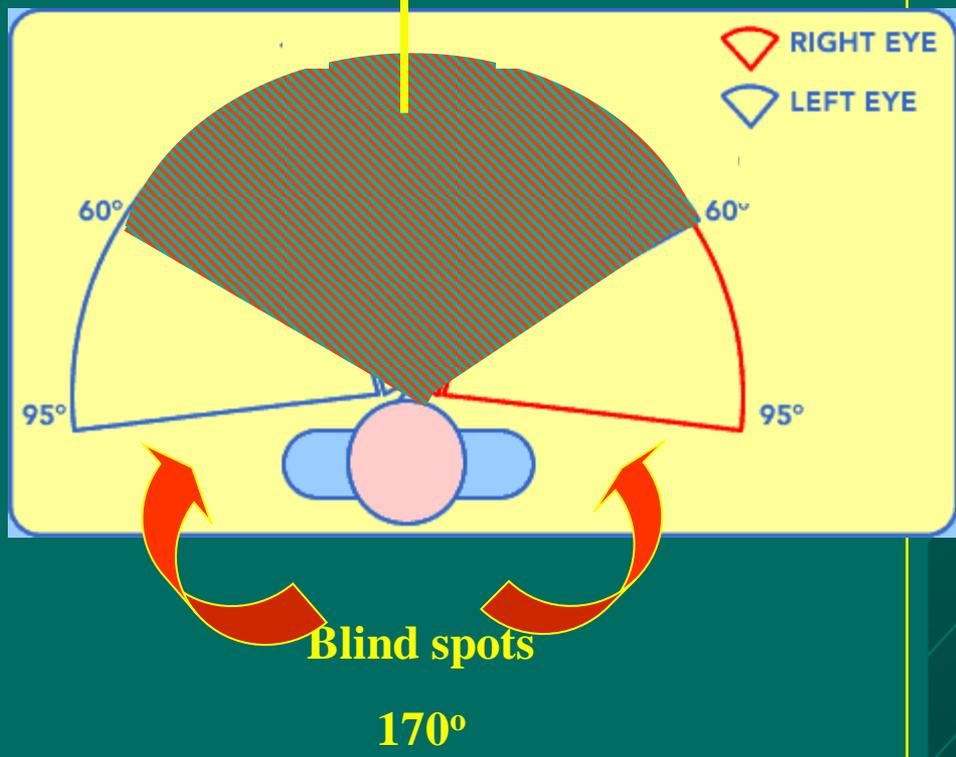


Visual Field

Binocular vision 65°



Binocular vision 120°



Visual Field

Human
field of
vision



Visual Field

Horse field of vision



Human
field of
vision

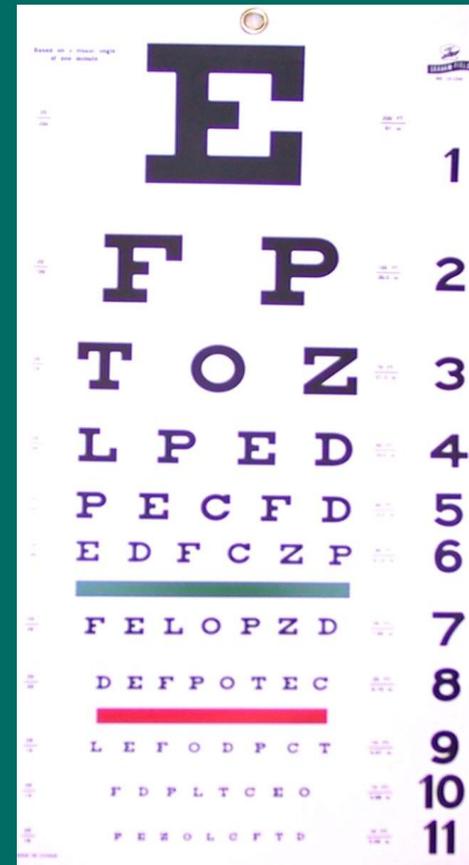


Visual Acuity

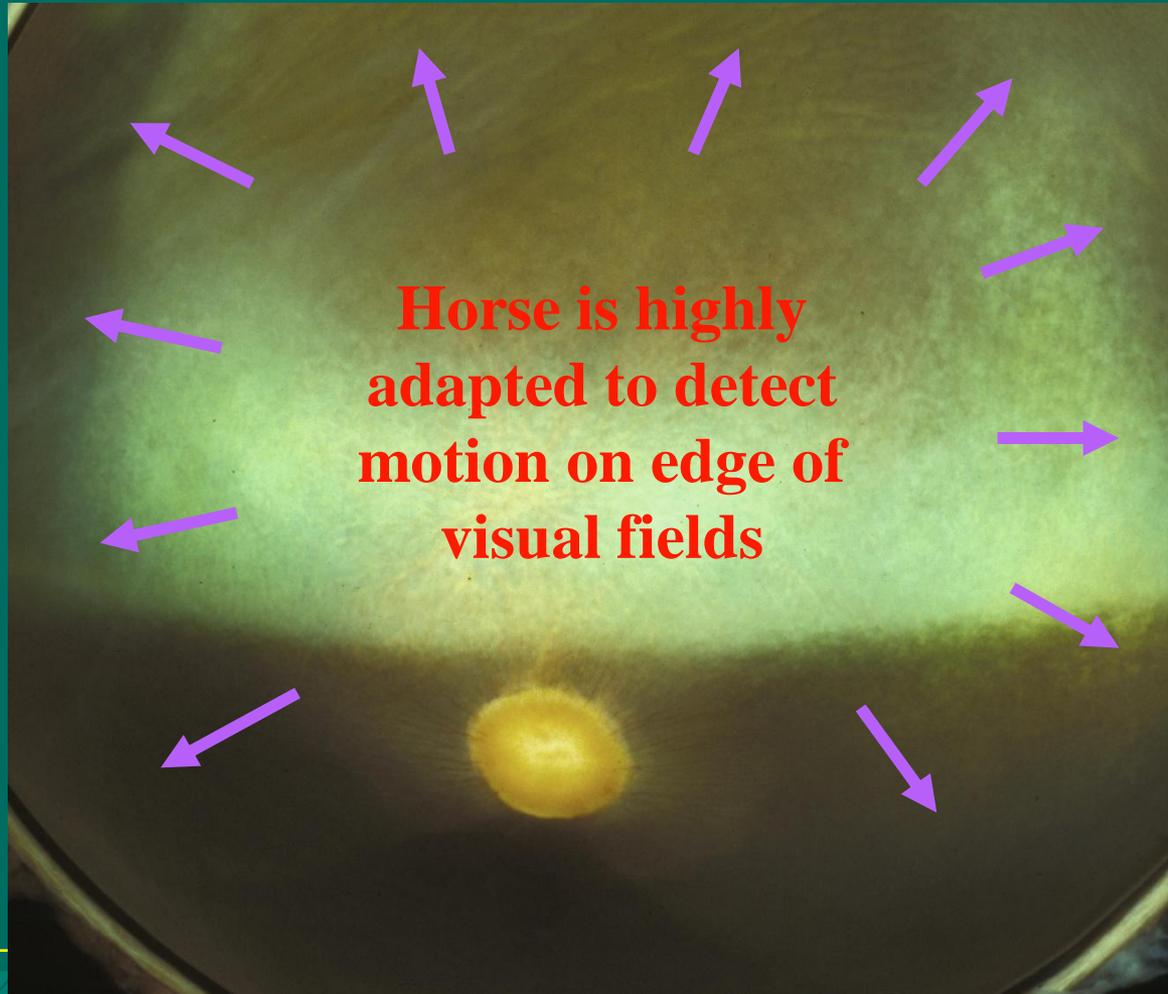
- Sharpness of Vision



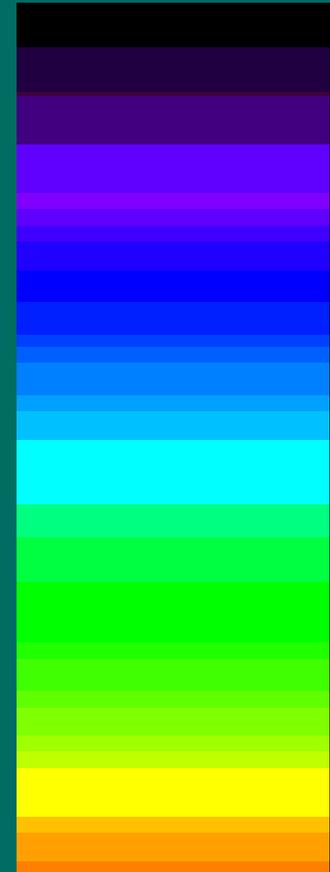
If you can see an object clearly from 50 feet away, a horse would need to be 20 feet away to see that object in the same detail



Detection of Motion



Equine Color Vision



Equine Color Vision



Colors appear 'washed out'





Can we test a horse's vision?

- If it is completely blind....Yes

Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!



Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!
- Otherwise....Not objectively!

Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!
- Otherwise....Not objectively!

OBSTACLE COURSES ??



Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!
- Otherwise....Not objectively!

'MENACE' TESTING

If horse reacts: *ie.* a positive test



Figure 2: The menace reflex

Tells us the horse has, at a minimum, 20\20000 vision

Which is vision 100x worse than what, in man, is legally blind!

Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!
- Otherwise....Not objectively!

~~'MENACE' TESTING~~

If horse doesn't react: *ie.* a negative test

Tells us the horse probably couldn't care less!!



Can we test a horse's vision?

- If it is completely blind....Yes
- Because it walks into things!
- Otherwise....Not objectively!
- Horses with severe and extensive eye disease show no apparent difficulty in “seeing”!
- This is one of life's mysteries.....

Can we test a horse's vision?



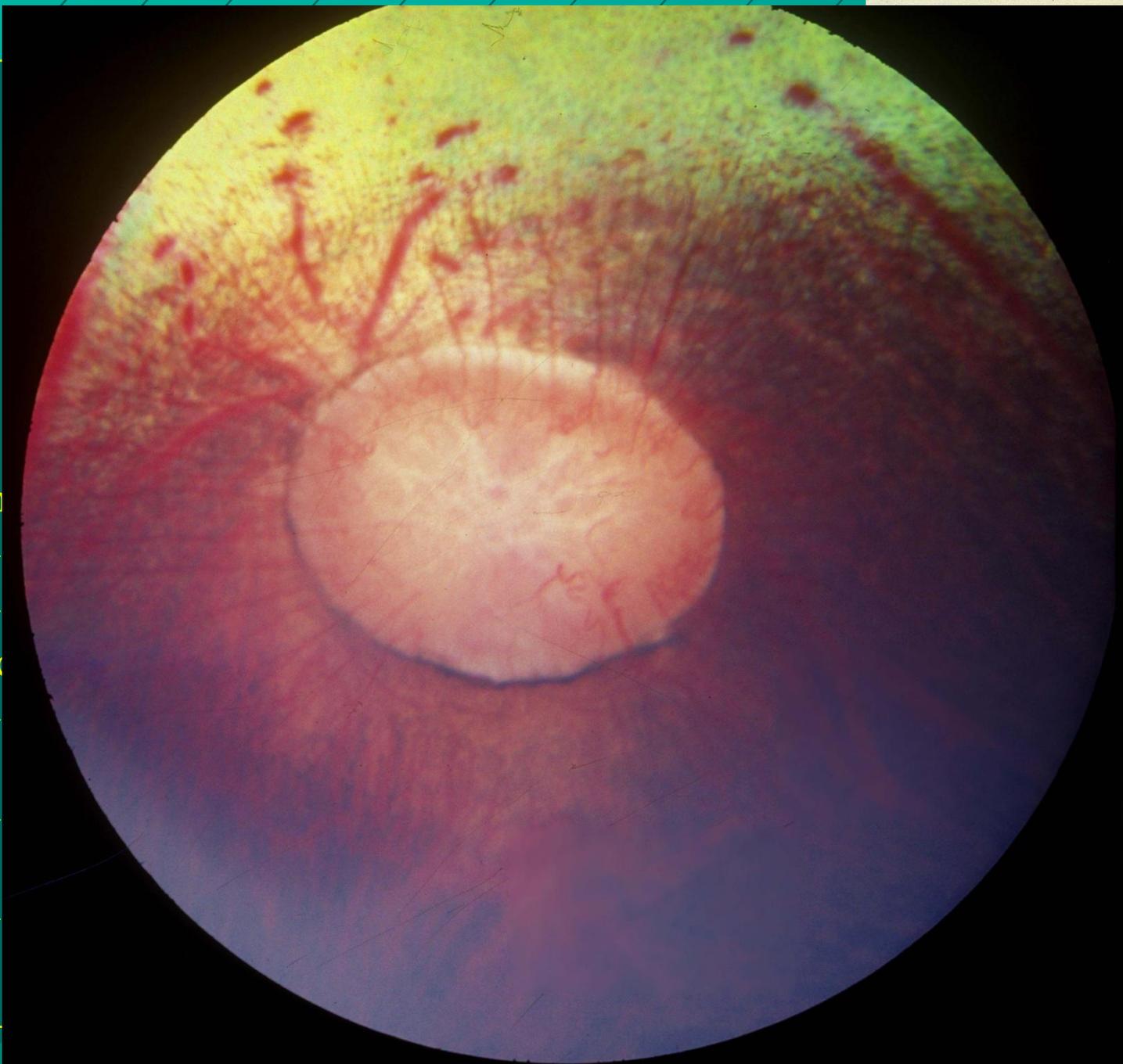
Can we test a horse's vision? The most we can say is...

- That from examining the eye...



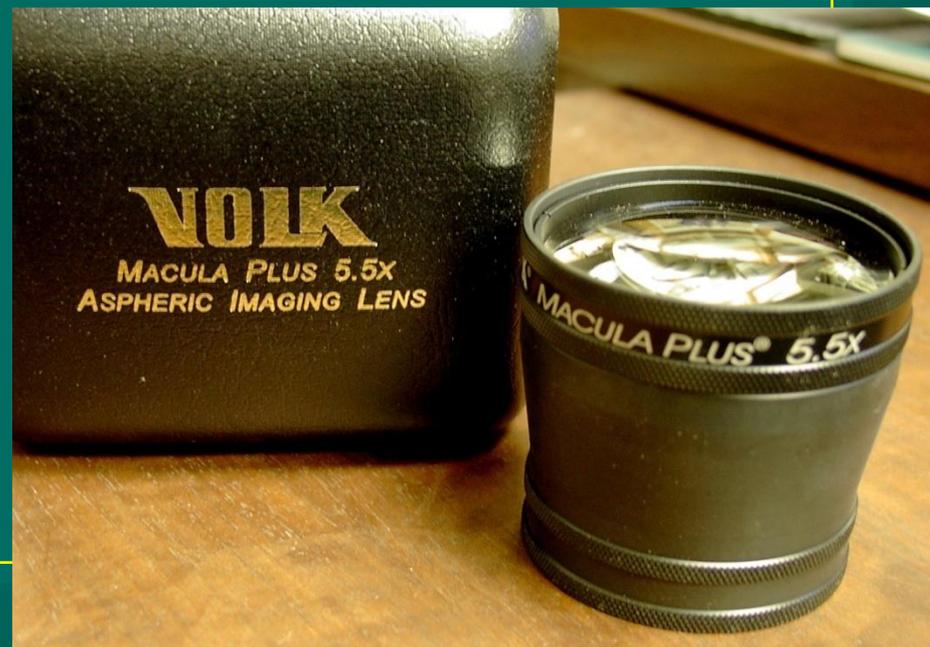
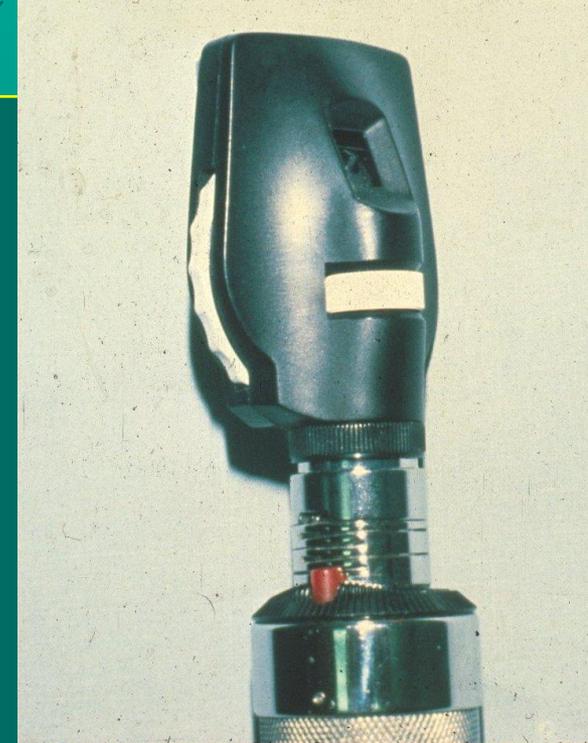
- This eye has an abnormality or disease which is damaging eye function...and therefore
- A visual deficit is present in this horse
 - Either: This is a major problem, and is likely to affect behaviour and safety of horse and rider
 - Or: This is a minor problem and is, on balance of probability, of no consequence
- But there are often ‘in betweens’.

- The
- Inc



Ophthalmoscopy

- The direct ophthalmoscope:
 - lateral magnification: 7.9X
 - axial magnification: 84X
- Indirect ophthalmoscopy:
 - 5.5 D lens: 3.86X lateral and 20.1X axial
 - 14 D lens: 1.18X lateral and 1.86X axial
 - 20 D lens: 0.79X and 0.84X lateral and axial respectively.



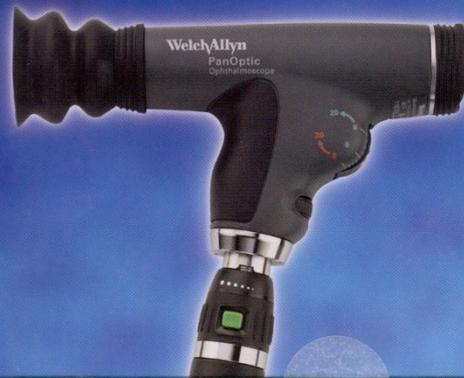
PanOptic™

Ophthalmoscope

Field of View

	
Standard	PanOptic

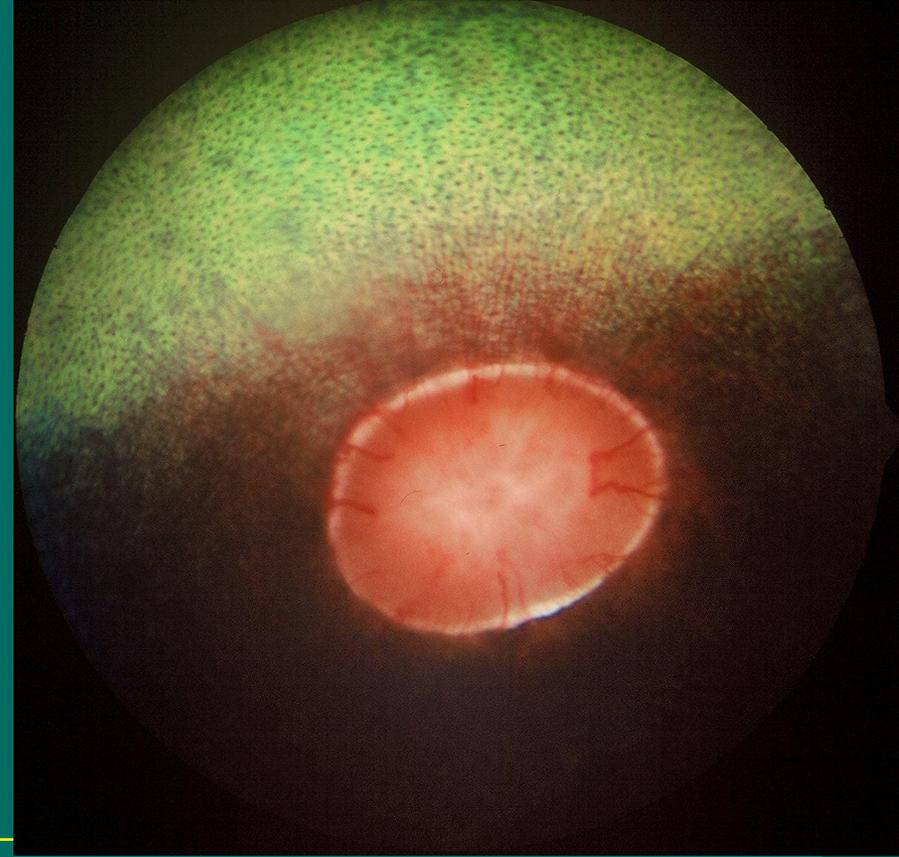
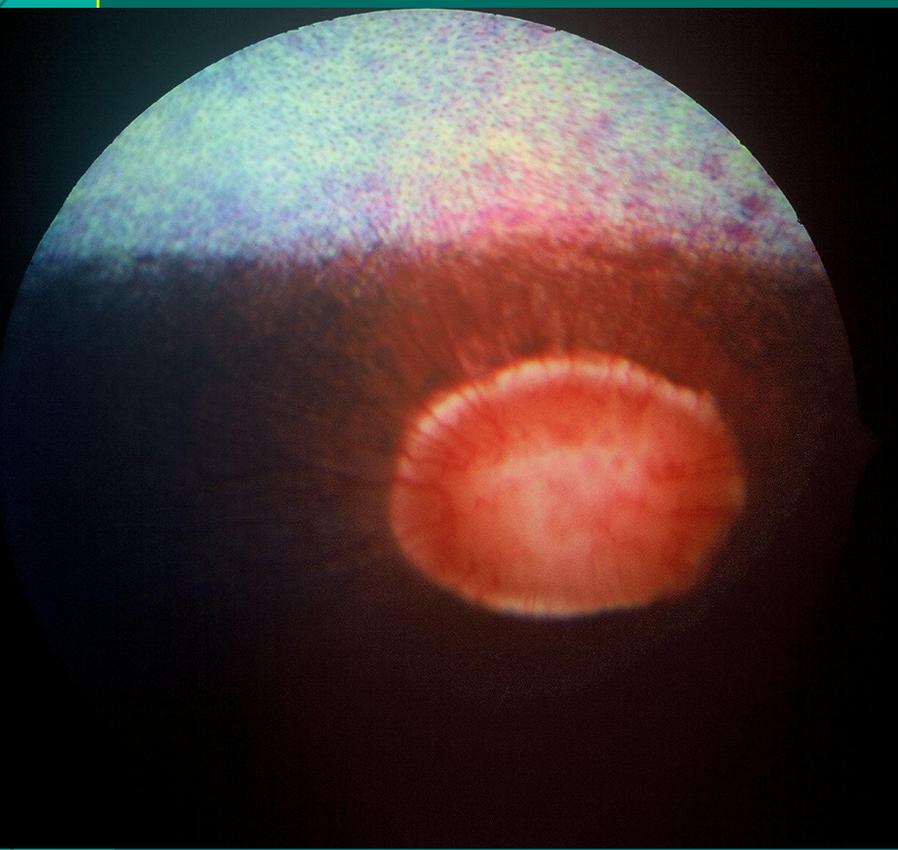
5X
Larger
Viewing
Area

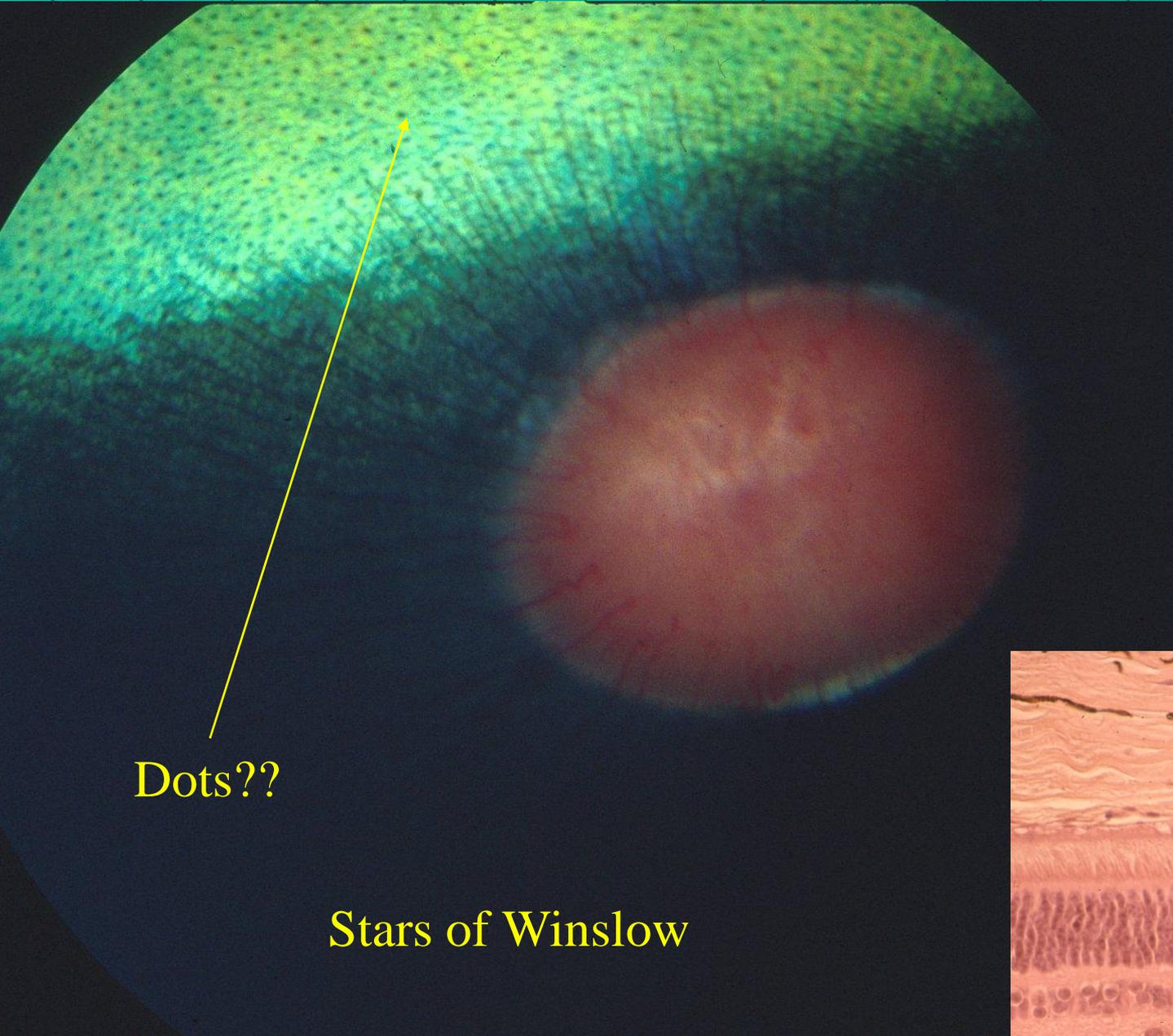


Introducing the Welch Allyn® PanOptic™ Ophthalmoscope with innovative Axial PointSource™ Optics

Revolutionary new technology for a difference you can see.

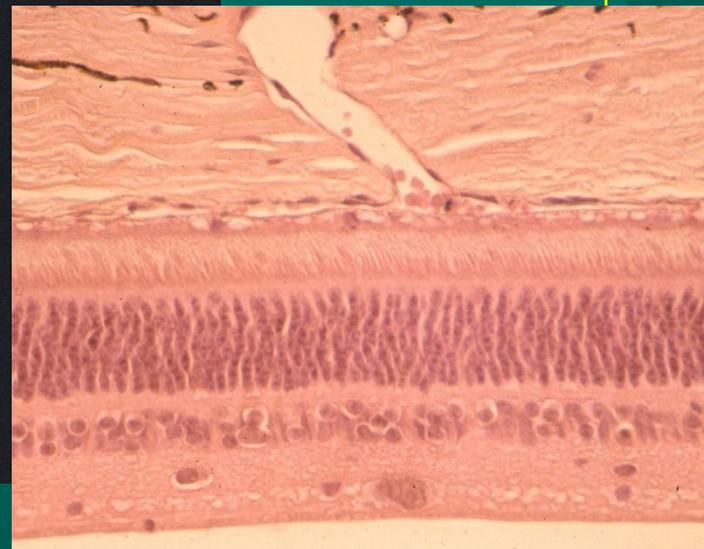
CD-ROM for Windows®





Dots??

Stars of Winslow



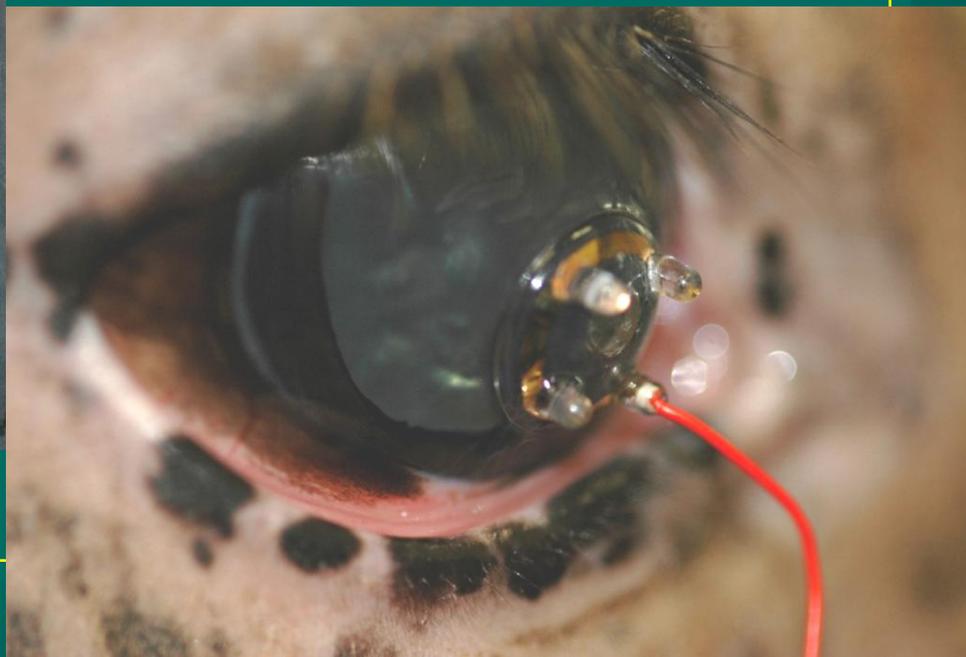
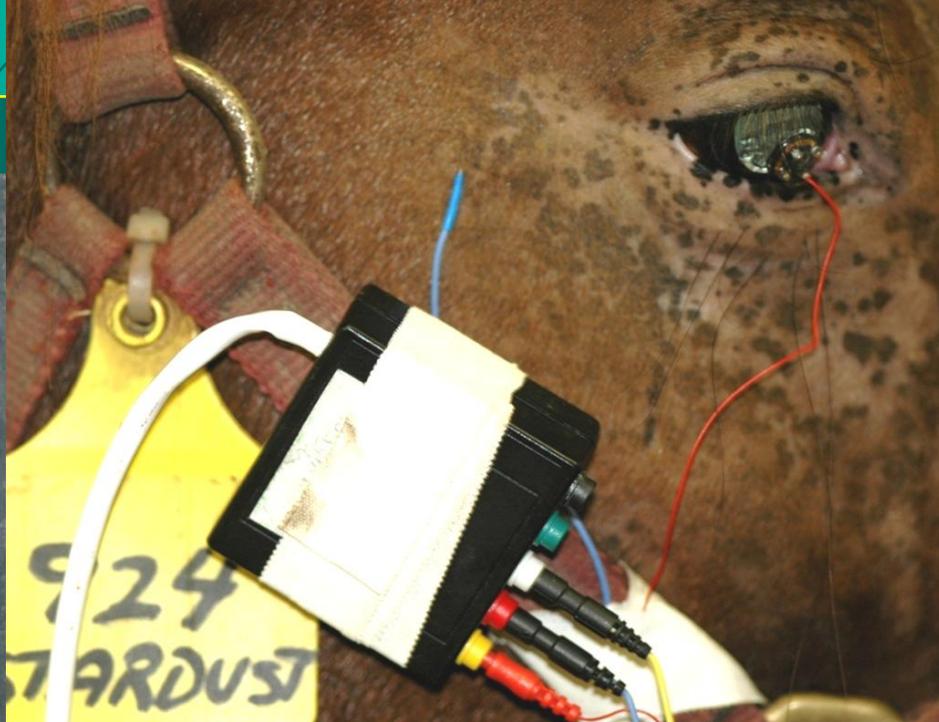
- Visual impairment in dim light with generally normal vision in daylight
- Behavioral uneasiness at night
- Normal retinal appearance!!
- Defect in neural transmission related to reduced expression of the *TRPM1* gene.
 - (Transient Receptor Potential Melatansin1)



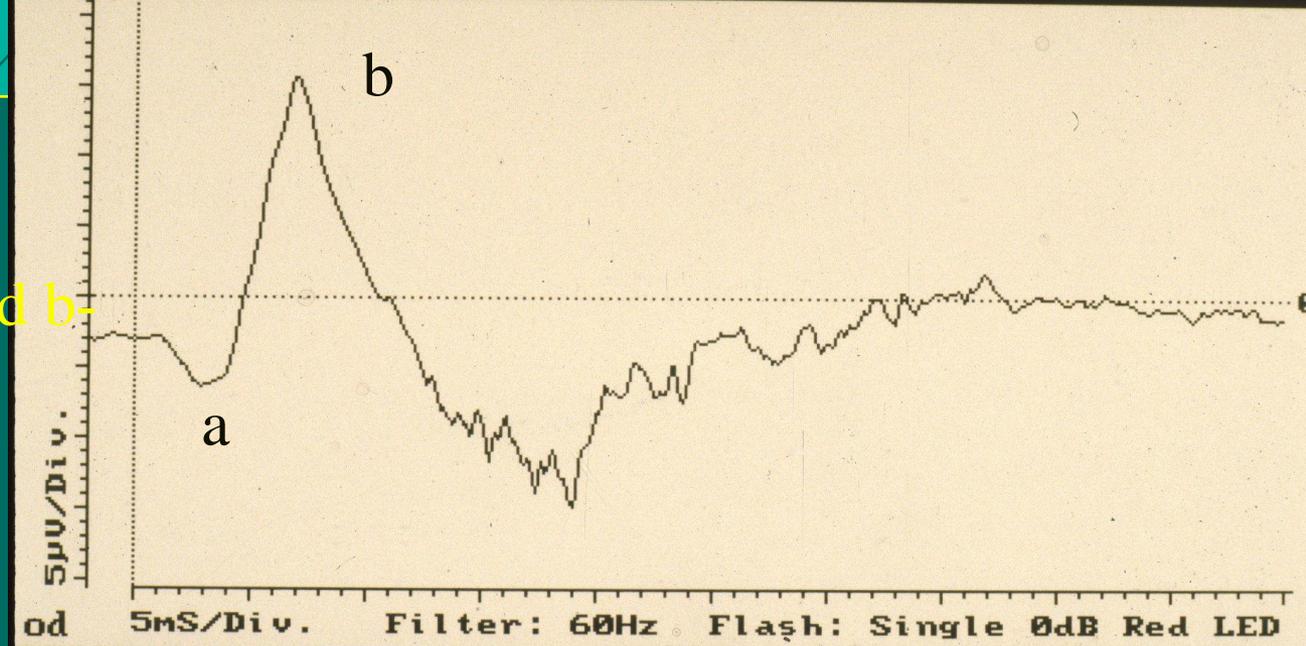
CSNB



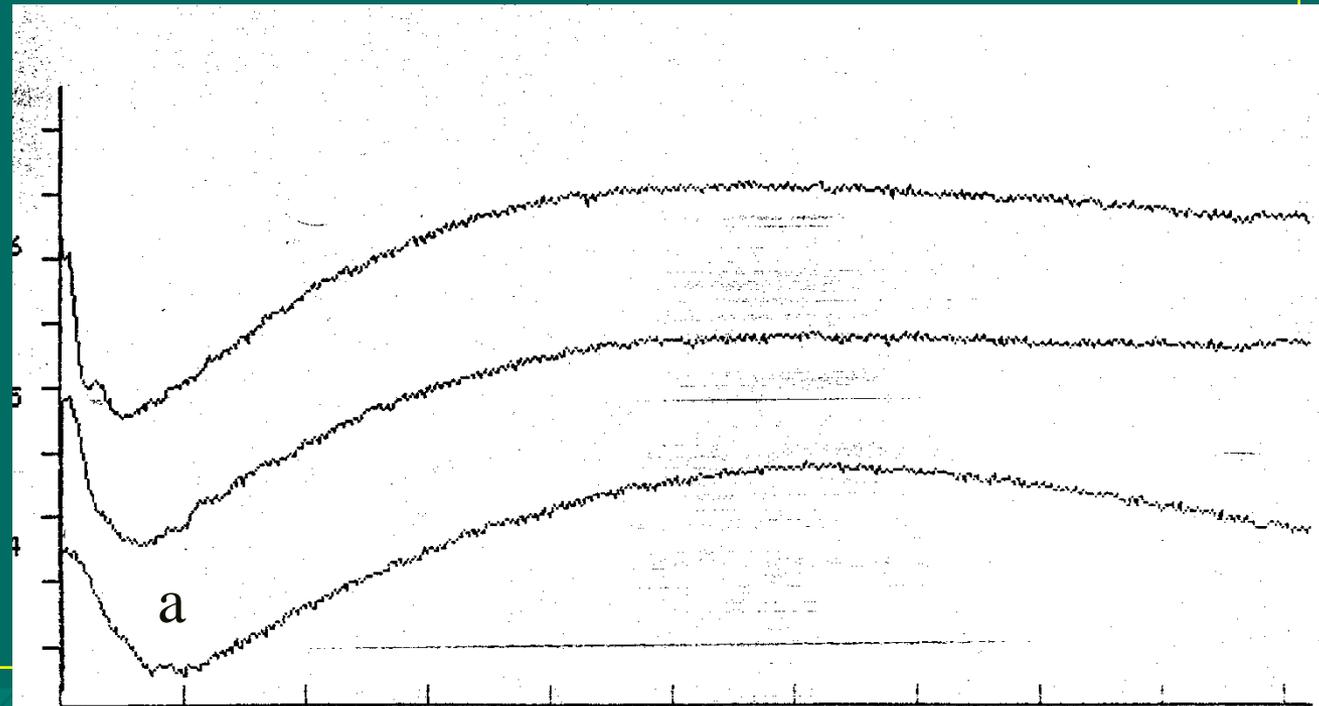
- ERG: large negative scotopic a-wave with decreased scotopic b-wave amplitude
- Normal histology suggesting a neurotransmission problem in the middle retina
- The true incidence of this disease in Appaloosas is not known but may approach 25%
- No treatment
- Do not breed



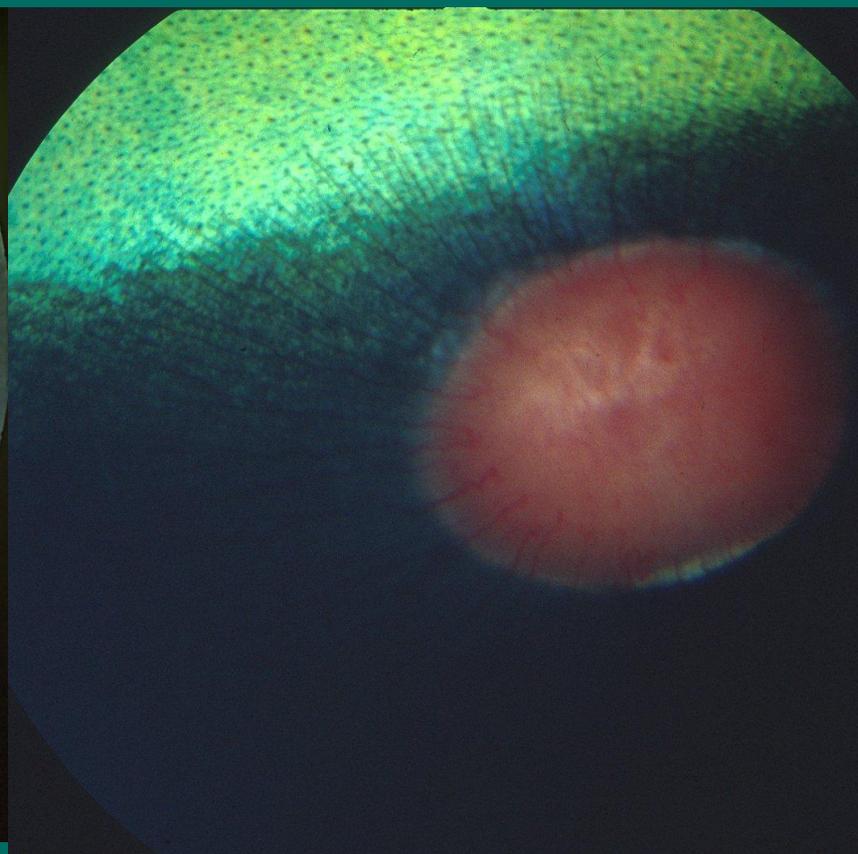
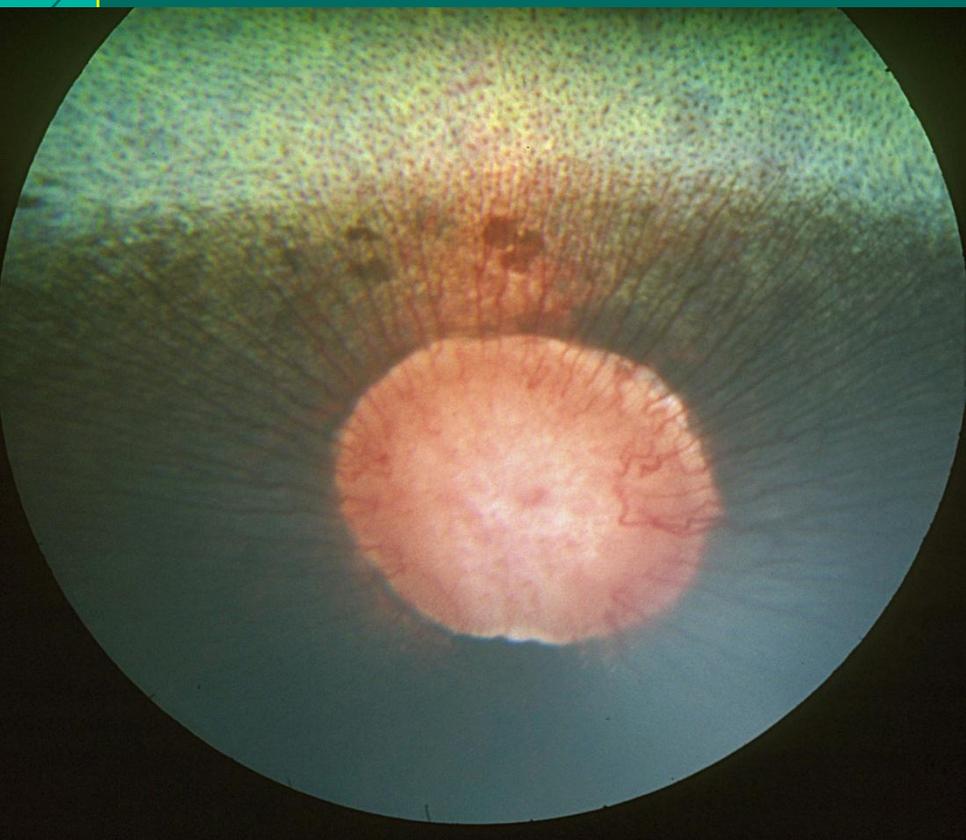
Normal ERG a- and b-waves

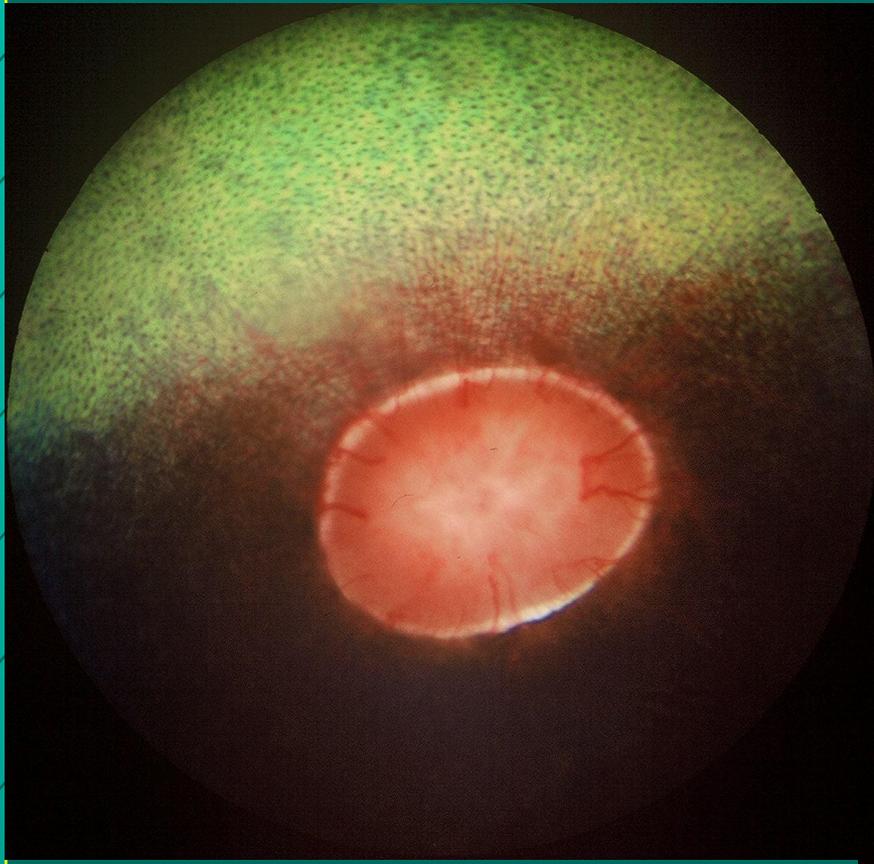


CSNB:
all a-wave

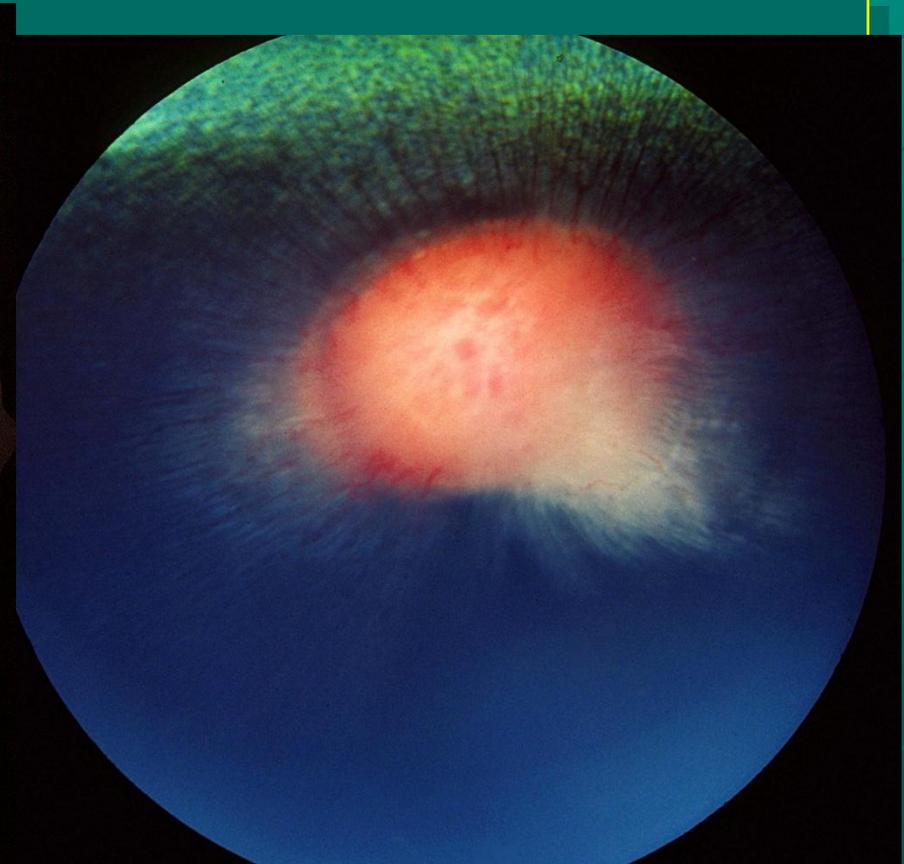


Retinal images

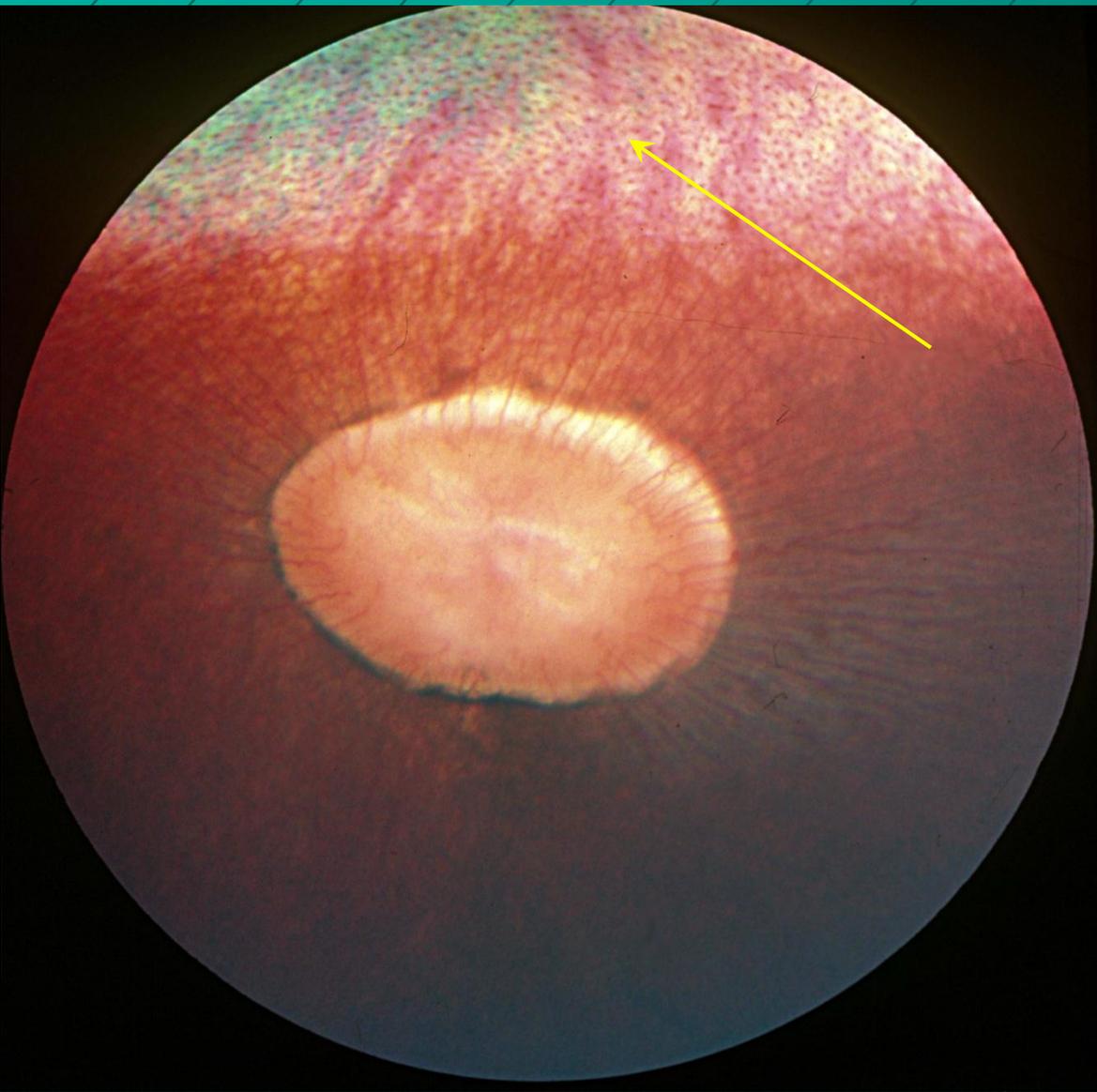
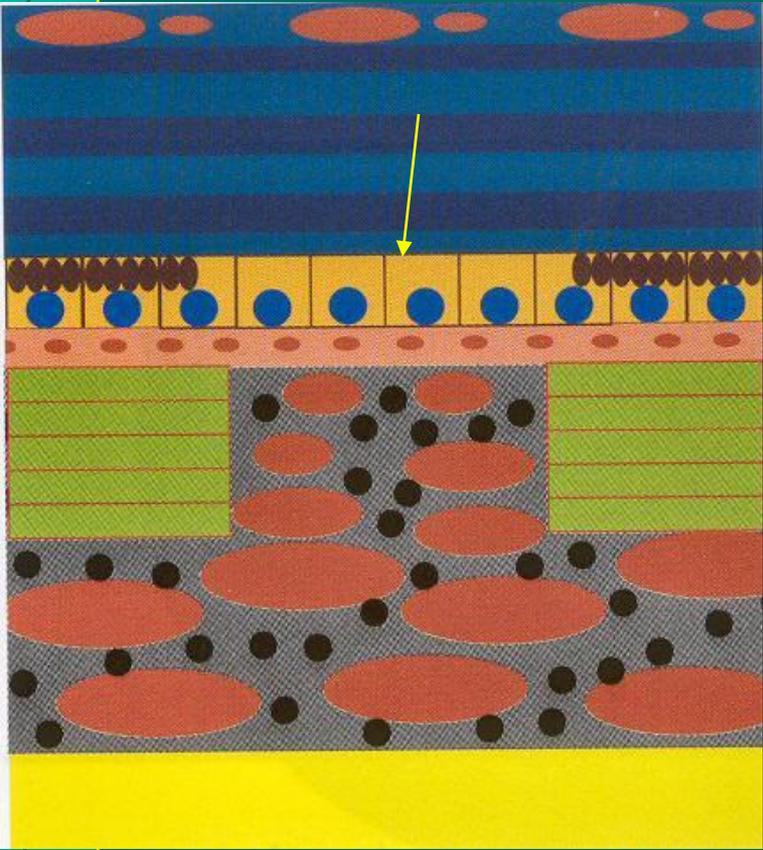




Normal

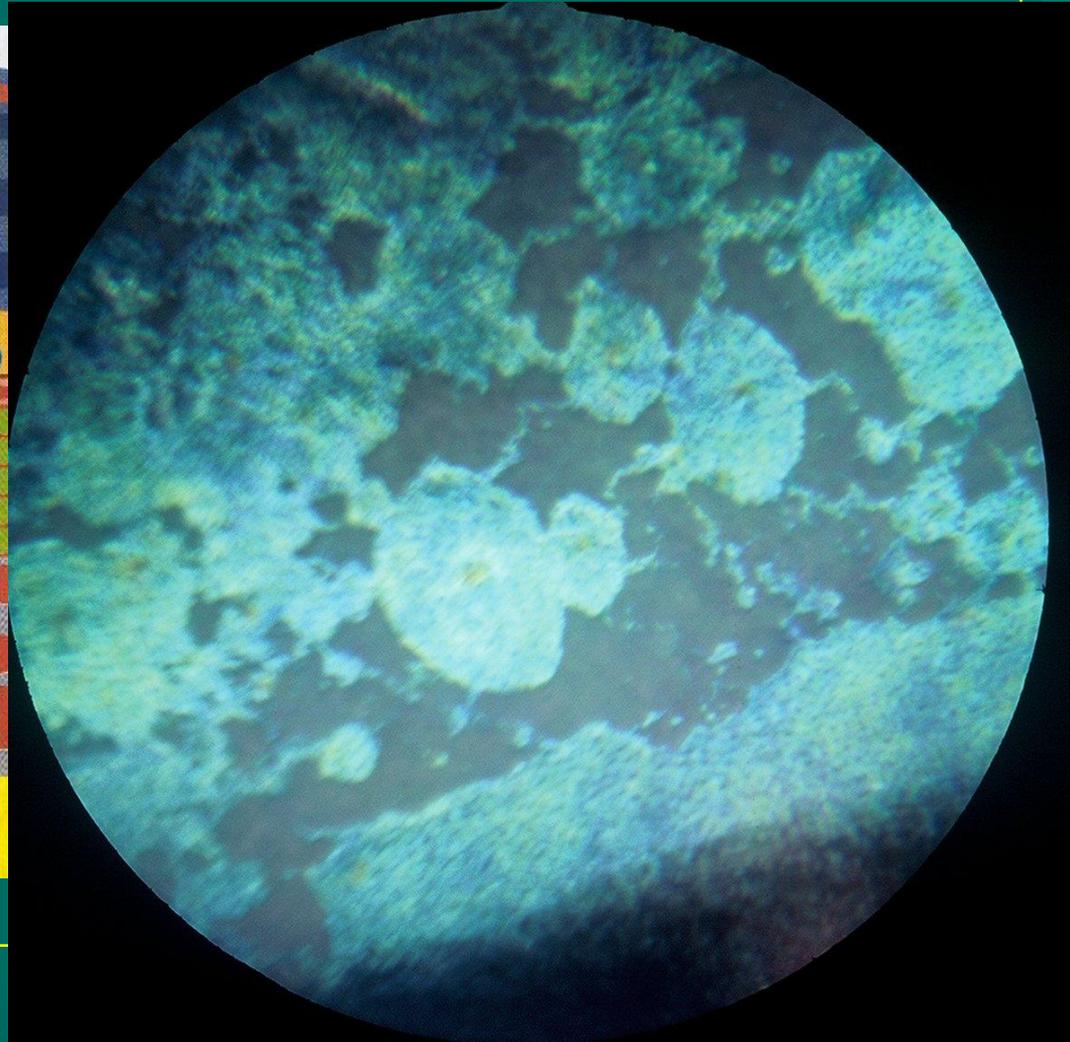
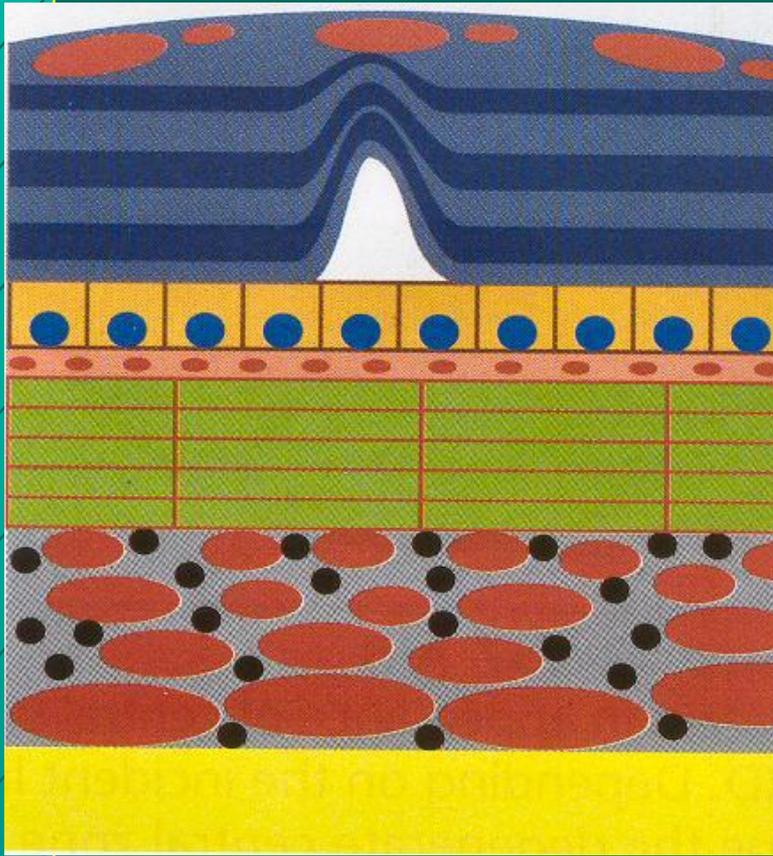


Excess myelin (AM)

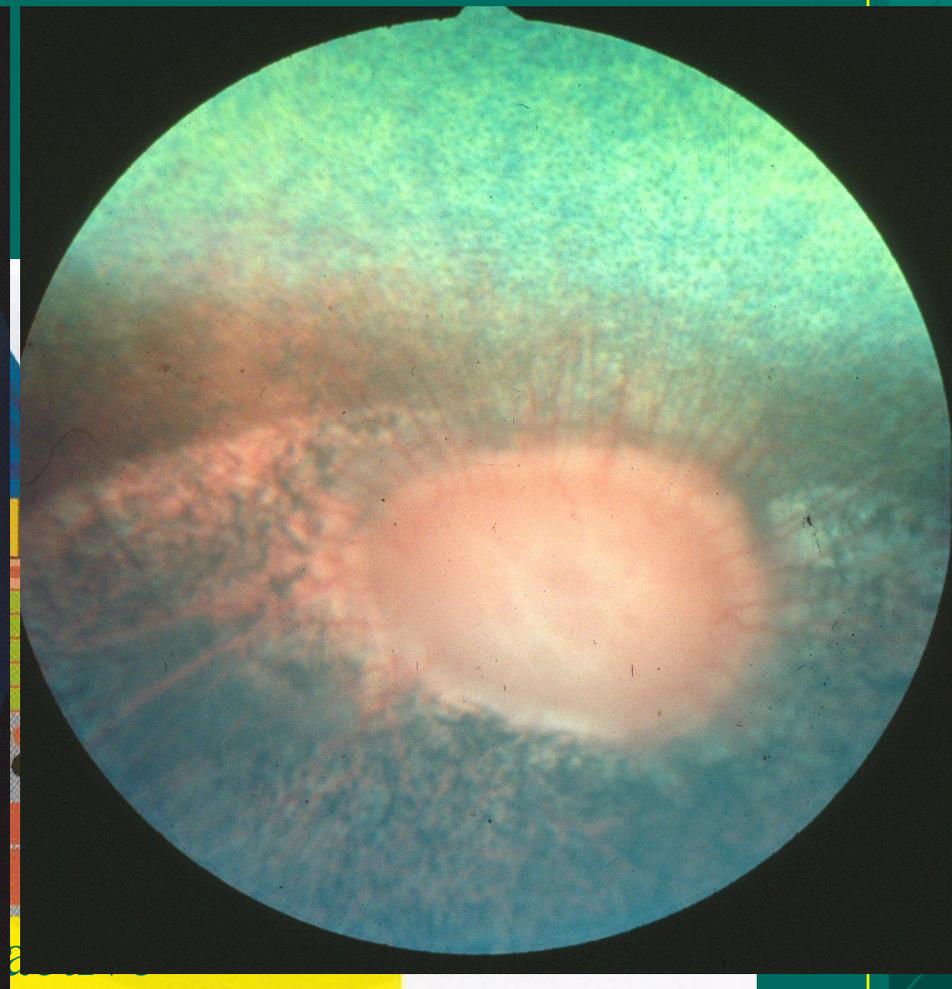
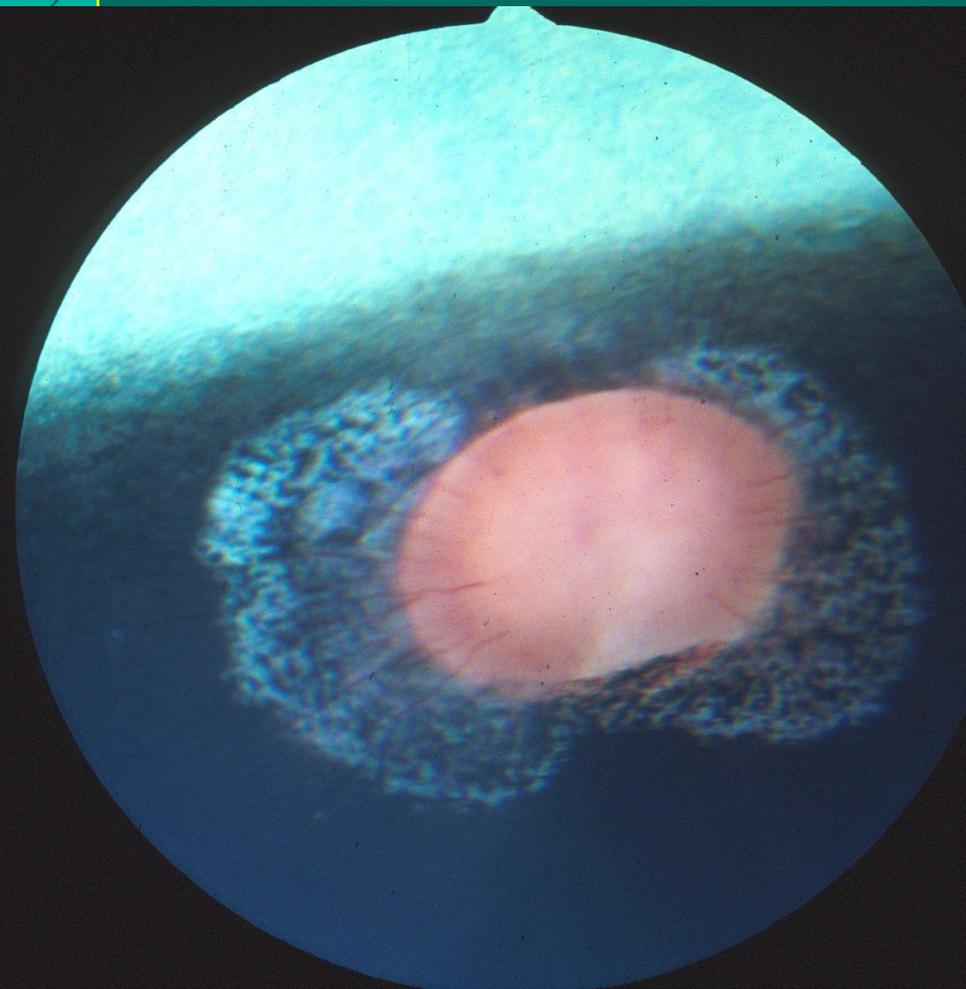


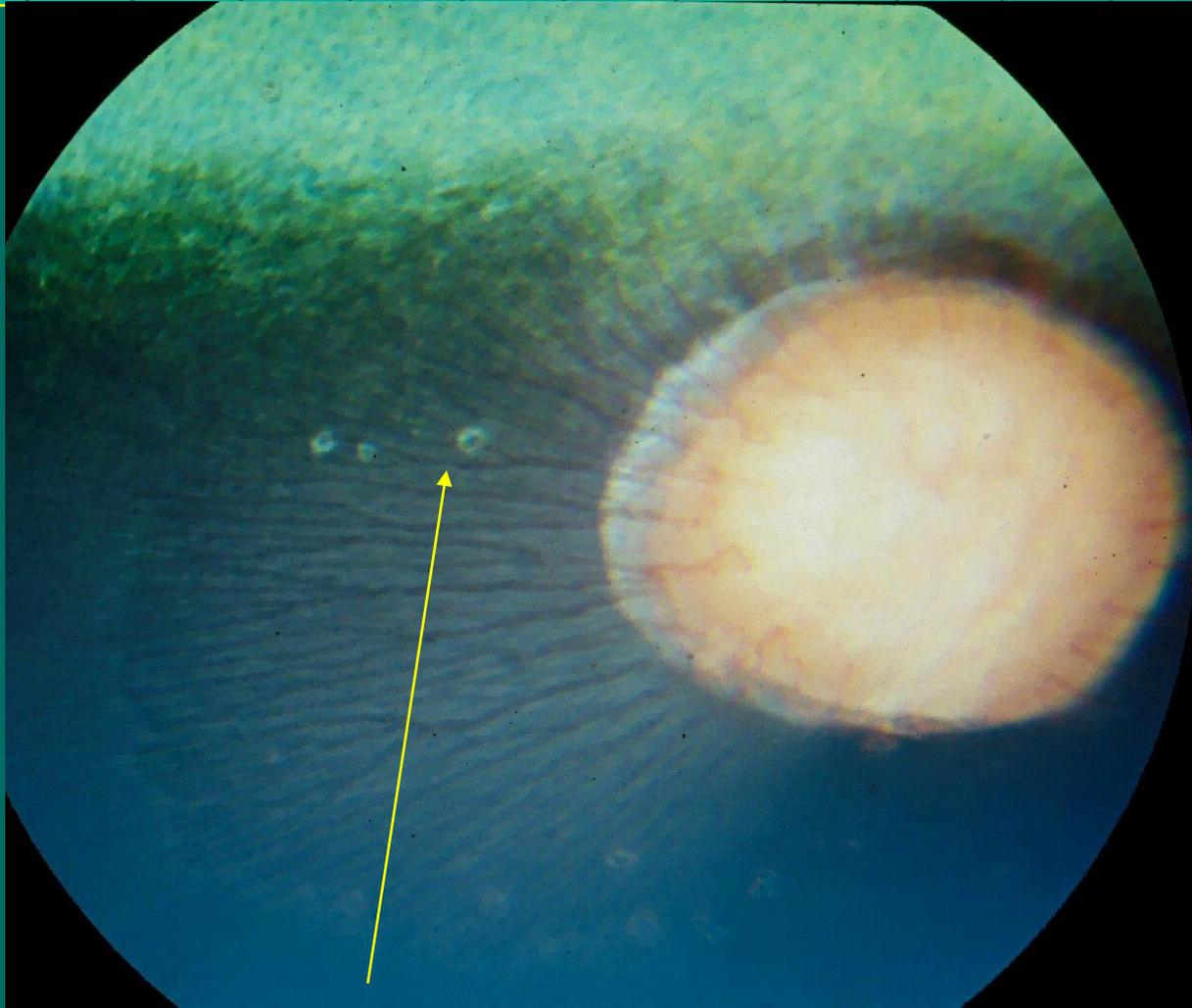
Tapetal thinning

Retinal Dysplasia

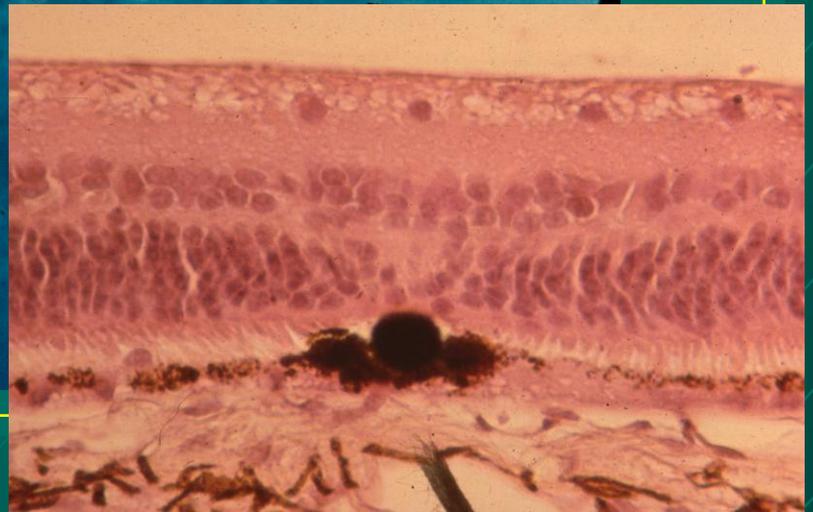
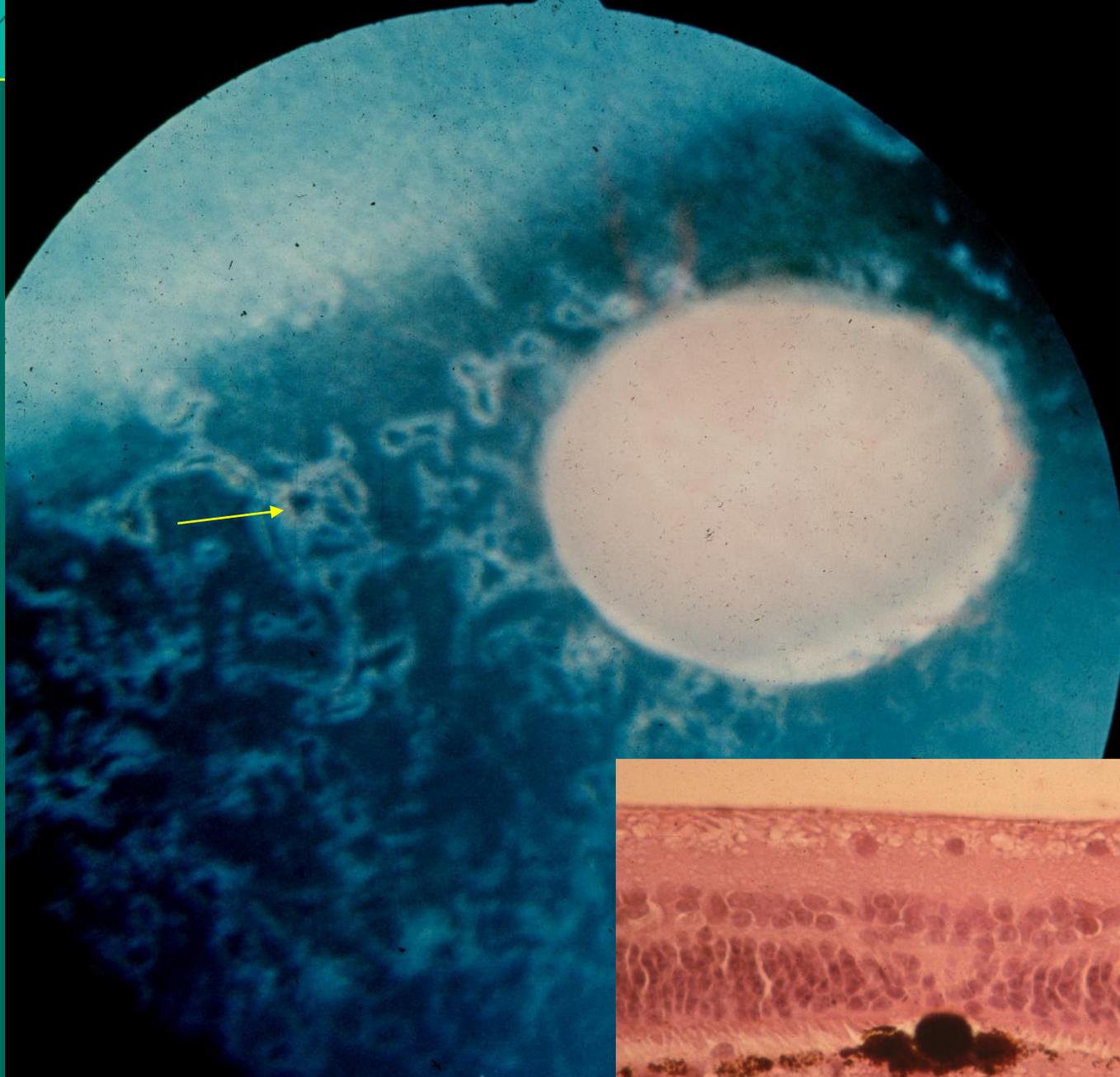


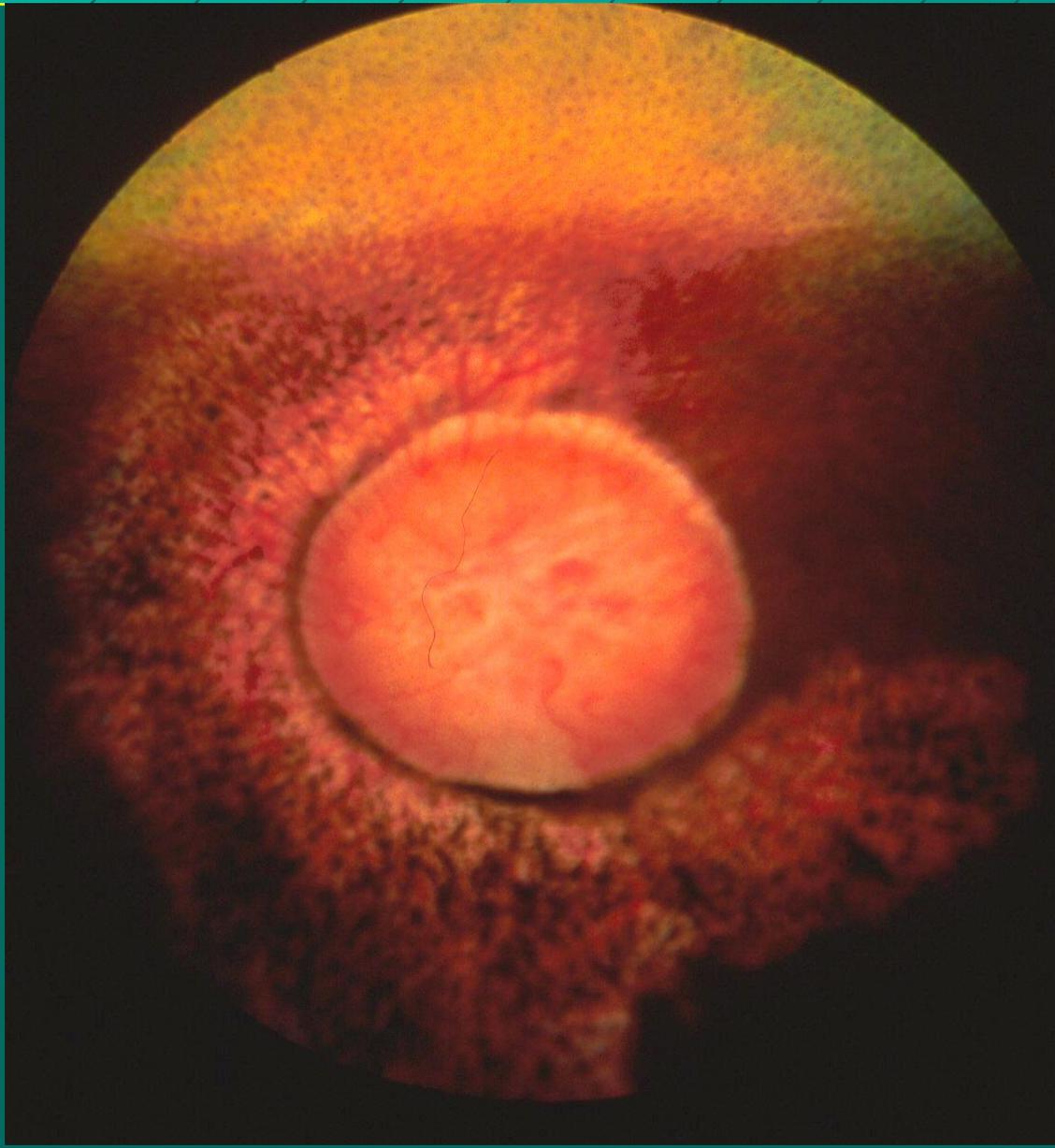
Chorioretinitis



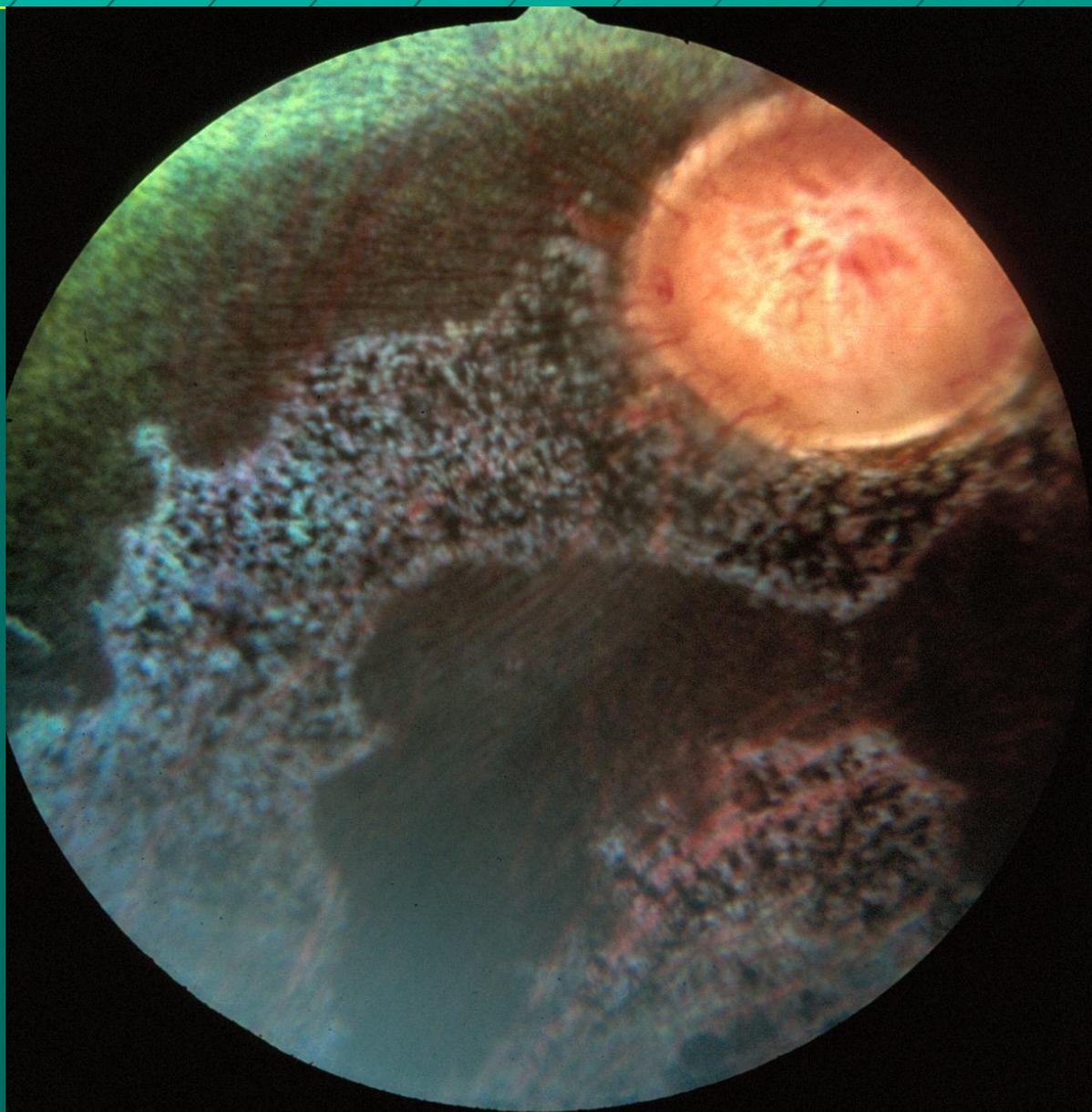


“bullet hole” chorioretinitis: not related to ERU



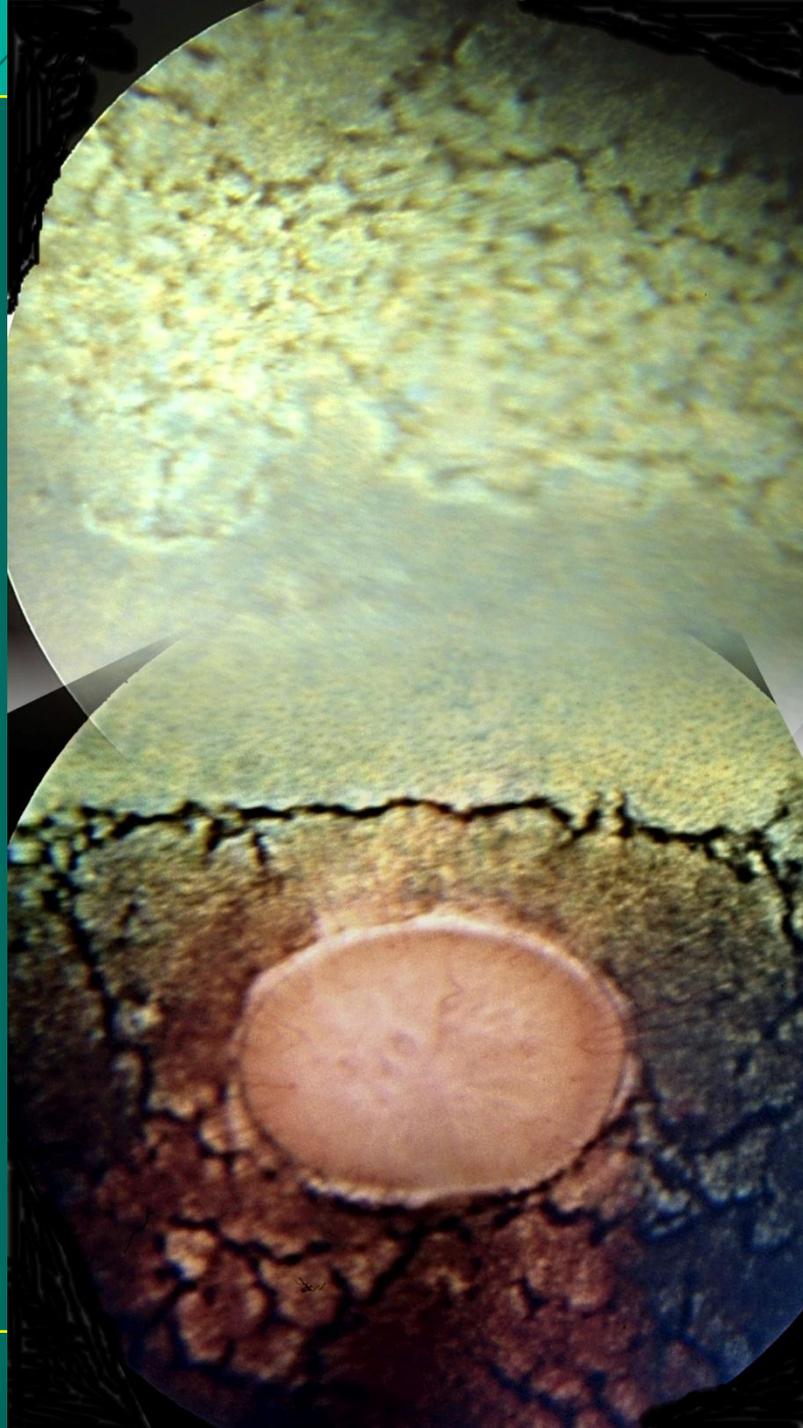


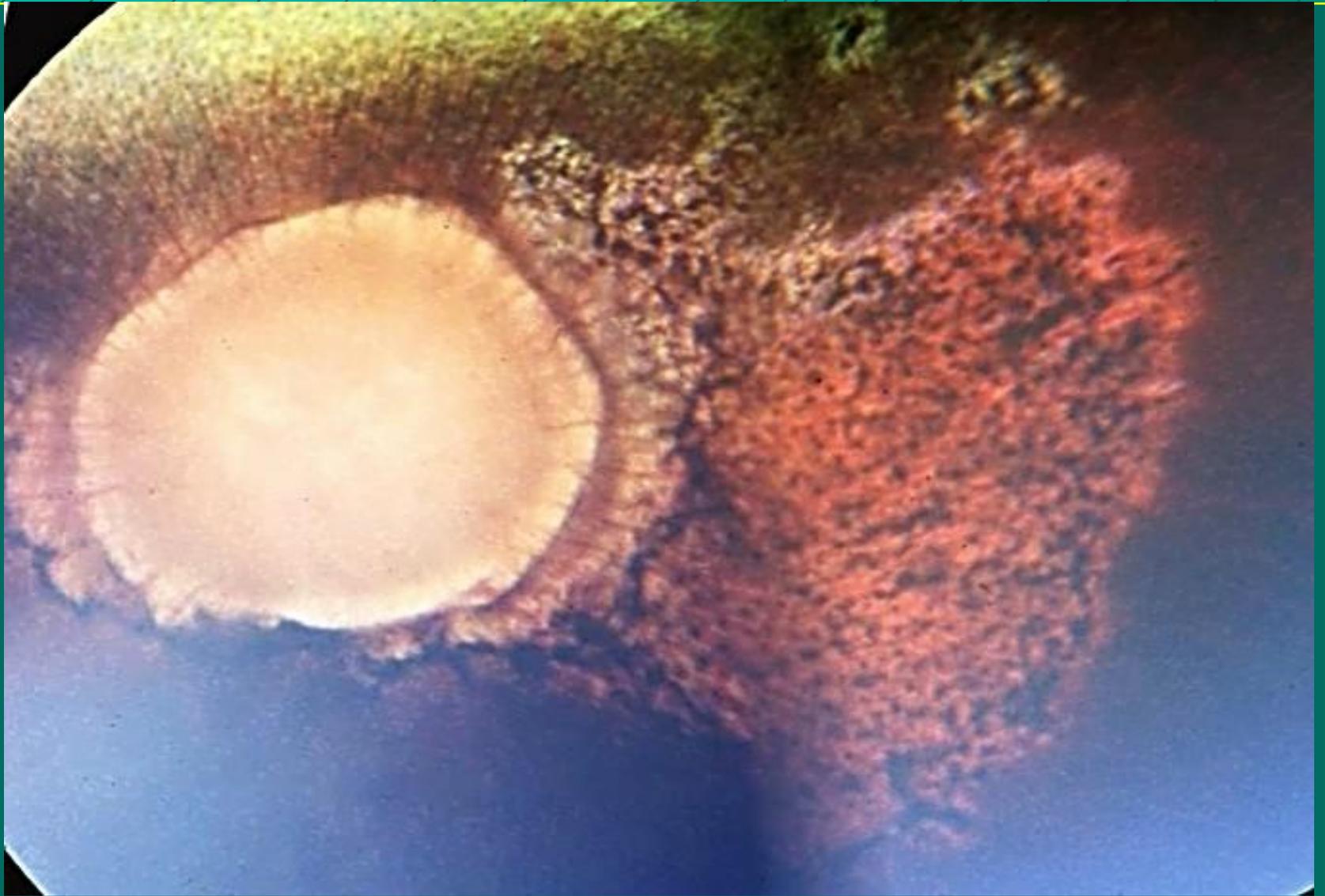
ERU



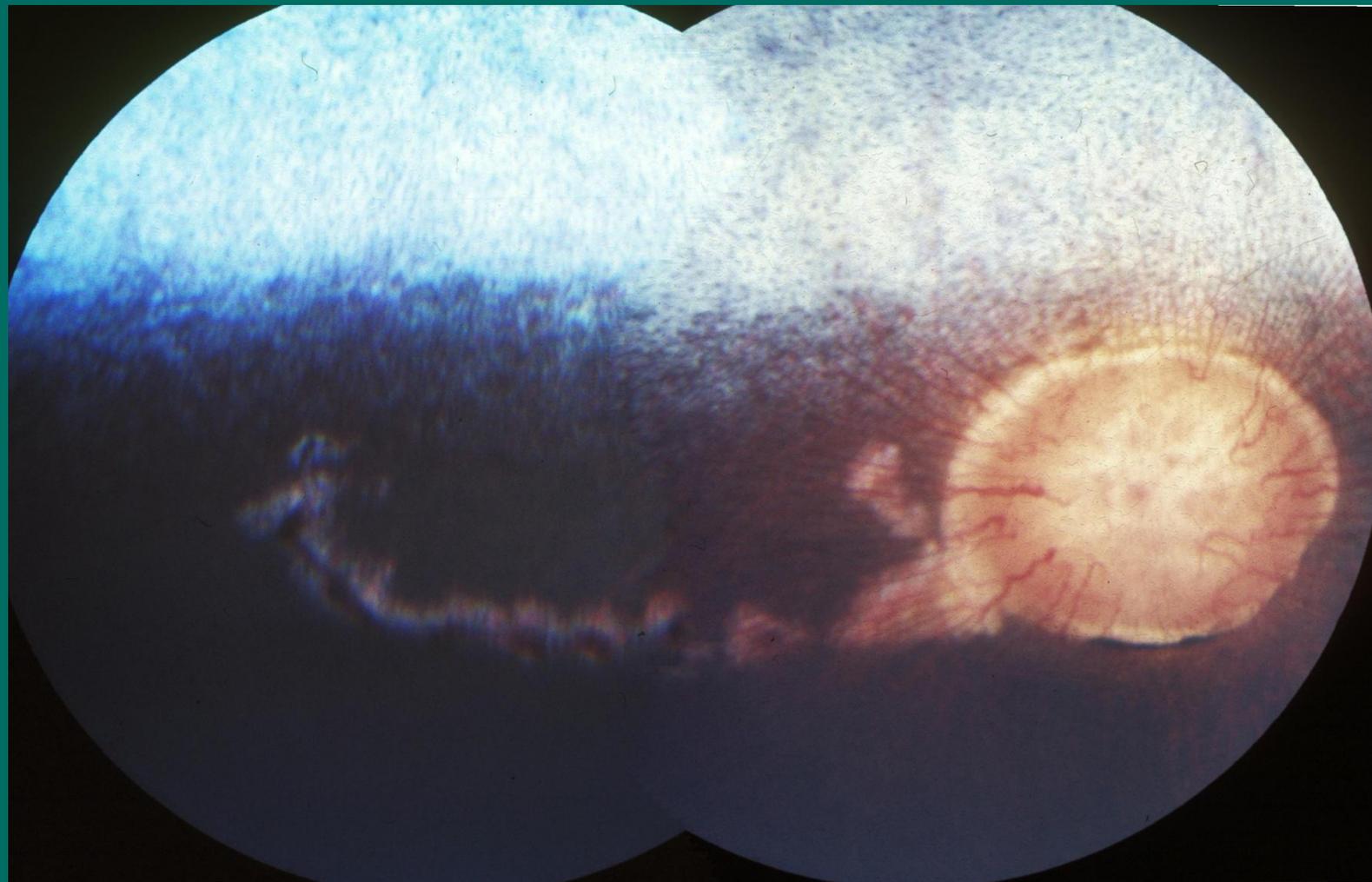
ERU

- Matthews Scotland





- Matthews Scotland

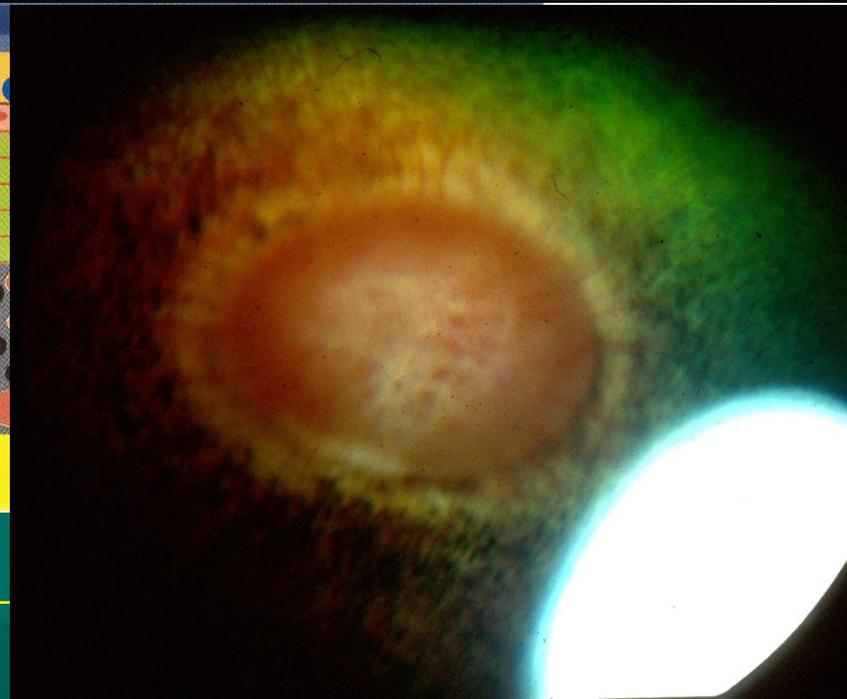
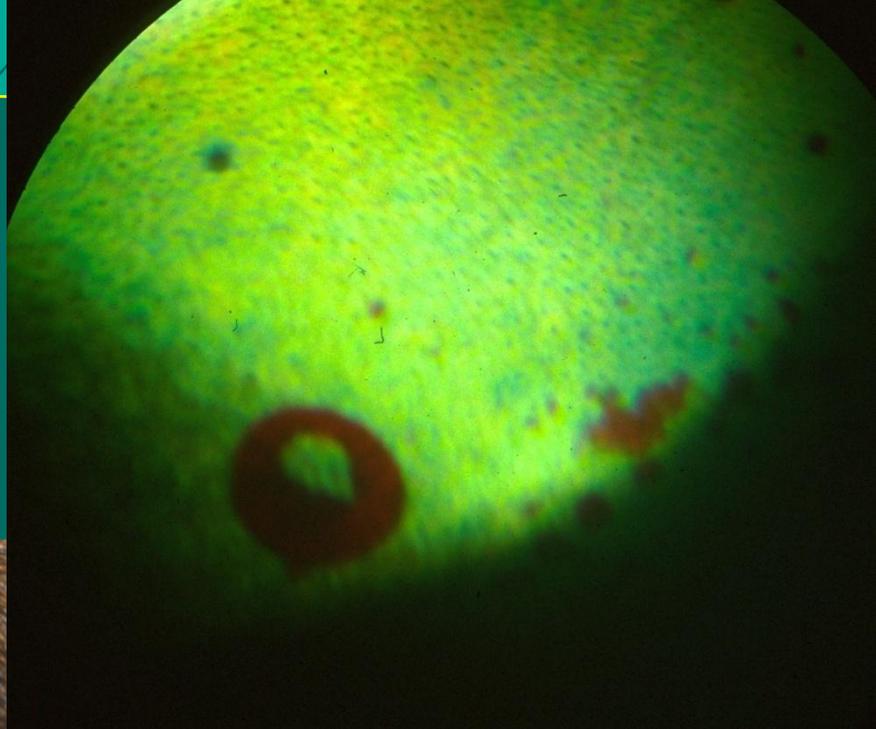


Chorioretinitis in Scotland (Matthews)



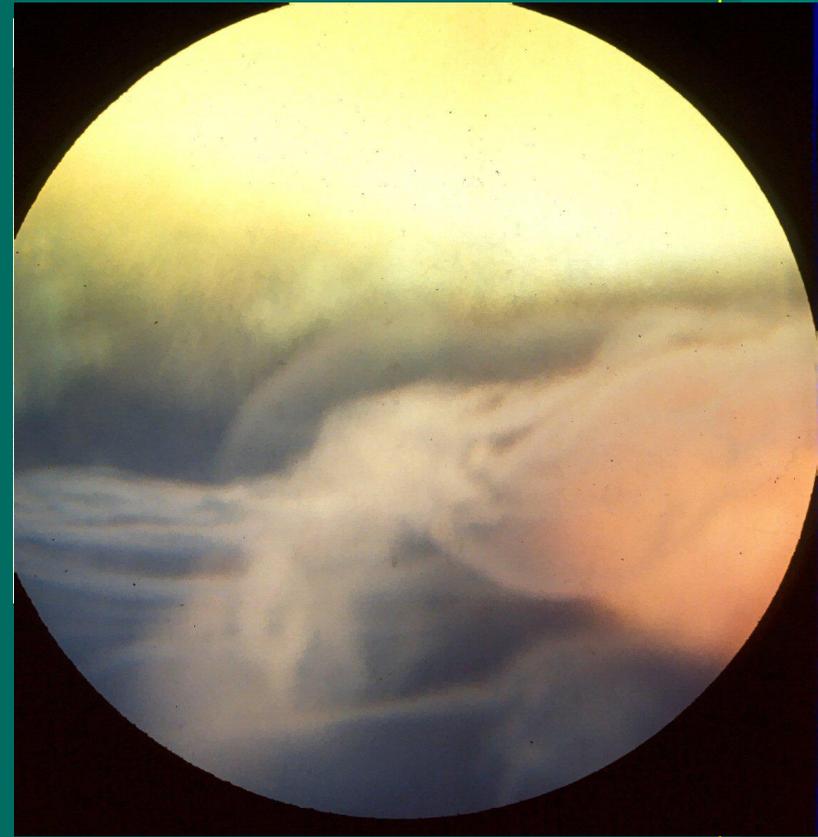
Italy: blindness
Horizontal band of depigmentation

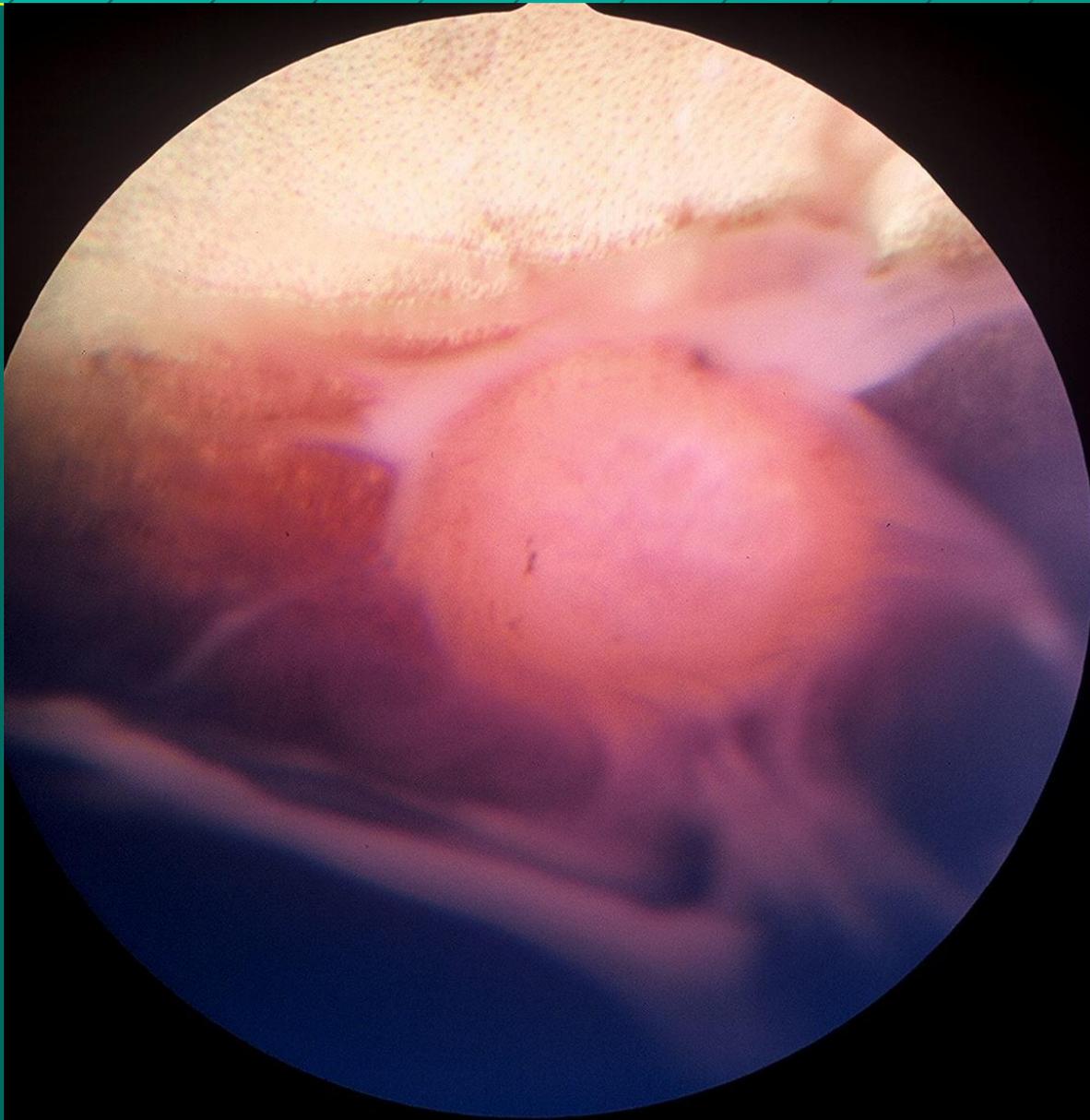
Hyphema and retinal hemorrhages.
Found in foals in many eyes.

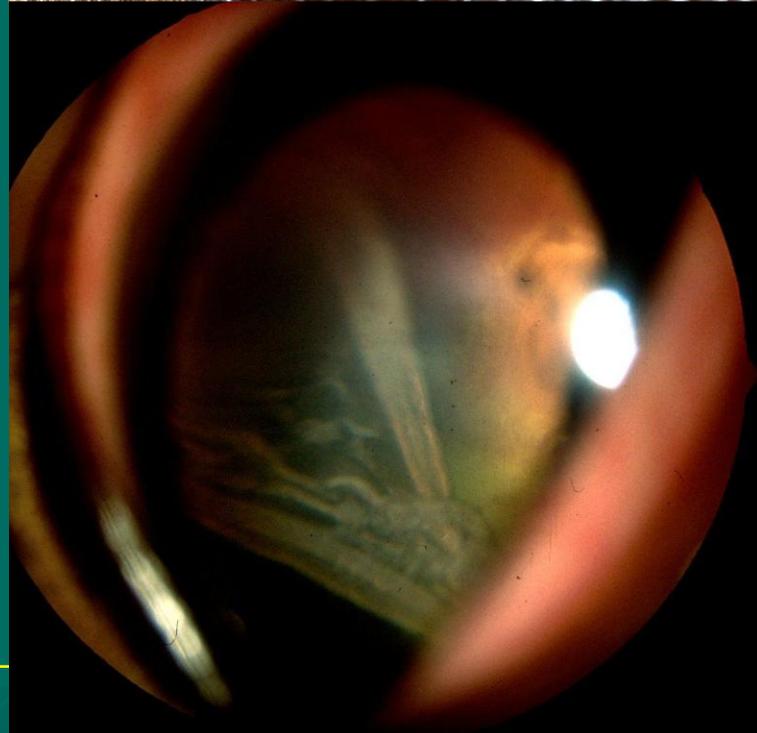
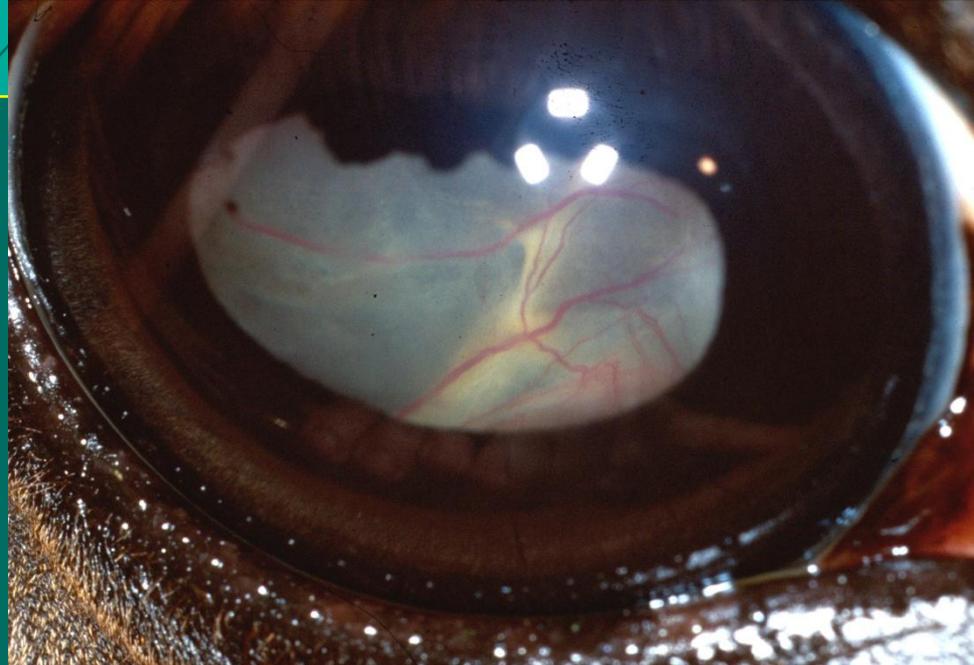
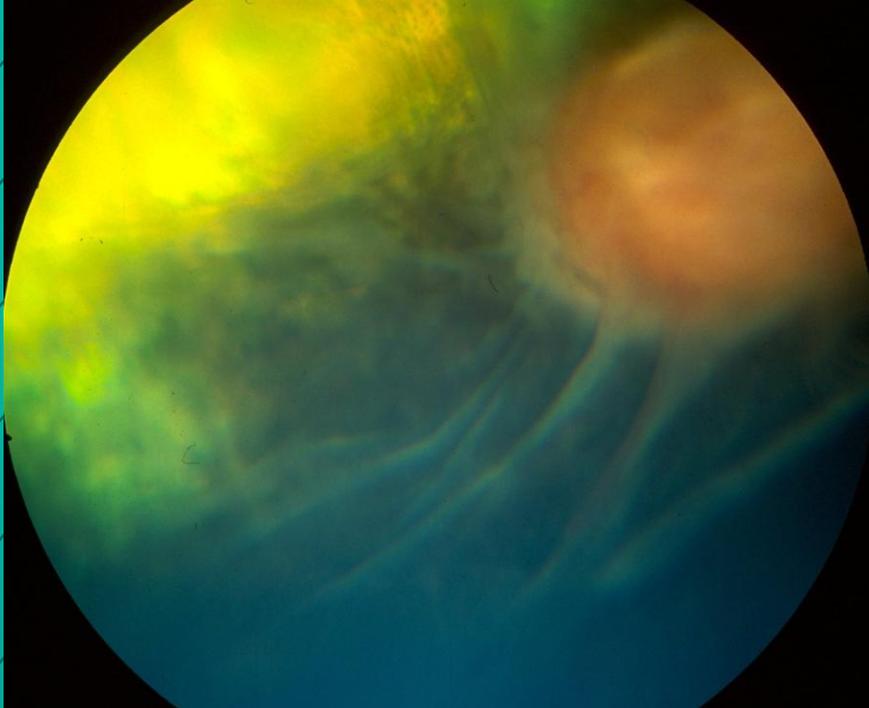


Retinal Detachments

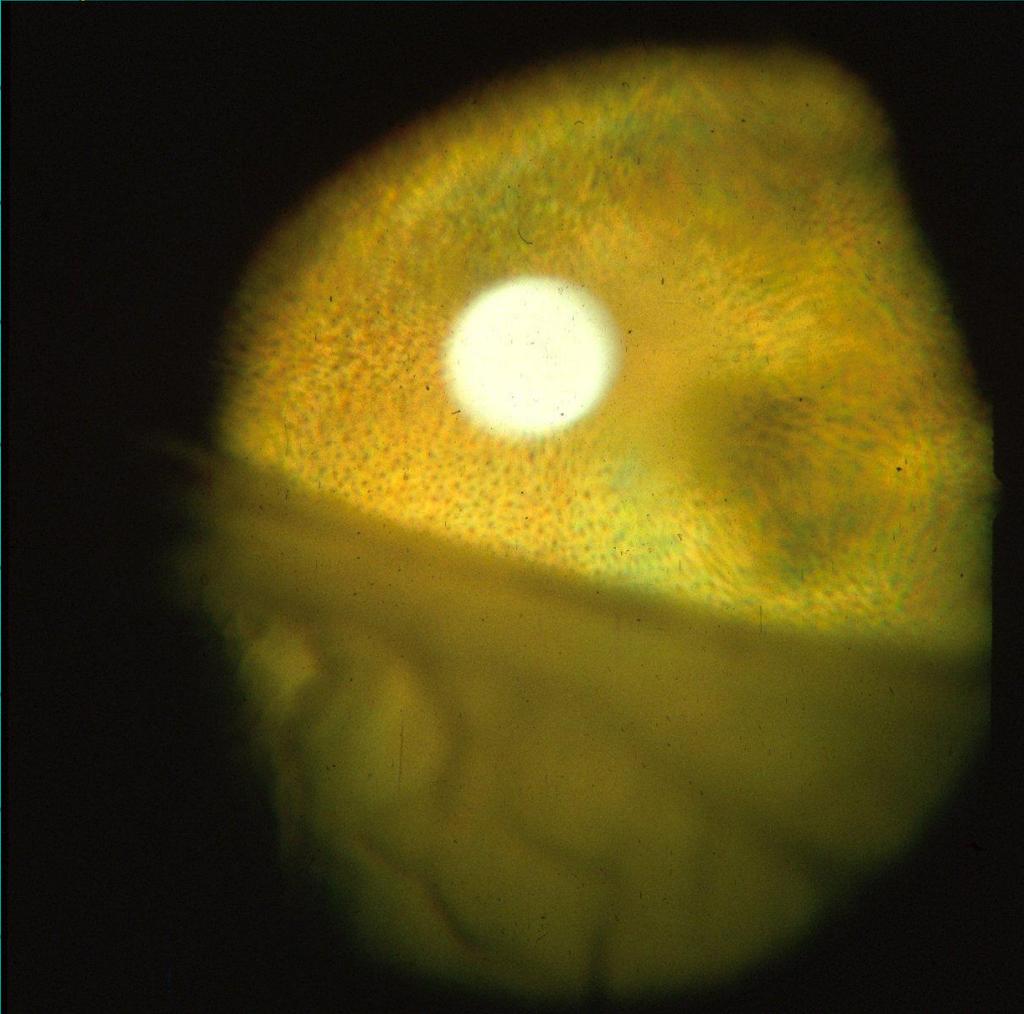
- Exudative and traction RD are found in the horse.
- Total RD: free-floating, opaque veils overlying the optic disc.
 - Tapetal hyperreflectivity
- Primary in RMH.
- Secondary to ERU, head trauma, perforating globe wounds, and tumors
- No treatment



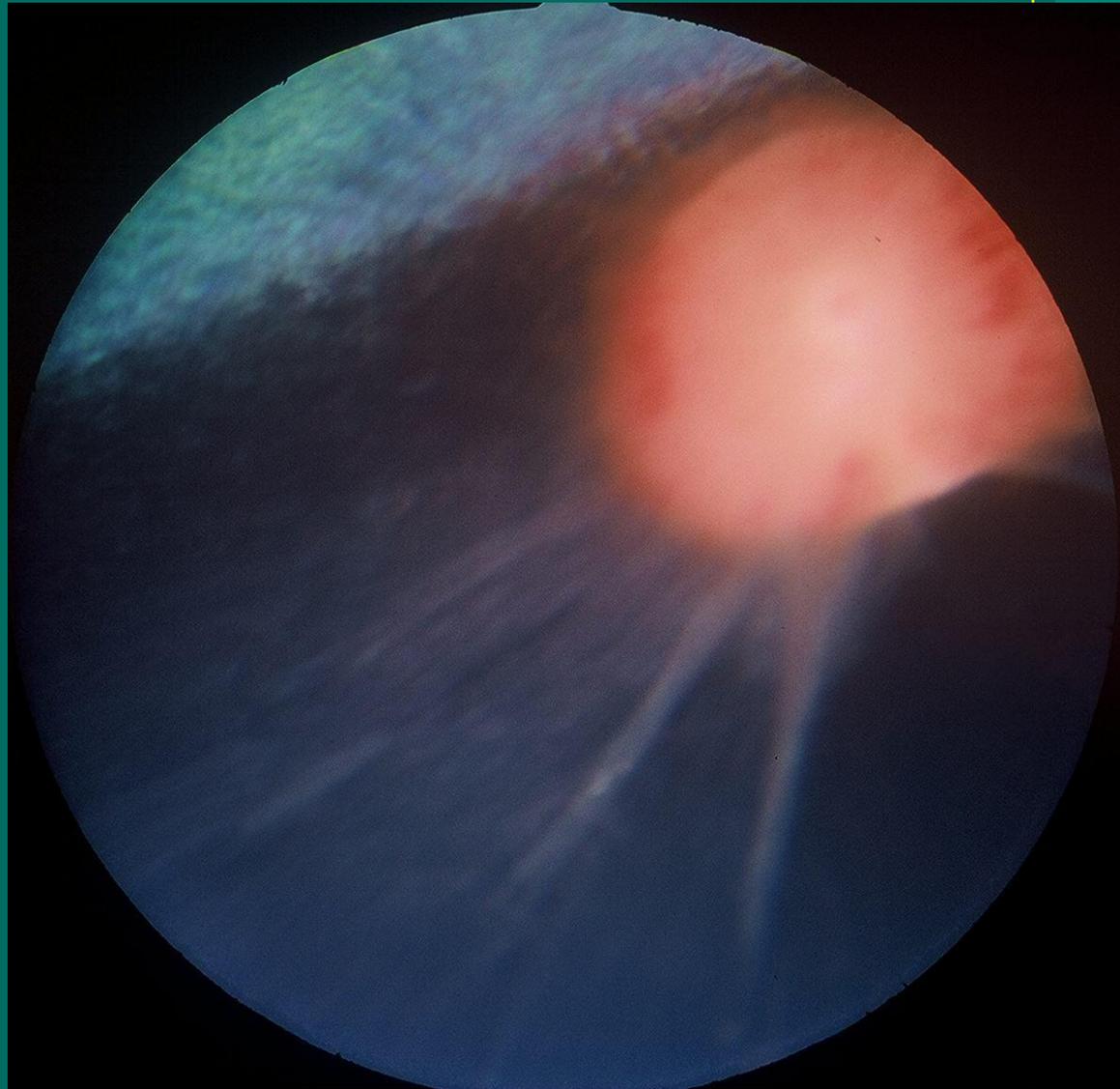




Blank title bar

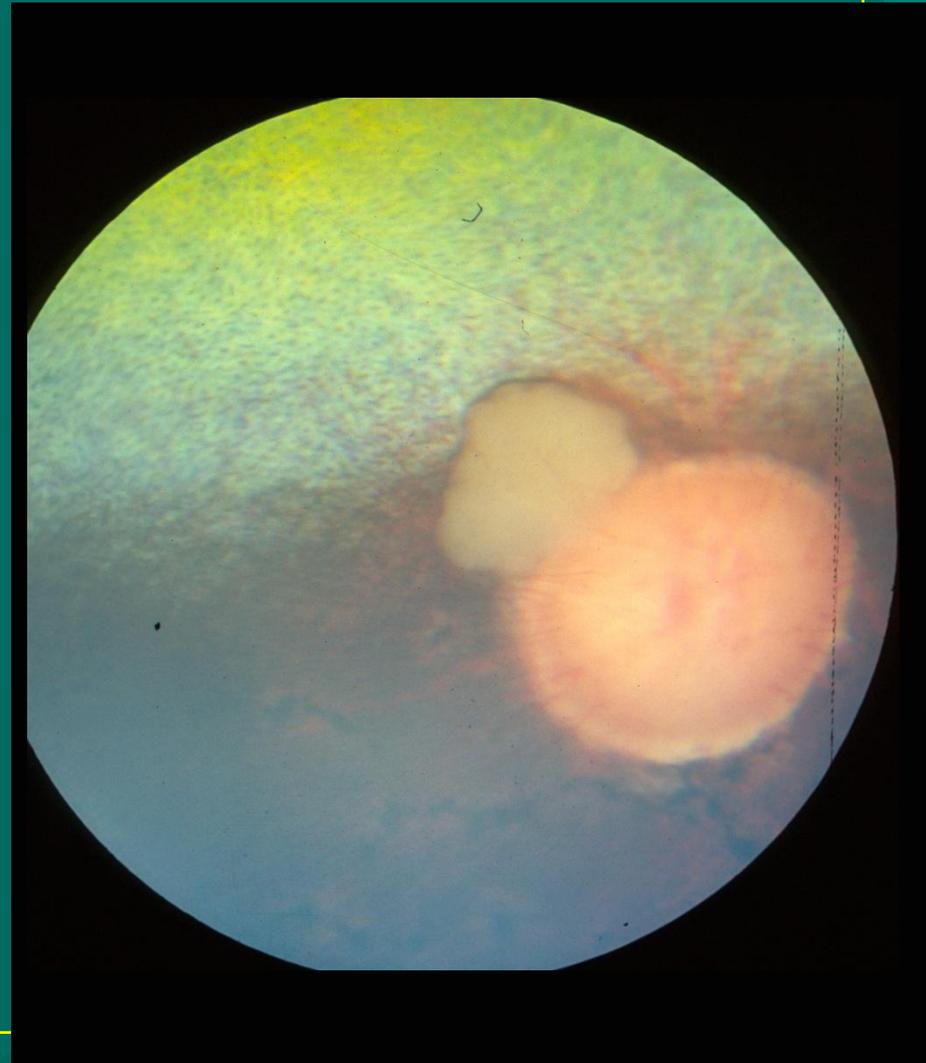


- Some exudative RD can reattach and leave retinal folds



Proliferative Optic Neuropathy

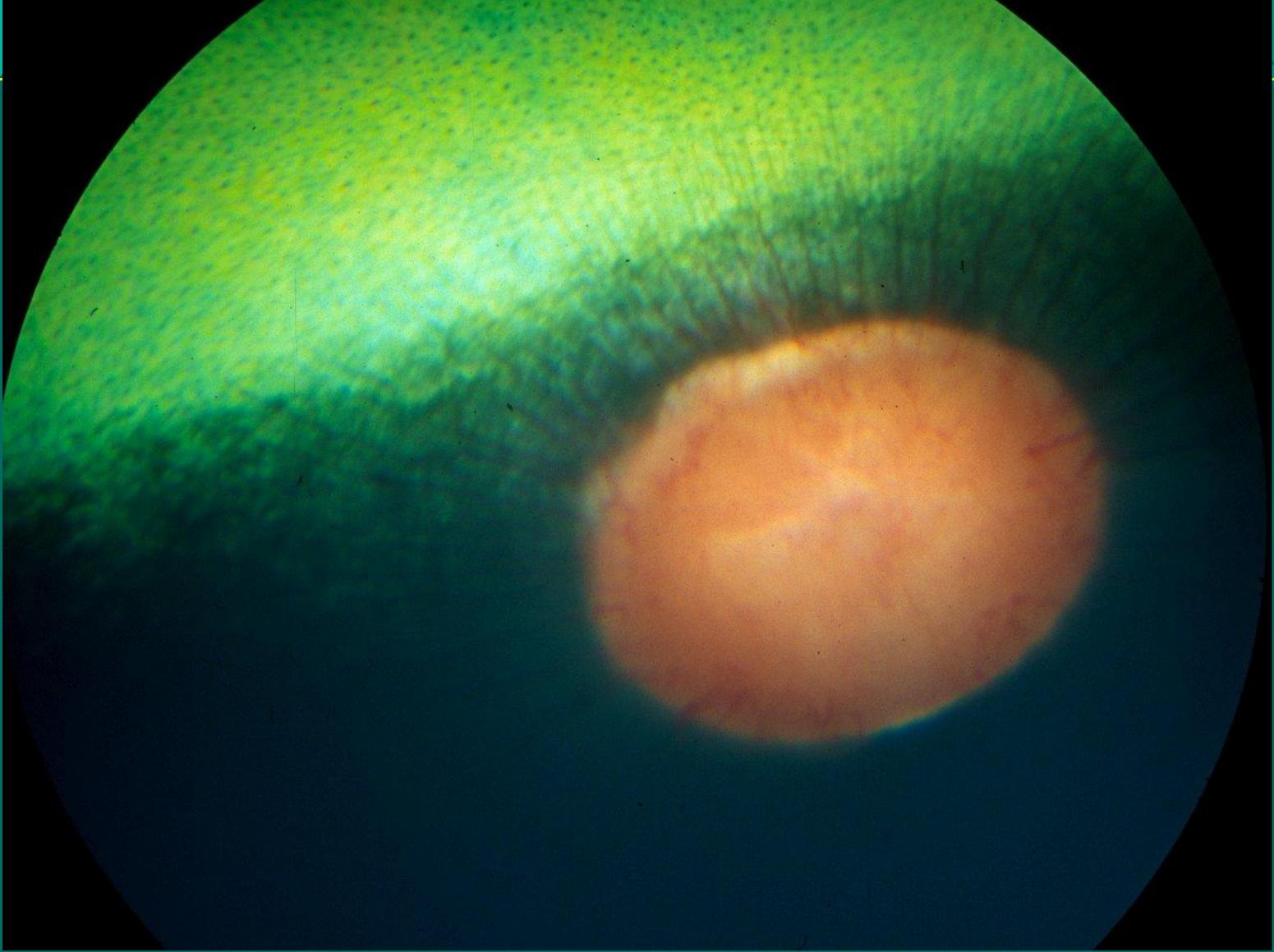
- PON is in older horses
- a slowly enlarging white mass protruding from the optic disc into the vitreous
- incidental, no effect on vision
- histology: “schwannoma“
- Protrusion of axonal contents
- no therapy.



Ischemic Optic Neuropathy

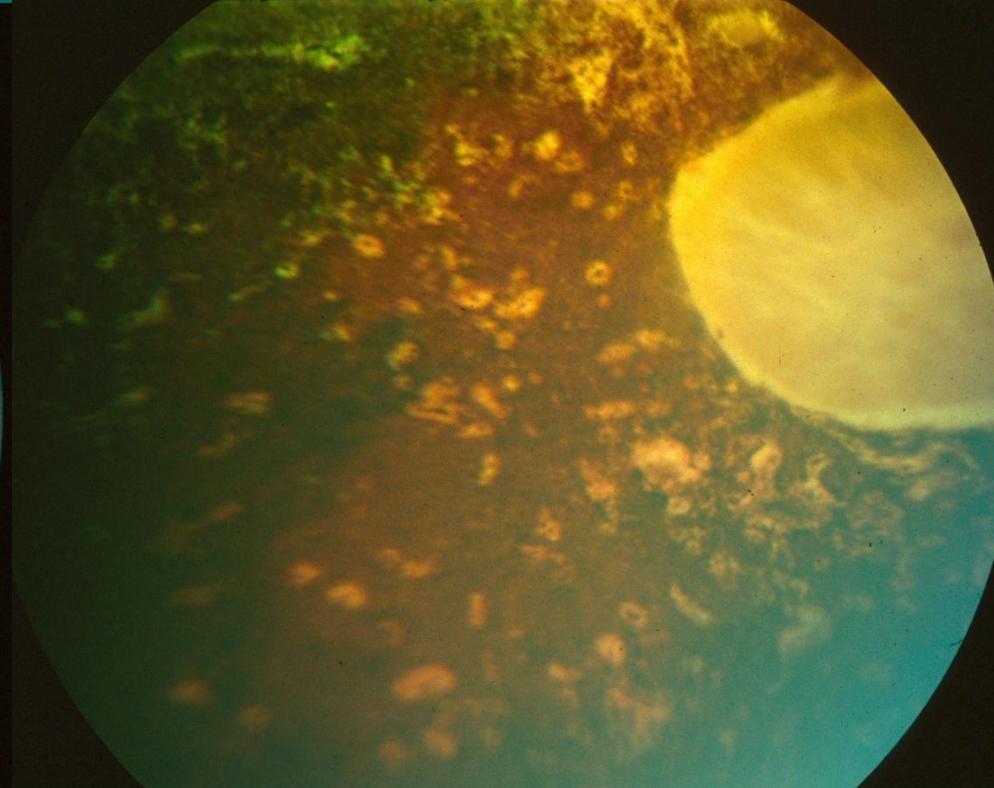
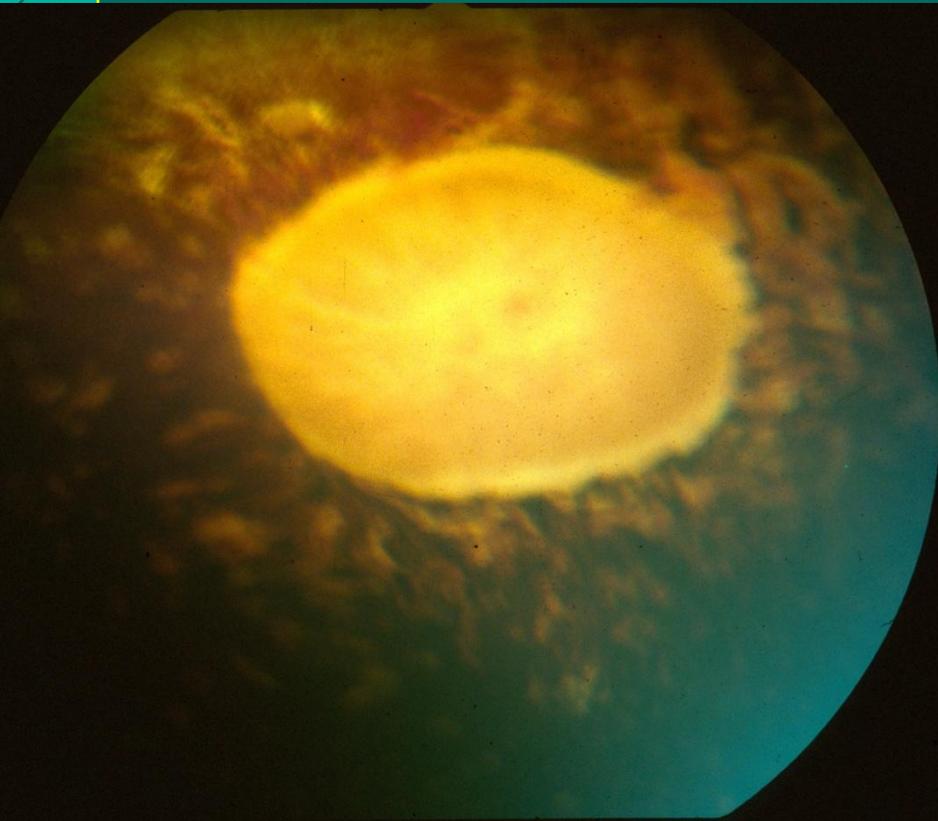
- ION is due to ligation of the internal carotid, external carotid and greater palatine arteries for treatment of epistaxis caused by guttural pouch mycosis.
 - Maxillary artery only should be occluded
- Can result in sudden, irreversible blindness to the eye on the surgically operated side.
- Optic disc congestion and NFL involvement are prominent.





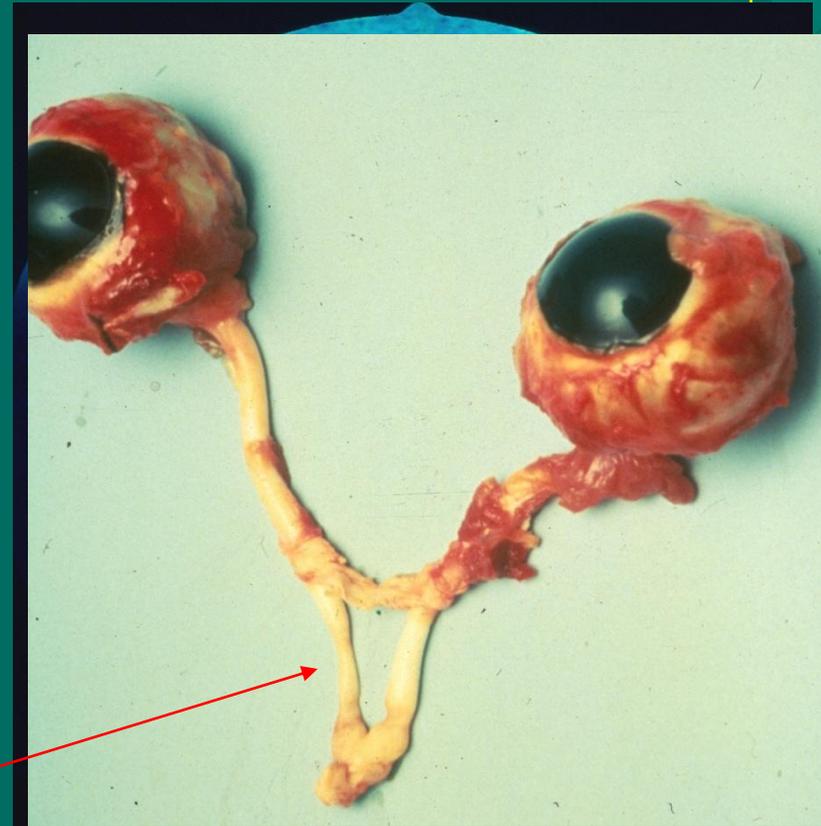
Normal

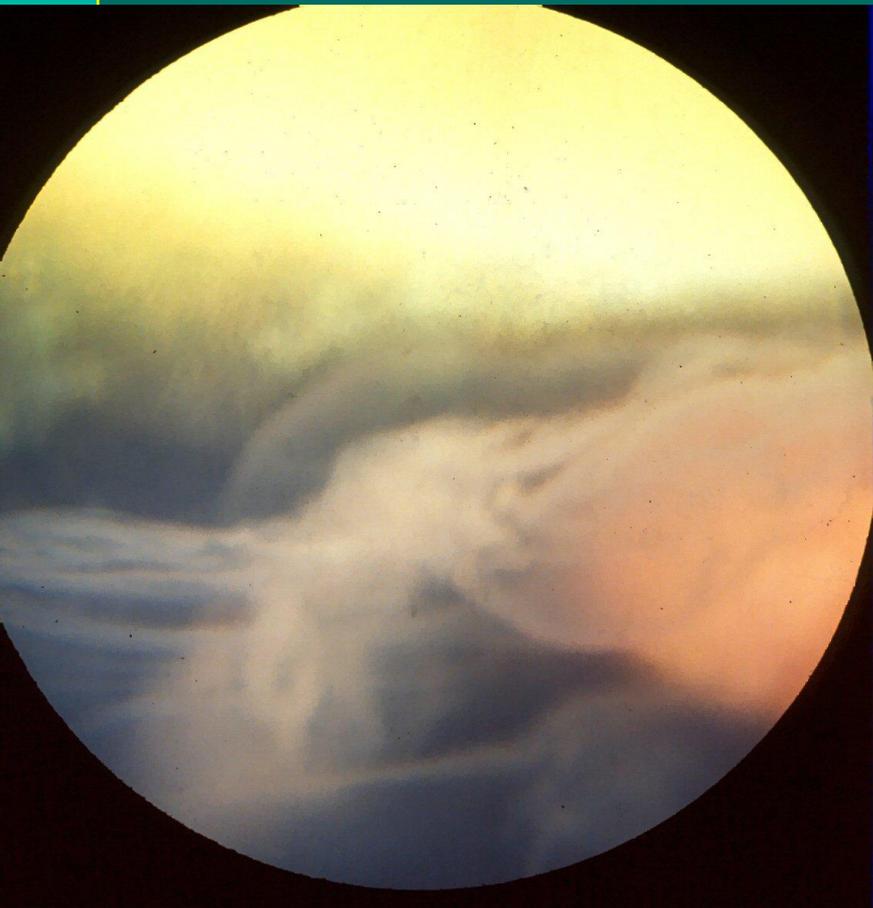
Chorioretinitis/Optic Nerve Atrophy



Traumatic Optic Neuropathy

- Trauma to the occipital region causes the globes to move anteriorly.
- The strong optic nerve attachments at the chiasm result in stretching of the optic nerves.



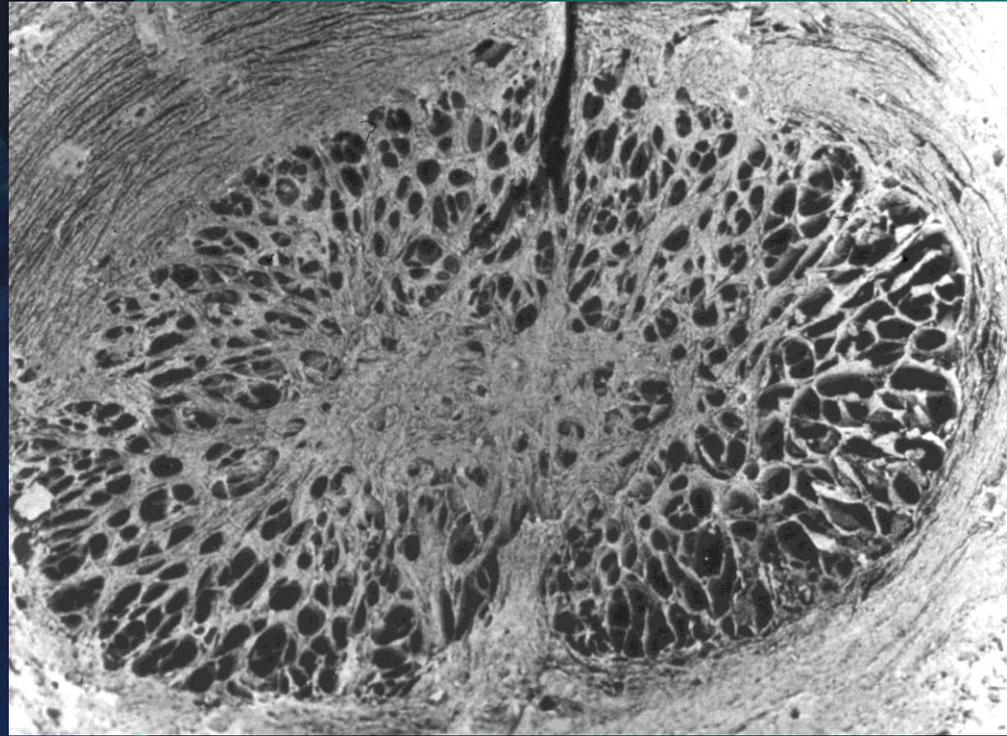
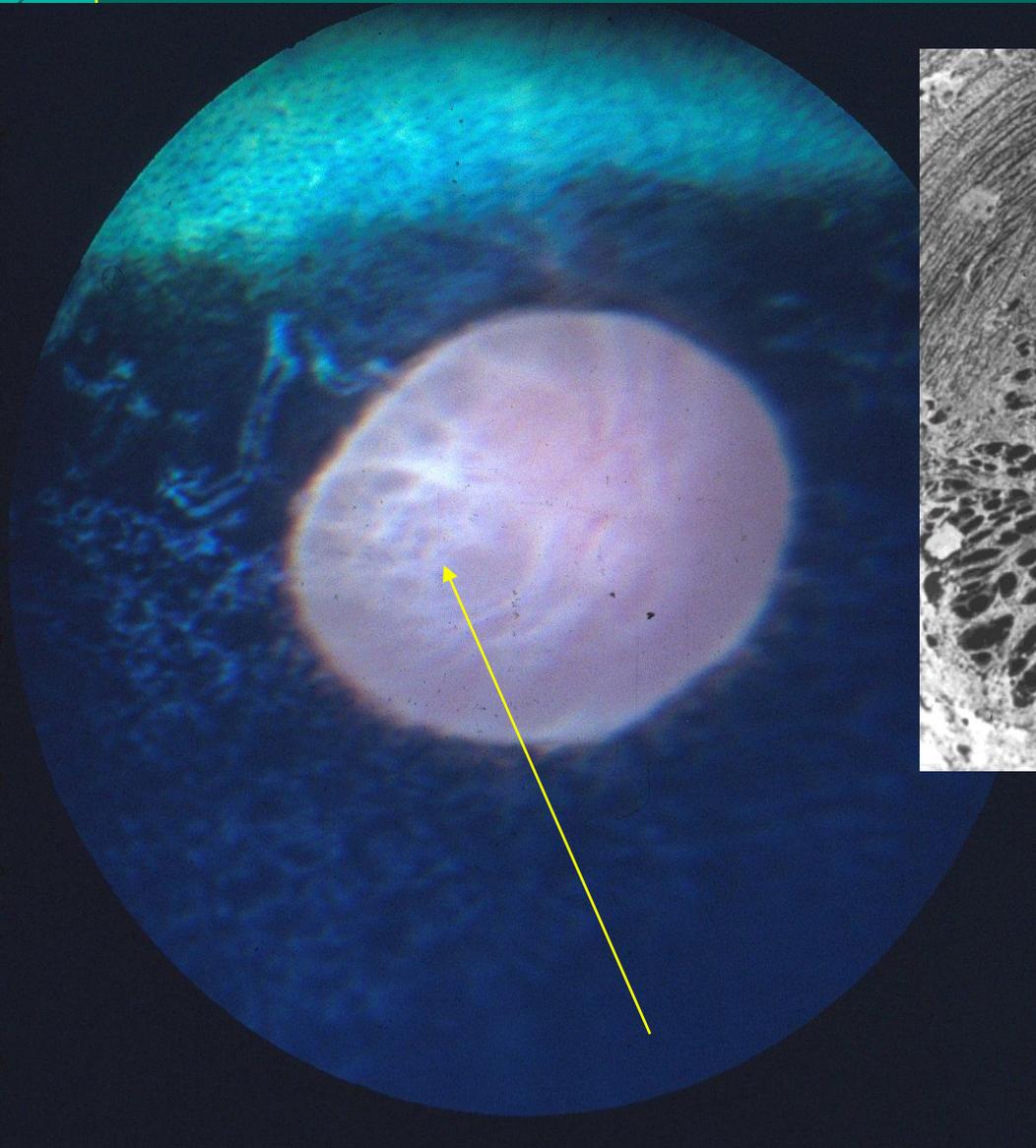


RD



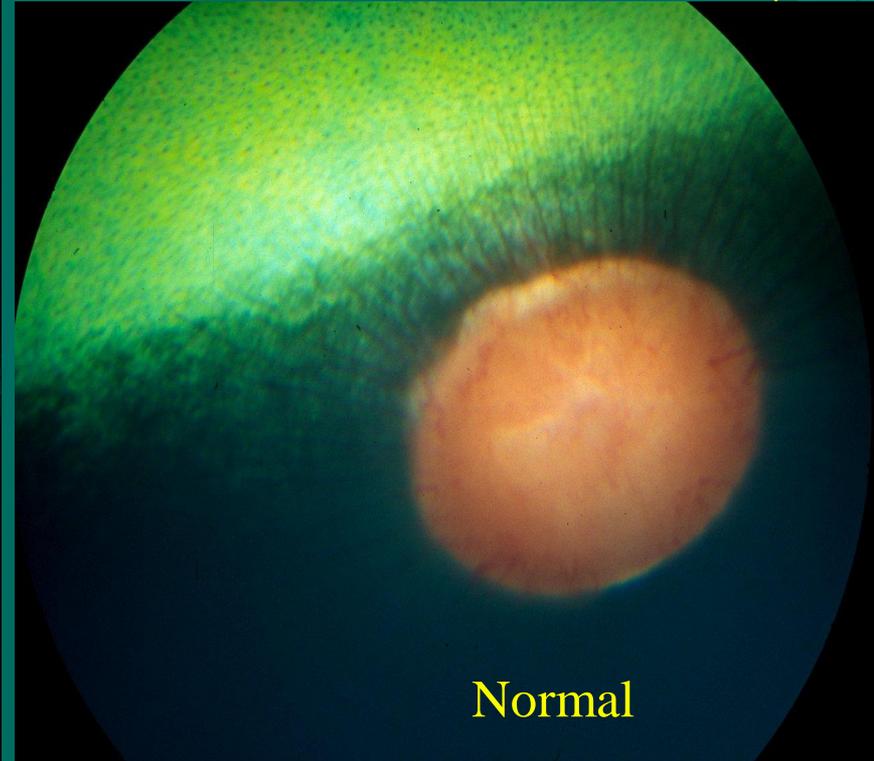
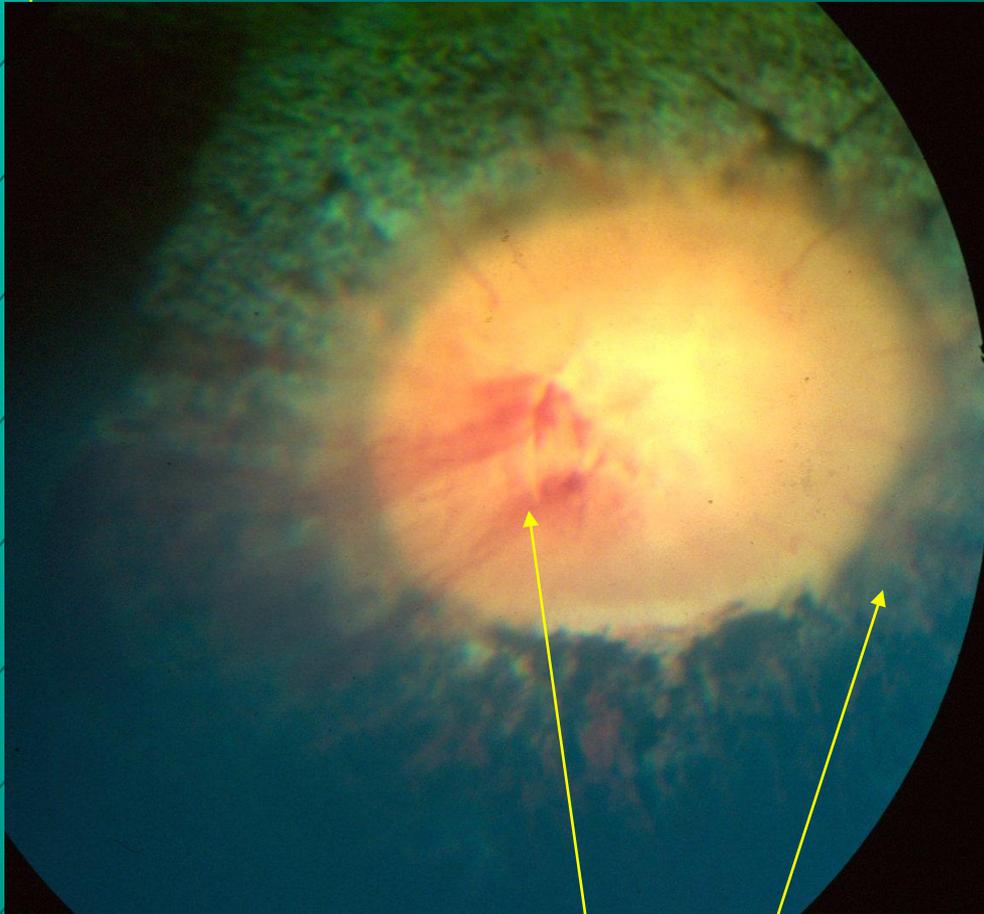
Optic nerve atrophy

Dilated pupils



The Lamina Cribrosa

Exposure of the lamina
indicates demyelination

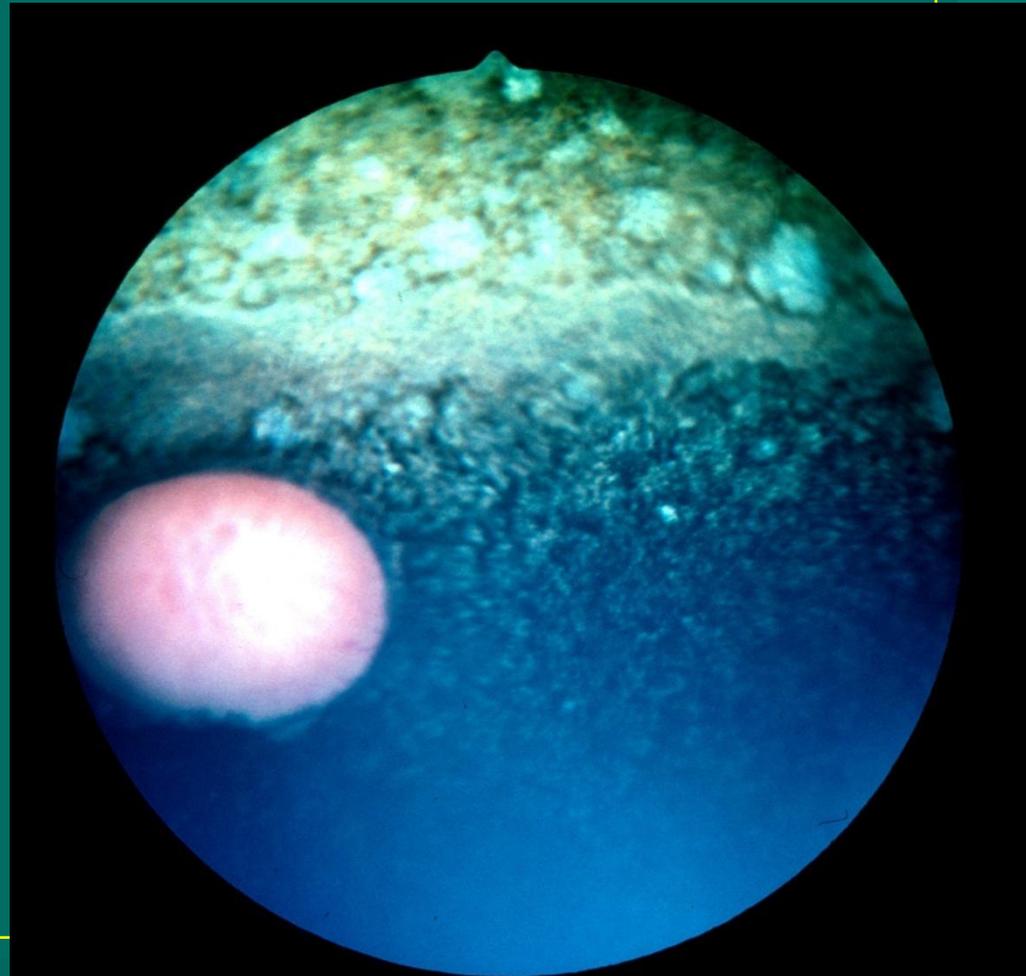


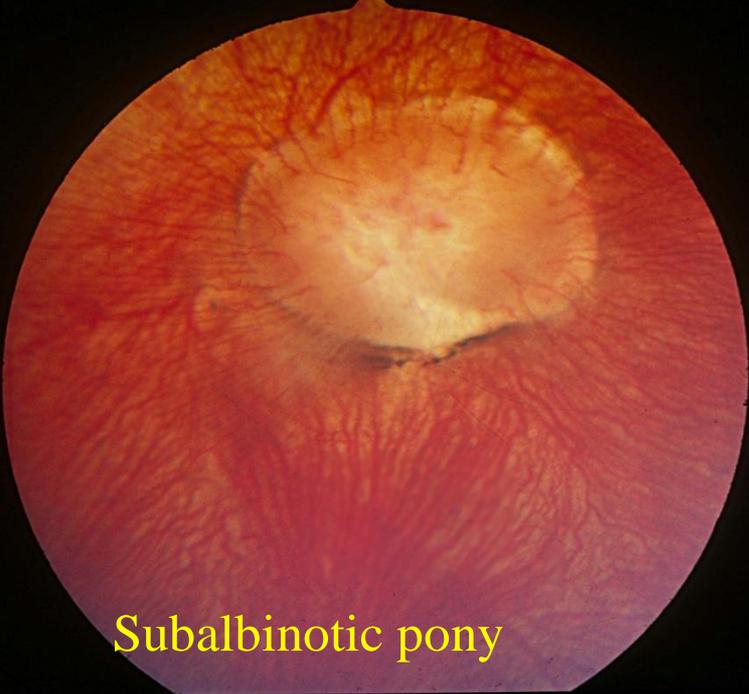
Normal

Optic neuritis: hemorrhage and edema from head trauma

Equine Motor Neuron Disease

- Ceroid lipofuscin in RPE
- Mosaic of yellow/dark
- Vitamin E deficient
 - <1.799 microg/ml
- Visual deficits at times
- Therapy does not resolve these lesions

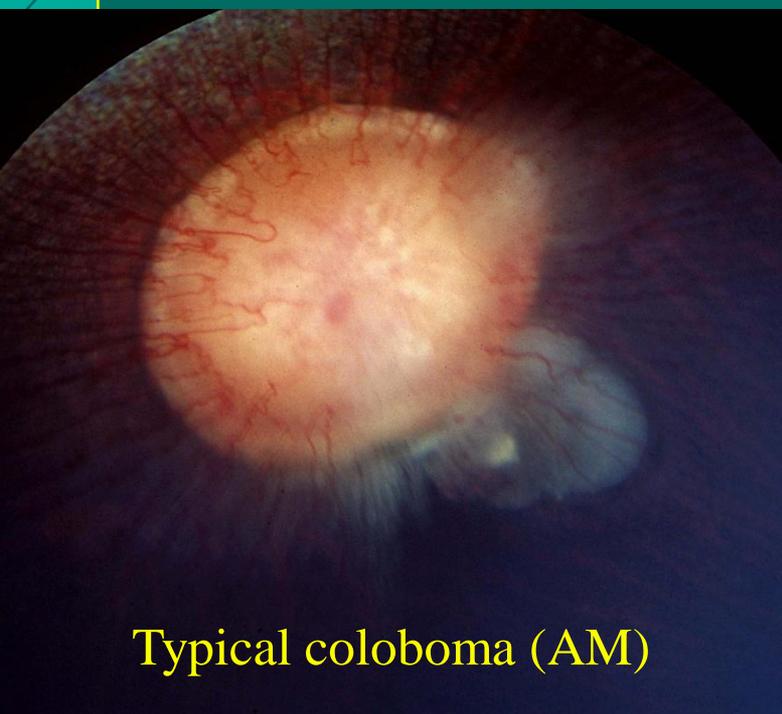




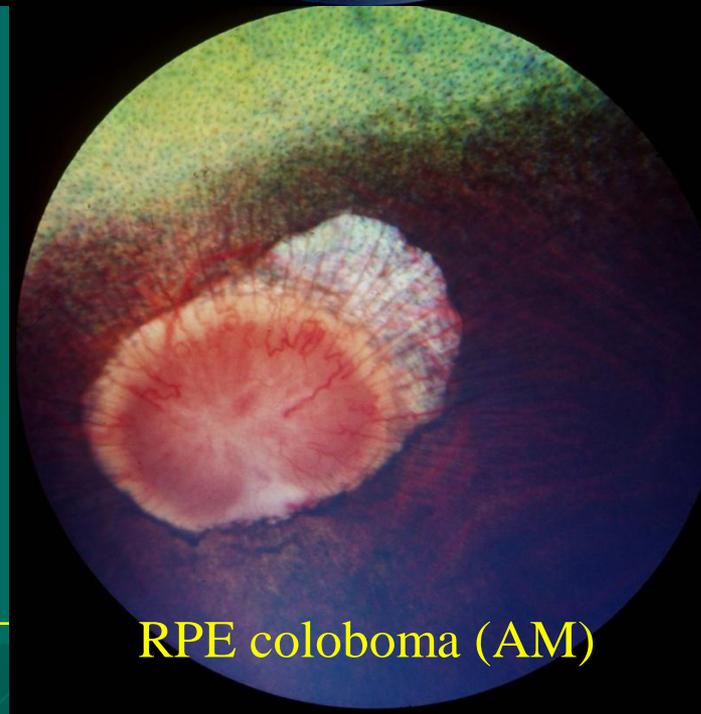
Subalbinotic pony



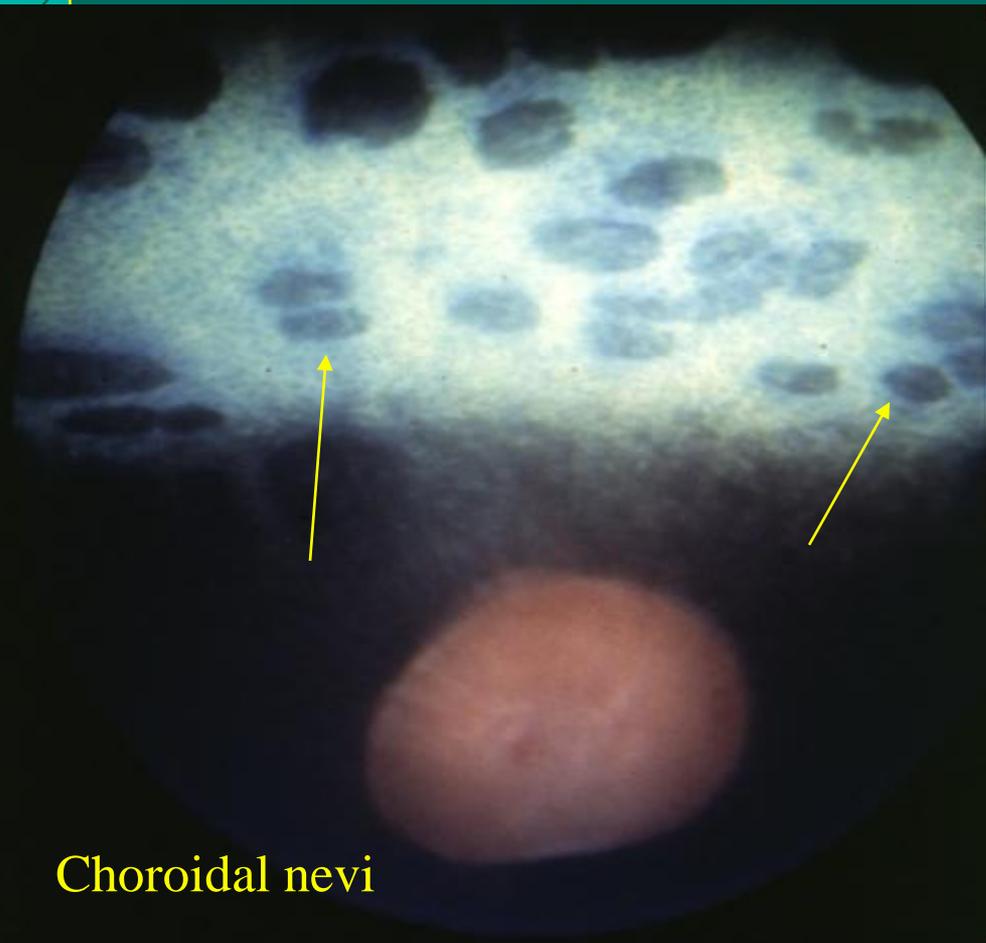
Border tissue of Elschnig



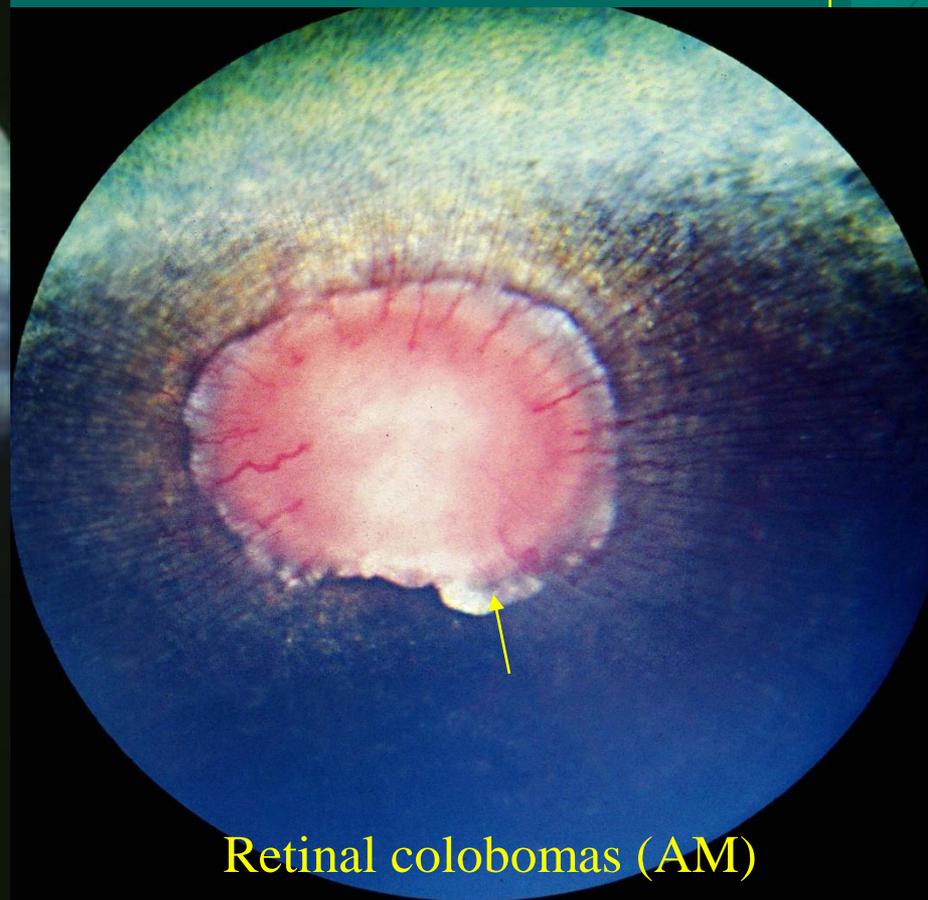
Typical coloboma (AM)



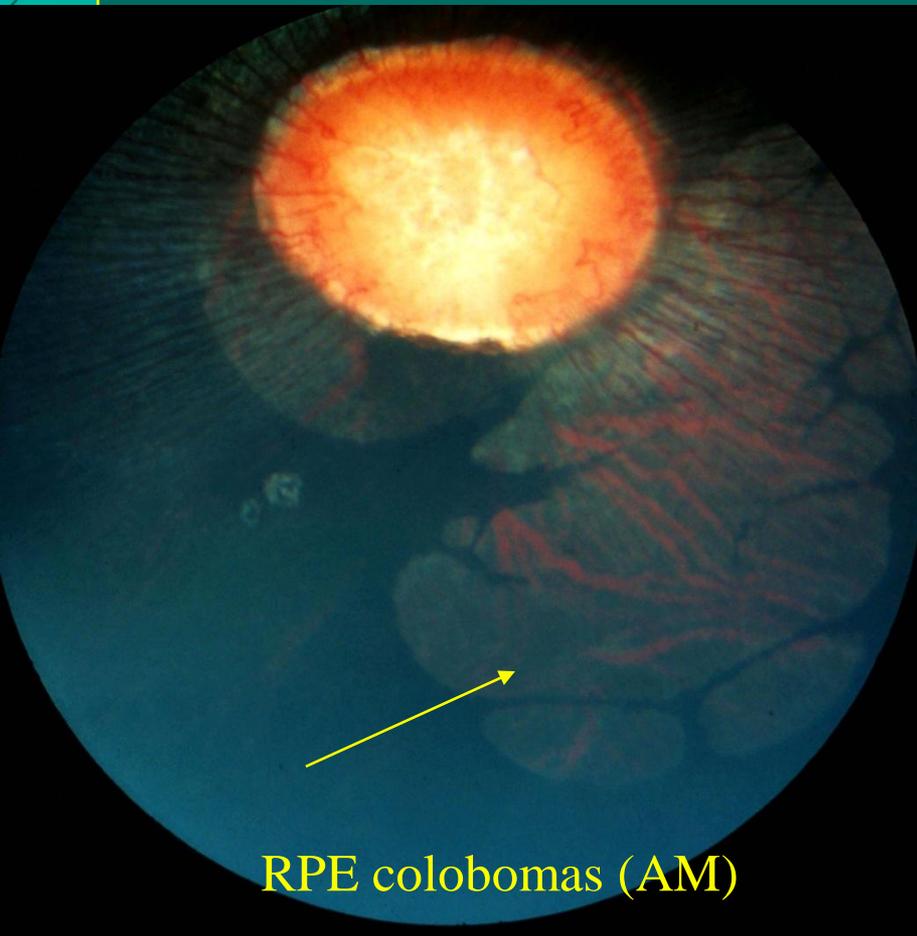
RPE coloboma (AM)



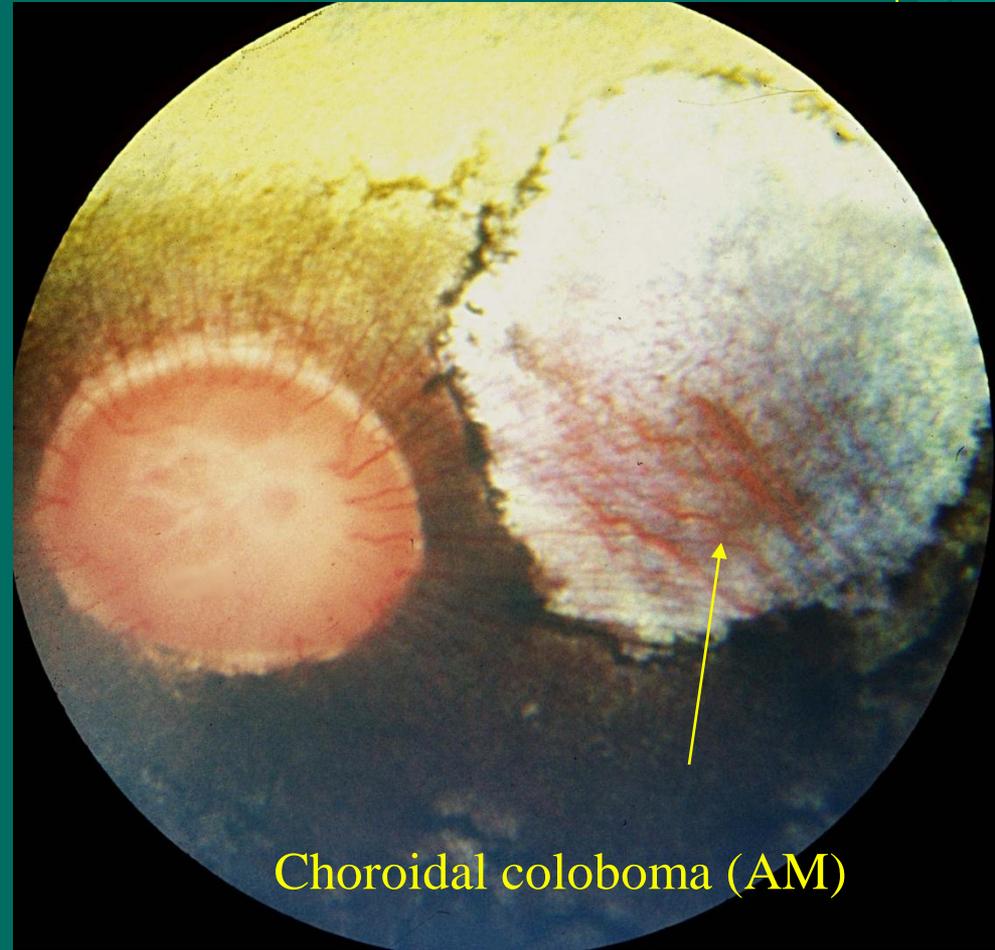
Choroidal nevi



Retinal colobomas (AM)



RPE colobomas (AM)



Choroidal coloboma (AM)