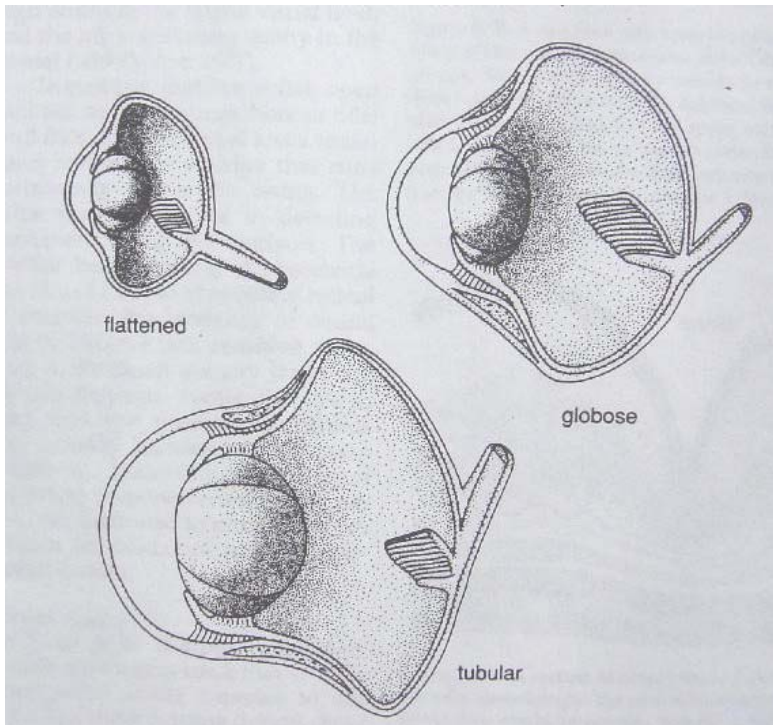
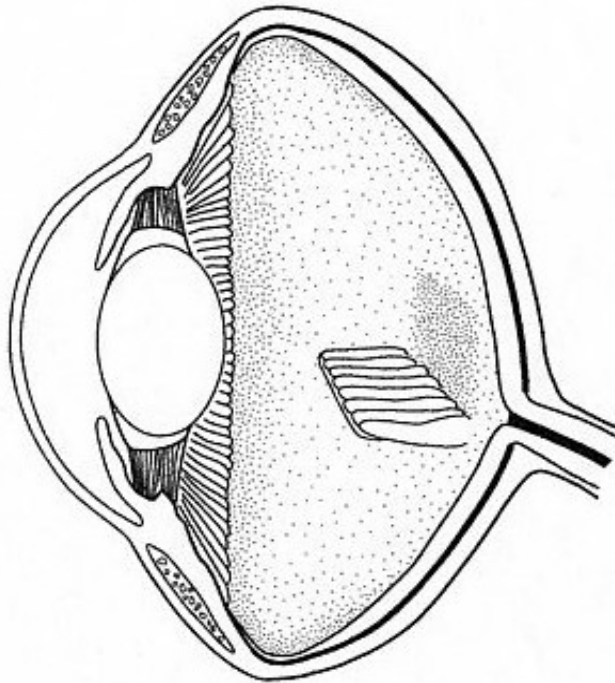


## Ophthalmic Examination & Diagnostic Procedures

- 1) General Appearance
  - a) Symmetry/Size
  - b) Discharge
  - c) Eyelids (palpebrae, nictitans)
  - d) Swelling(s)
  - e) Shape
  - f) Color
  - g) Movement
- 2) Visual Response
  - a) Follow motion
  - b) Menace response
  - c) Movement in cage
  - d) Positional change
- 3) Palpation
  - a) Intraocular pressure
  - b) Palpebral reflex
- 4) Structural Exam
  - a) Penlight
    - i) PLR
    - ii) Withdrawal
    - iii) Anterior chamber
  - b) Fluorescein stain
  - c) Magnifying loupe
    - i) Cornea
    - ii) Anterior chamber
    - iii) Lens & Iris
  - d) Ophthalmoscope
    - i) Fundic exam

### Anatomy of the Avian Eye

1. Cornea
2. Anterior Chamber
3. Iris
4. Pupil
5. Lens
6. Ciliary body
7. Fundus
8. Posterior Chamber
9. Retina
10. Fovea
11. Pecten
12. Choroid
13. Sclera
14. Scleral ring
15. Optic Nerve
16. Rods
17. Cones



Flattened – diurnal birds with narrow heads

Globose – diurnal birds with broad heads

Tubular – nocturnal birds

## Ophthalmic Examination & Diagnostic Procedures

Yasuko Suzuki, DVM and Erica A. Miller, DVM

### Examine the eyes grossly

Is any discharge present? If so, describe it.

Does the bird hold the eye closed?

Is there swelling around the eye (periocular) or of the conjunctiva (chemosis)?

Does one eyelid droop (ptosis)? This is usually associated with trauma to that side of the head

Do the eyes fit into their respective sockets similarly? Are they the same shape?

Is the nictitating membrane drawn across one or both eyes? (both = head trauma or systemic illness)

Are both irises the same color?

Are the pupils the same size? (Slight asymmetry or anisocoria may be normal; a large difference with no ocular lesion suggests brain or cranial nerve injury)

Do the pupils oscillate (hippus)? Are they normally positioned?

Do the eyes move rapidly in any particular direction (lateral, up and down, around)? This rapid movement, especially if slow in one direction and a rapid return is called nystagmus and is associated with head trauma.

### Attempt to evaluate the bird's vision (very difficult)

Is the head position normal? Does the bird always try to keep an eye toward you? (normal)

Can the bird follow silent motion (e.g., a dropped or tossed cotton ball)?

Menace response is not reliable in birds. Menace response is a blinking or withdrawal in response to movement coming toward the bird

Does the bird appear to startle excessively (this varies among species)?

### Use a penlight to evaluate the cornea and the pupil

Does the bird turn its head away from the light or blink repeatedly in response to the light (photophobia)?

Does each pupil constrict when you shine a light into it (direct pupillary light response (PLR))?

If so, is the reaction brisk or slow? In birds, consensual or indirect pupillary responses (pupil constriction in one eye when light is shown in the opposite eye) are not characteristically seen.

1. Shine a penlight into the pupil, holding it at a right angle to the corneal surface. You should see three images in a row (Purkinje images) if the lens is in its proper place and is transparent.
2. Move the penlight slowly to the right or left: the first two images (cornea and anterior lens capsule) should move in the same direction as your penlight, while the third image (posterior lens capsule) should move in the opposite direction.
3. Examine the anterior chamber. By looking at it from the side, evaluate its depth. Increased depth occurs with posterior luxation of the lens. Decreased depth can occur with anterior luxation of the lens. The depth is also changed by intraocular pressure.
4. Is there blood in the anterior chamber (hyphema)? Are reflective particles (flare) present in the fluid (aqueous humor)?
5. Is the cornea transparent? Is it rounded and smooth (i.e., is it normal)? Are there white spots or pigmented areas present? Are there blood vessels on the cornea?
6. Is the lens transparent or opaque?

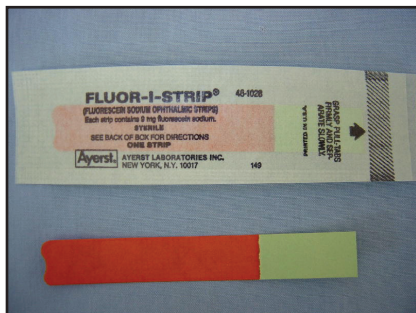
### Examine intraocular pressure

Gently press on your eyes through the upper eye lids, then press on the bird's eyes. Do they feel the same, or is one more turgid (glaucoma) or less turgid (seen with uveitis, inflammation of the anterior portions of the eye, or rupture/collapse of the globe)?

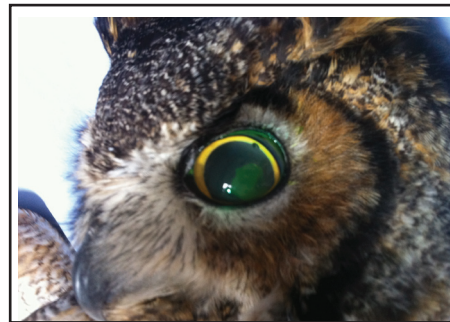
### Fluorescein stain

Fluorescein sodium is a yellow dye, most commonly used to determine if a corneal ulcer is present. The fluorescein dye will not stick to the cornea itself, but will adhere to the tissue that is exposed from under the torn away layers of cornea. If corneal opacities are present, apply fluorescein stain to determine whether or not ulceration is present.

Flush the eyes with warm sterile saline to remove mucus and debris. The stain is applied by dropping irrigating solution onto the sterile fluorescein strip and then allowing the drop to fall on the eye (or place a small section of the strip in a syringe of sterile saline--see page 14), and place one or two drops into the eye. The strip should not contact the cornea or it will cause false positive stain retention at the site of contact. After 10-15 seconds, rinse the eye copiously with saline to remove excess stain. Examine the eyes for areas of staining where the cornea is not intact. Holding gauze sponges beneath the eye will prevent staining of the feathers.



Fluorescein strip



Corneal ulcer shows Fluorescein positive stain

If no dye remains in/on the eye, no lesions are present.

If dye is present only on the surface of the cornea, this suggests a corneal abrasion.

If dye is present inside the eye and/or on the cornea, this suggests either a complete corneal ulcer or a traumatic rupture of the globe.

### Fundic examination (use ophthalmoscope)

Examine the bird in a darkened room.

Set the light to project a white circle and set the dial to zero.

Hold the ophthalmoscope with the padded rest touching your forehead.

Stand two feet away from the bird, and focus on the corneal surface. Adjust focus to obtain a clear image by turning the dial on the side. Gradually move closer until you are approximately two inches away. As you move in, other structures should come into focus (iris, lens, fundus).

Continue to adjust the dial until the back of the eye (retina) is in focus.

The large billowing black structure covering the optic disc is the pecten. Birds do not have the highly reflective tapetum seen in mammals. Fundic vessels are not obvious in diurnal birds, but are present in nocturnal birds.

Examine the fundus for lesions and areas of pigmentation. Blood may be present in the posterior chamber.

## Conjunctival Swab

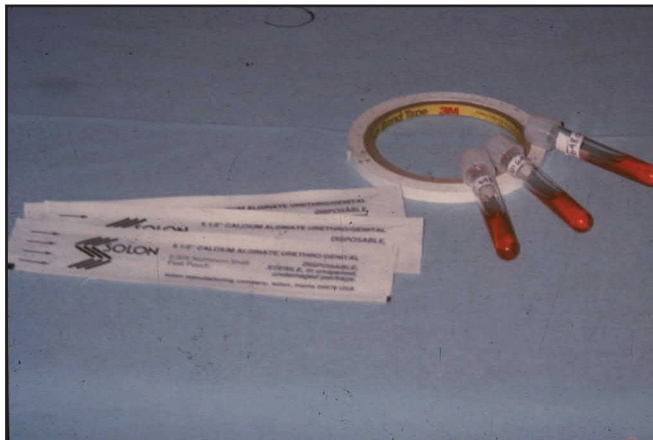
The conjunctiva can be swabbed with a sterile swab if specific diseases are suspected. If mycoplasmal conjunctivitis is suspected, the swab is placed in Frey's mycoplasma broth medium (other transport media will work, but Frey's is preferred).

In mammals suspected of distemper, the conjunctiva can be swabbed with a sterile swab and then rolled onto a microscope slide, stained and examined for cytoplasmic inclusions, or submitted for diagnosis by immunofluorescent assay (IFA) or reverse transcriptase (RT) PCR.

Note: A drop of tetracaine or proparacaine ophthalmic solution can be applied to the eye prior to swabbing the conjunctiva to numb the surface.



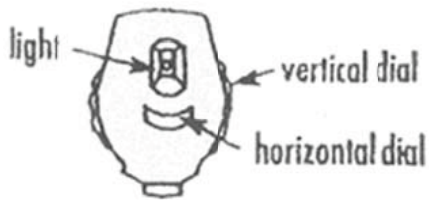
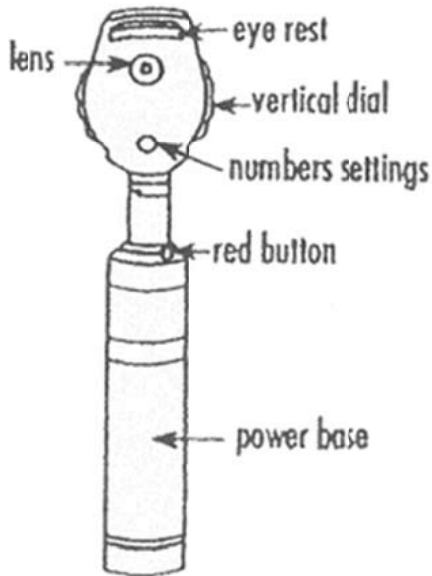
Using forceps to gently pull down lower eyelid for swabbing



Frey's medium (red broth in tubes), sterile swabs and label tape

## Ophthalmoscope Directions

(adapted from: <http://www.health.state.mn.us/divs/fh/mch/webcourse/vision/index.cfm>)



other side of ophthalmoscope head

### 1. Turn the ophthalmoscope on

- Use your thumb to press the red button and twist it clockwise around the rim (or press the black button on the top of the silver clip and slide it upwards).
- You should be able to see the light in the palm of your hand when you point the narrow end toward your palm.

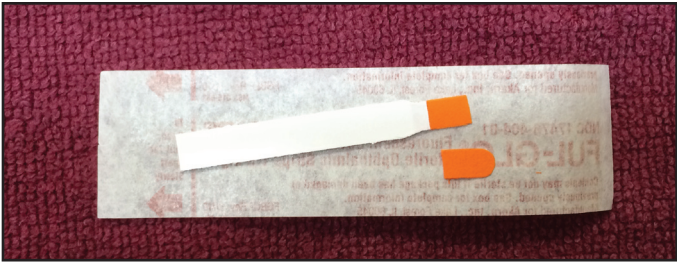
### 2. View the eye with the ophthalmoscope

- Turn the vertical dial with your index finger until it is on the “0” setting (see illustration above)
- Find the “large circle of light” by turning the horizontal dial with your index finger (see illustration—turning the dial will make several different lights appear; stop on the largest circle of white light)
- **\*Important: Find a fixed distance that works for you and adjust the vertical dial to see different depths of the eye. Alternative is to keep the same setting and move closer to the patient, but this can be more stressful to the animal.**

### Making Fluorescein Stain



Start with Fluorescein stain strip and 10cc of sterile saline.



Disinfect scissors and carefully cut half of strip; keep cap on syringe and carefully remove plunger. Use gloved hand or clean forceps to place piece of strip into syringe and gently replace plunger.



Cap after use and keep refrigerated when not in use (warm before dripping into eye!) Dispose of in 2 weeks or sooner if solution becomes cloudy.

To use, simply warm and then place one drop on the cornea, wait 15 seconds, flush with sterile saline and look for dye retention in the cornea (occurs when the cornea is damaged).

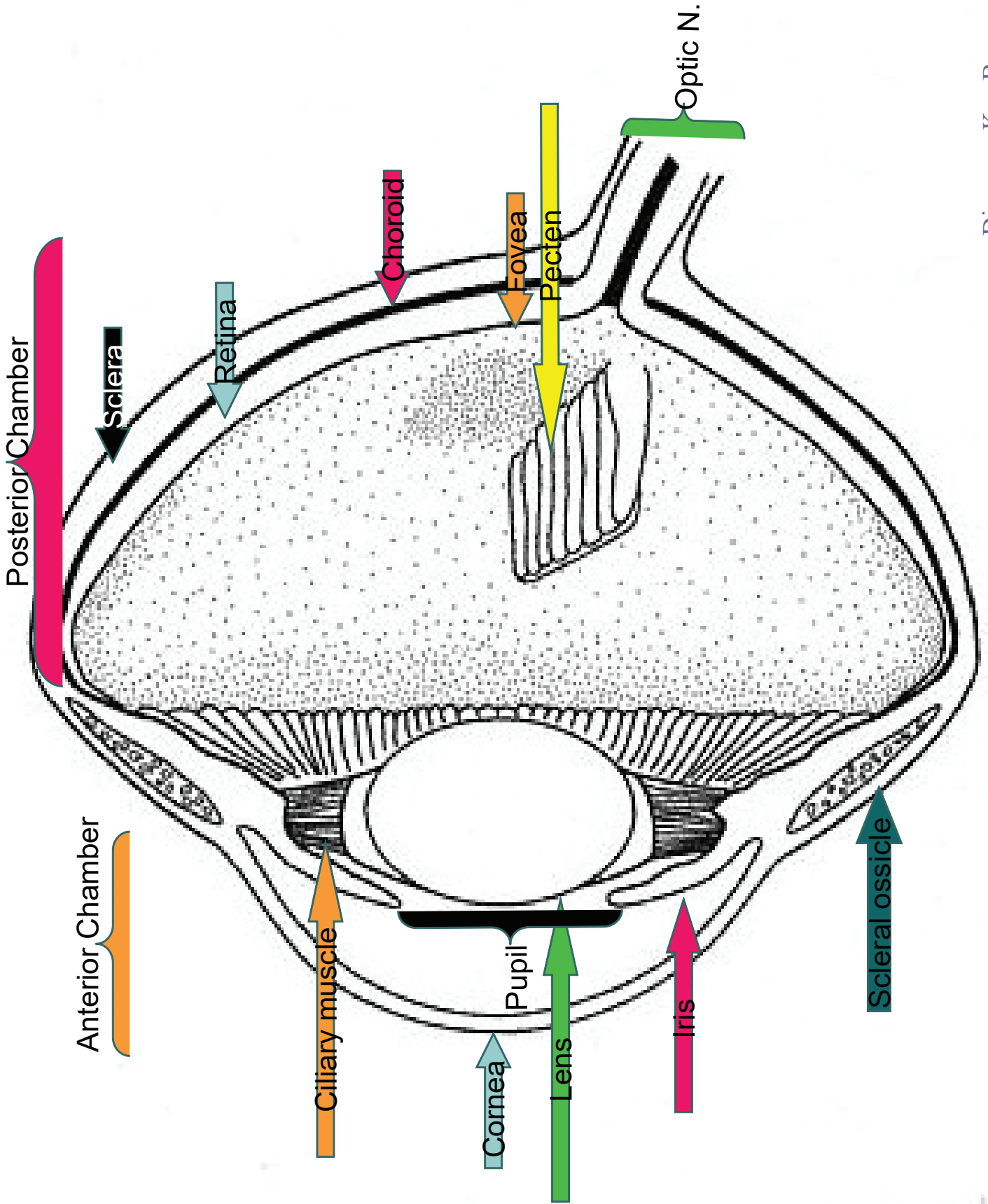


Diagram: Ken Brewer



## Glossary of Vision Terms

(taken from <http://www.health.state.mn.us/divs/fh/mch/webcourse/vision/index.cfm>)

**Accommodation** – The adjustment of the eye for seeing at different distances, accomplished by changing the shape of the crystalline lens through action of the ciliary muscle, thus focusing a clear image on the retina.

**Anterior Chamber** – Space in the anterior portion of the eye; bounded in front by the cornea and behind by the iris; filled with aqueous fluid.

**Aqueous Humor** – A water-like fluid, which fills the anterior chambers of the eye, manufactured by the ciliary body.

**Binocular Vision** – The ability to use both eyes simultaneously to focus on the same object and fuse the two images into a single image, giving a correct interpretation of its solidity and position in space.

**Blepharitis** – Inflammation of the margin of the eyelids. Sometimes referred to as granulated eyelids.

**Choroid** – The choroid is the intermediate layer of the coat of the eyeball and lies between the retina and the sclera. It contains blood vessels, which provides nourishment and cooling to the retina.

**Cataract** – A condition in which the crystalline lens of the eye, or its capsule, or both become opaque, with consequent loss of visual acuity.

**Cilia** – Eyelashes

**Ciliary Body** – Portion of the vascular coat between the iris and the choroid that produces the aqueous humor. It consists of ciliary processes and the ciliary muscle. This organ changes the convexity of the lens when a change of **Accommodation** is required.

**Cones** – One of the two types of light-sensitive cells that are scattered over the surface of the retina, making it possible to transmit visual impulses to the brain. Cones see fine detail and color and are more numerous at the back of the eye in the region of the macula.

**Conjunctiva** – Mucous membrane, which lines the eyelids and covers the front part of the eyeball, and the surface of the sclera.

**Conjunctivitis:** Inflammation of the conjunctiva; bacterial, viral, protozoal, allergic, or other irritant.

**Cornea** – The anterior transparent portion of the outer coat of the eye through which light enters.

**Depth Perception** – The ability to perceive the solidity of objects and their relative position in space. Syn. Stereoscopic vision.

**Exophthalmos** – A condition in which the eyeballs protrude or bulge abnormally from their sockets; usually from trauma or a mass behind the eye.

**Field of Vision** – The entire area, which can be seen at one time without shifting the head or eyes.

**Fovea** – Small depression in the retina at the back of the eye; the part of the macula adapted for the most acute vision (central vision).

**Fundus** – The inner surface of the posterior part of the eye.

**Glaucoma** – Disease of the eye marked by increased intraocular pressure resulting in hardness of the eyeball; can cause blindness if not treated adequately.

**Iris** – The part of the eyelid, which gives it color. Circular membrane, which regulates the amount of light entering the eye by changing the size of the pupil.

**Lacrimal Apparatus** – The system responsible for the formation, secretion, and drainage of tears. Includes: lacrimal canal; lacrimal duct; lacrimal fluid (tears); lacrimal gland.

**Lens** – A transparent, flexible body, convex on both surfaces and lying directly behind the iris of the eye; serves to focus light rays on the retina.

**Nystagmus** – An involuntary, rapid movement of the eyeball; may be lateral, vertical, rotary, or mixed.

**Oculus Dexter (O.D.)** – Right eye.

**Oculus Sinister (O.S.)** – Left eye.

**Oculus Uterque (O.U.)** – Both eyes.

**Ophthalmoscope** – An instrument used in examining the interior of the eye.

**Optic Nerve** – Second cranial nerve; the special nerve of the sense of sight, which carries messages from the retina to the visual centers in the brain.

**Orthophoria** – Straight eyes.

**Photophobia** – Abnormal sensitivity to and discomfort from light.

**Posterior Chamber** – Space between the posterior surface of the iris and the anterior surface of the lens; filled with aqueous fluid.

**Ptosis** – Drooping of the eyelid, which if significant, may interfere with vision.

**Pupil** – The opening at the center (appears dark) of the iris of the eye for the transmission of light.

**Retina** – The innermost layer of the coat of the eyeball that lies next to the vitreous. It is formed of highly specialized and sensitive cells, the “rods” and “cones” that transmit messages to the optic nerve when they are stimulated by light.

**Retinal Detachment** – Separation of the retina from back of the eye.

**Retinitis** – Inflammation of the retina.

**Rods** – One of the two types of light sensitive cells that are scattered over the surface of the retina, making it possible to transmit visual impulses to the brain. Rods perceive dim light and are not color sensitive.

**Sclera** – The white part of the eye. A tough covering which, with the cornea, forms the external, protective coat of the eye.

**Strabismus** – Failure of the two eyes to simultaneously direct their gaze at the same object because of muscle imbalance.

**Sty (Stye) ( Hordeolum)** – Acute inflammation of sebaceous gland in the margin of the eyelid, due to infection and usually resulting in the formation of a pus sac.

**Vitreous Humor** – The transparent jellylike substance, which fills the major part of the eyeball and holds it spherical.

## Ophthalmic Medications

### Eye wash/flush

Warm (body temp) sterile saline may be copiously applied in a gentle stream to dislodge irritants.

### Antibiotics

Triple antibiotic ointments (TAO) and solutions (NPG) are commonly used topical antibiotics.

- a. TAO (Vetropolycin, Pharmaderm, Melville, NY) is a broad spectrum topical antibiotic. It contains polymyxin, neomycin and gentamicin.
- b. NPG (Neocidin, Bauch & Lomb Pharmaceuticals, Inc., Tampa FL) contains neomycin, polymyxin B, gramicidin solution); used for finch eye syndrome and punctured corneas.
- c. Erythromycin ointment (Bauch & Lomb Pharmaceuticals, Inc.).
- d. Chloramphenicol\* 1% ointment (Pharmaderm).
- e. Gentamicin\* solution (Falcon Ophthalmics, Alcon Labs, Forth Worth, TX) and ointment (Akorn, Inc., Buffalo Grove, IL).
- f. Terramycin\* ointment (Pfizer, New York, NY) oxytetracycline and polymyxin B sulfate.
- g. Tobramycin solution (Tobrex, Alcon Labs).
- h. Ciprofloxacin HCL solution (Ciloxan, Alcon Labs).

\*antibiotics c.– h. should be used based on culture/sensitivity results.

### Steroid-containing medications

Topical steroids for inflammation of the eye\*\*; should not be applied to eyes with corneal damage. Their use should be tapered off to avoid problems with the function of the adrenal gland.

- a. Dexamethasone sodium phosphate solution.
- b. Predonisolone acetate 1% solution.
- c. NPG/DXM ophthalmic solution (Neomycin and Polymyxin B sulfates and Dexamethasone Suspension, Unilect Research Labs, Philadelphia, PA).
- d. Steroidal Antibiotic Ointment (SAO) (Neomycin and Polymyxin B sulfates and dexamethasone, Falcon Ophthalmics) contains antibiotics (bacitracin, neomycin and polymyxin) and a steroid (hydrocortisone acetate).

\*\*Systemic steroids used to reduce inflammation of the CNS may also help to reduce swelling of the optic nerve and tissues around the eye.

### Non-steroidal medications\*\*\*

Topical NSAIDS are used to treat inflammation of eyes with corneal abrasions, ulcers or punctures.

- a. Flurbiprofen (Ocufen, Allergan, Inc., Irvine, CA).
- b. Diclofenac (Voltaren Ophthalmic, Novartis Ophthalmics, Duluth, GA).

\*\*\*Systemic non-steroidal anti-inflammatory drugs (NSAIDS) such as Meloxicam (Metacam®, Merial, Duluth, GA) may help reduce swelling of the optic nerve and tissues around the eye.

### Sterile lubricants

- a. Petrolatum Ophthalmic Ointment (Puralube®, Pharmaderm) is used TID-QID due to decreased tear production or lid function (as often seen with botulism, for instance).
- b. Artificial tear solutions (Tears Naturale, Alcon Labs).
- c. Cyclosporine (Restasis, Allergan, Inc.) stimulates tear production

### Cornea Care

Solution applied TID-QID for corneal injuries and infections.

0.25ml Acetylcystine and 0.75ml NPG solution; mix in syringe; refrigerate; discard after 72hrs.

## Common Eye Injuries

### a. **Corneal ulcer**

Fluorescein stain is used to detect these lesions. A broad-spectrum topical antibiotic such as TAO (triple antibiotic ointment) is the first choice of treatment for non-penetrating ulcers.

### b. **Hyphema** (hemorrhage in the anterior eye chamber)

Hemorrhage usually organizes into a clot within 2-3 days, and then slowly resolves. Steroids or non-steroidal anti-inflammatory drugs (NSAIDs) may be used systemically or topically to decrease inflammation.

### c. **Hypopyon** (pus in the anterior eye chamber)

Hypopyon appears as a yellow or white fluid accumulation between the cornea and the iris. May be exacerbated by the use of steroids (which facilitate bacterial growth).

### d. **Synechia** (intraocular adhesion)

Adhesion between the iris and the cornea, called anterior synechia, may impair fluid (aqueous humor) outflow. Posterior synechia (adhesion between the iris and the lens) is commonly seen at the edge of the pupil. If the adhesion affects the entire pupil, aqueous humor is trapped in the posterior of the eye, causing higher intraocular pressure in the posterior than the anterior, resulting in forward ballooning of the iris (iris bombe).

### e. **Uveitis** (inflammation of the anterior segment)

Result of intraocular trauma such as hyphema, lens rupture, etc. Corneal edema (thickened cornea), vessels on the cornea, low intraocular pressure, and/or a small pupil are common clinical signs.

### f. **Cataract** (opacity or cloudiness of the lens)

Traumatic cataracts can develop as a result of blunt trauma or perforating wounds with or without rupture of the lens capsule. Cataracts may also be caused by age, nutritional deficiencies, and prolonged chilling of young birds. Hazy opacity or "blue lens" is a normal developmental stage in young raptors. Juvenile onset cataracts are sometimes resorbed.

### g. **Lens luxation** (forward or backward movement of the lens)

Often from severe impact to the eye, and can result in secondary uveitis or glaucoma.

### h. **Trauma to the posterior chamber.**

Hemorrhage and/or fibrin in the vitreous; massive hemorrhage may cause retina detachment when a clot forms. Steroids or NSAIDs may be used topically or systemically to help reduce scarring.

### i. **Scar formation of the retina/retinal detachment.**

Scar formation around the fovea can cause severe damage to visual acuity, especially in raptors. A detached retina may look like a hanging curtain in a theatre. Once the retina is detached, vision in the eye is very limited; retinas rarely reattach in avian patients.

### j. **Puncture of the eye globe.**

The eye itself looks smaller than normal (conjunctivae often swollen and aqueous humor and/or vitreous humor leak out from the globe). Ointments should not be used.

## Common Eye Infections

a. **Finch eye syndrome** (mycoplasmal infections) - a mild to severe inflammation of the conjunctiva of one or both eyes (chemosis). This inflammation is often accompanied by fluid accumulation (edema) in the tissues around the eye, excess tear production (epiphora), and in more severe cases, by the production of a thick exudate.

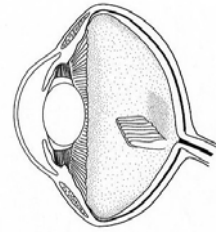
b. **Avian pox** often manifests as firm, proliferative nodules on the skin around the eye.

c. **Bacterial infection** - Commonly seen clinical signs are swelling and/or red conjunctivae with a yellowish discharge.

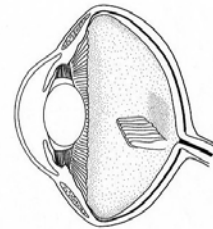
**Avian Ophthalmology Examination Form**

Species \_\_\_\_\_ ID# \_\_\_\_\_ Examiner \_\_\_\_\_ Date \_\_\_\_\_

| Observations:                | Right Eye | Left Eye |
|------------------------------|-----------|----------|
| Orbit (area around the eyes) |           |          |
| Globe                        |           |          |
| Eyelids                      |           |          |
| Upper                        |           |          |
| Lower                        |           |          |
| Nictitans                    |           |          |
| Conjunctiva                  |           |          |
| Cornea                       |           |          |
| Pupil                        |           |          |
| Size & shape                 |           |          |
| Movement                     |           |          |
| Anterior Chamber (aqueous)   |           |          |
| Iris                         |           |          |
| Lens                         |           |          |
| Posterior Chamber (vitreous) |           |          |
| Retina & vessels             |           |          |
| Pecten                       |           |          |
| Optic disc                   |           |          |
| Tear Formation & Drainage    |           |          |
| Vision evaluation            |           |          |
| Follows hand motion          |           |          |
| Lands well on perches        |           |          |
| Walks/flies into wall        |           |          |
| FES Grading (see chart)      |           |          |
| Diagnostic Test              | Right Eye | Left Eye |
| Direct PLR                   |           |          |
| Consensual PLR               |           |          |
| Menace Reflex                |           |          |
| Palpebral Reflex             |           |          |
| Schirmer's Tear Test         |           |          |
| Fluorescein Stain            |           |          |
| Intraocular pressure         |           |          |
| Culture                      |           |          |



Right eye



Left eye

FES Grading Scale (Kollias 2004)

- 0 = Normal eye
- 1 = pink conjunctiva; epiphora
- 2 = pink conjunctiva; epiphora; mucoid discharge
- 3 = red conjunctiva; matting around eye; edema; feather loss
- 4 = red conjunctiva; feather matting; severe edema below eye; chemosis of 40% of conjunctiva; rhinitis
- 5 = red conjunctiva; severe edema above and below eye; chemosis of 80% of conjunctiva; feather loss & matting; rhinitis blocking nares

