

*Direct and Indirect
Veterinary Eye and Ear
Examination Instructions*



WelchAllyn[®]

3.5v Halogen Ophthalmoscopes



3.5v Halogen Otoscopes Ophthalmoscopes



OPHTHALMOSCOPY

Ophthalmoscopy is a valuable diagnostic aid in veterinary medicine. Both direct ophthalmoscopy and indirect ophthalmoscopy can easily be performed utilizing Welch Allyn diagnostic equipment.

(A) Direct ophthalmoscopy—When light enters the eye, a portion of the light is reflected. In direct ophthalmoscopy, a large portion of the fundus field is illuminated and the reflected rays of light are viewed by the observer through a series of lenses. If the animal observed is emmetropic and the observer is emmetropic, the image seen is erect and magnified approximately 15 times.

(B) Indirect ophthalmoscopy—In indirect ophthalmoscopy, the fundus is viewed through a convex, aspheric viewing lens producing a real, inverted image. The magnification of the fundus depends on the dioptric strength of the convex lens used and on its position from the eye. The 20 diopter lens generally provides for 3 x magnification. The largest field size is seen when the lens is held at a distance from the subject's eye that is equal to the focal length of the lens. Indirect ophthalmoscopy can be performed using monocular or binocular equipment.

References

Rubin, Lionel F; Atlas of Veterinary Ophthalmoscopy—Lea and Febiger Philadelphia, 1974. Bistner, Stephen I; Examination of the Eye; Veterinary Clinics of North America., Vol. 1., January 1971. pp. 29-52.

The following material on the use of both the ophthalmoscope and otoscope has been prepared by Drs. Stephen Bistner, Ronald Riis, and Jeffrey Smith. The facilities of the Biomedical Communications Center at the New York State Veterinary College were used and we are indebted to the State University of New York for their generosity. Medical illustration has been provided by Mr. George Batik.

PRINCIPLES OF DIRECT OPHTHALMOSCOPY

Successful ophthalmoscopy requires that the pupil be dilated. In order to adequately perform ophthalmoscopy, a semi-darkened area should be obtained. Dilatation of the pupil can be accomplished with $\frac{1}{2}$ to 1 per cent Tropicamide drops utilizing one drop in each eye, waiting 10 minutes and administering the drops again. Pupillary dilation will be obtained in twenty minutes.

In order to visualize the right eye with the direct ophthalmoscope, the ophthalmoscope should be held in the right hand, the right eye used and one should stand to the right side of the animal to be examined. The left hand is used to part the lids and may also be used to restrain the head.



Figure 1. Use of the Direct Ophthalmoscope to examine the eye of the dog. The ophthalmoscope is held in the left hand when observing the left eye. The right hand is used to separate the lids.

When examining the left eye, the left hand holds the ophthalmoscope, the left eye is used and the examiner stands to the left of the animal. The index finger of the hand holding the ophthalmoscope is placed on the lens dial in order to change lenses when necessary. (See figure #1-2)

Attempt to keep both eyes open when using the ophthalmoscope as this causes less strain on accommodation.

In using the direct ophthalmoscope, place the lens dial at 0 setting and hold the ophthalmoscope at 20 inches from the patient's eye. Observe the pupil and tapetal reflex. Opacities within the lens can be visualized at this time. Once the tapetal reflex is obtained, bring the ophthalmoscope to within one inch of the patient's eye and place the setting on (-1) to (-3) to view the optic disc and retina. Inserting more plus lenses into the ophthalmoscope focuses the lens on the more anterior structures within the eye.



Figure 2. Fundus examination of the horse. In examining the left eye the direct ophthalmoscope is held in the left hand and the right hand is used to prevent the head from hitting the ophthalmoscope.

TECHNIQUE OF INDIRECT OPHTHALMOSCOPY

Indirect ophthalmoscopy involves visualizing the fundus through a convex, aspheric viewing lens in which the image is reversed. Indirect ophthalmoscopy offers several very distinct advantages over direct ophthalmoscopy: (1) The indirect image has less magnification and allows for less distortion and a much larger field of view of the fundus than direct ophthalmoscopy; (2) indirect ophthalmoscopy permits examination at a safe distance from fractious animals; and (3) when the binocular indirect ophthalmoscope is used, a stereoscopic view of the fundus can be obtained.

The use of a focal source of illumination and a good aspheric viewing lens permits the observer to perform monocular indirect ophthalmoscopy. Monocular indirect ophthalmoscopy requires that the animal's head be restrained by an assistant while examination is being performed. The examiner stands approximately one meter from the animal (approx. one arm's length). The convex aspheric viewing lens is held in the right hand and interposed between the eye and the focal source of illumination. The lens is held in front of the eye so that the reflected rays of light are brought into focus at the principal focus of the condensing lens, creating a real inverted image. The entire lens should be filled with a picture of the fundus. The degree of magnification of the fundus

depends on the dioptric power of the lens. A 20 diopter lens providing approximately 3 x magnification is excellent to learn with. The lower the dioptric power of the lens, the more inherent the magnification and the more difficult the lens becomes to use. When using the indirect lens, the light beam and condensing lens must be kept in the same plane, and the lens and light source kept at the same distance from the animal's eye. (See figure 3)

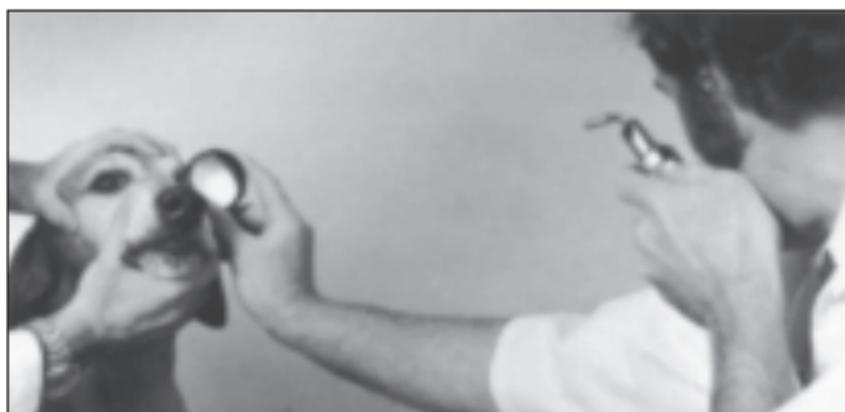


Figure 3. Use of the monocular indirect ophthalmoscope. The Finoff transilluminator is held at eye level with the left hand and a 20 diopter aspheric viewing lens is held in the right hand.

OTHER USES

In addition to examination of the eyegrounds, the ophthalmoscope is a useful diagnostic aid in studying other ocular structures. The light beam may be used as a method of illuminating the cornea and iris, for detecting foreign bodies in the cornea, and irregularities of the pupil. Lens opacities can easily be detected by looking at the pupil through the peep hole "O" at a distance of about 6 inches (15 cm.) from the animal.

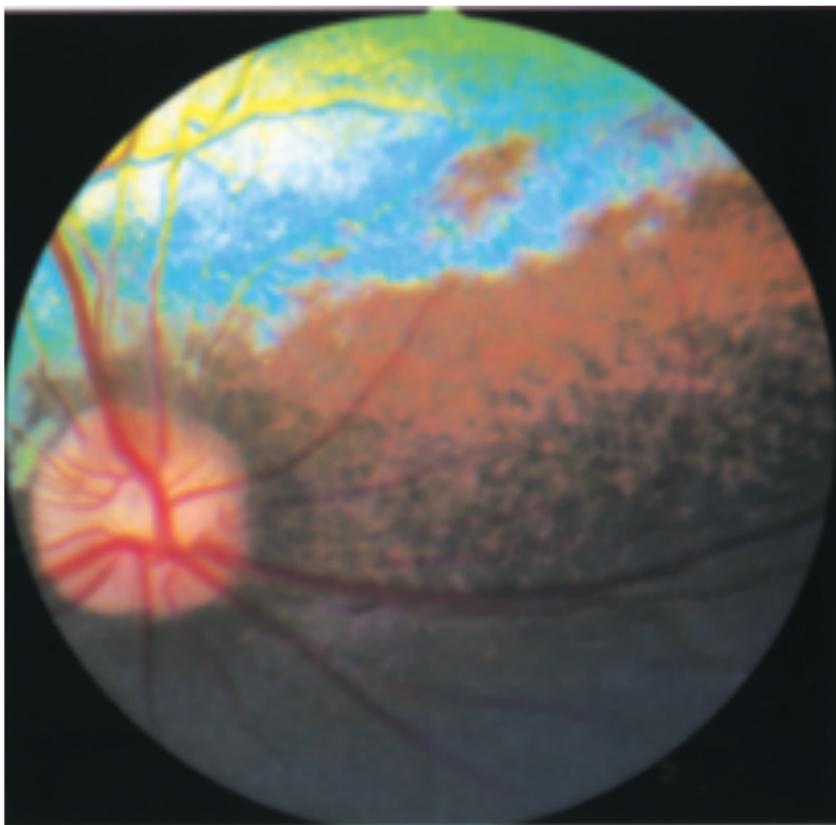


Figure 4. The normal fundus of the dog is characterized by the usual presence of three major venules with the direction being superiorly, inferonasally and inferotemporally. There are approximately 20 arterioles emanating from the disc in a radial pattern. The fundus can be divided into a tapetal and non-tapetal zone. The tapetum develops its natural color, usually a shade of pastel, after the dog is four months of age. The optic disc may be located in the tapetal, junctional or non-junctional area. The size and shape of the disc vary with the degree of myelination present.

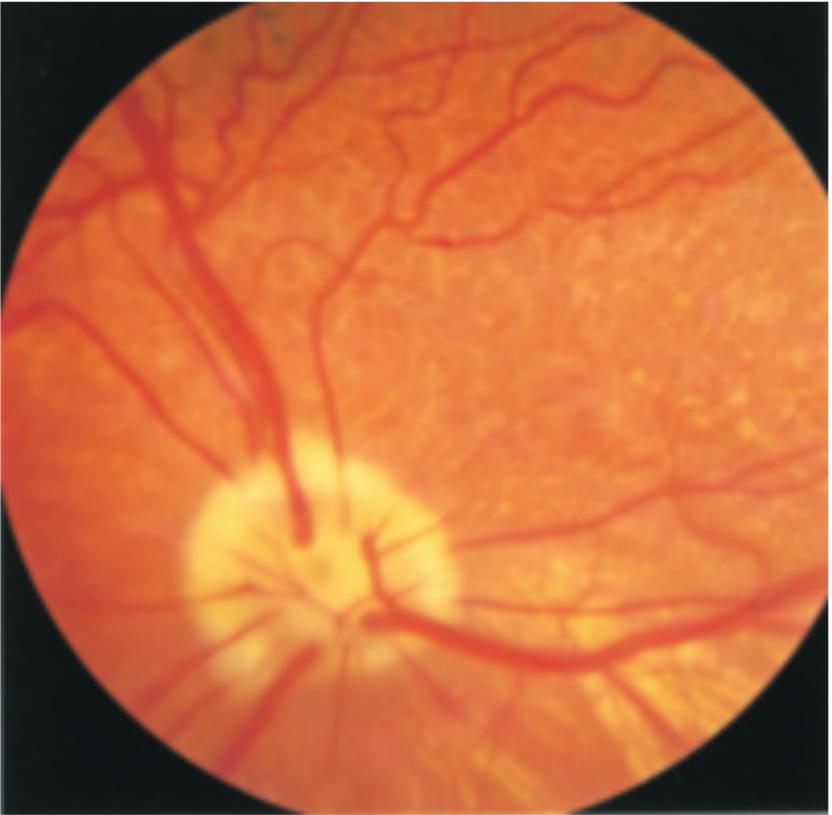


Figure 5. Absence of the tapetum and lack of pigment in the retinal pigment cell layer and choroid gives the fundus a “red reflex” and the tigroid appearance of the choroidal circulation can be visualized. Lack of tapetum in the dog is not unusual, especially in certain breeds such as the Weimeraner, Dalmatian, and Chihuahua. Absence of the tapetum does not appear to adversely affect vision in dogs.



Figure 6. In the normal fundus of the cat, the optic disc is small and a peripapillary pigment ring is frequently present. There are three major arterioles leaving the disc; one superiorly, one inferonasally and one more inferotemporally. Each arteriole is accompanied by a venule. The tapetum may vary in color from yellow to green. The area centralis in the cat is 1.5 disc diameters above and roughly 3 disc diameters lateral to the optic disc.

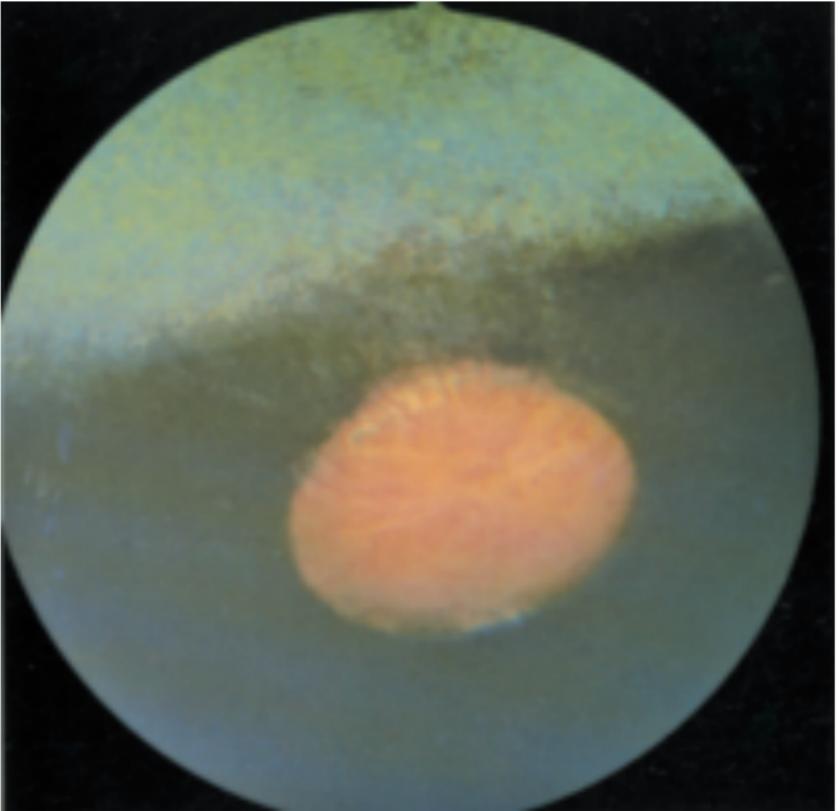


Figure 7. The horse has a large number of small blood vessels that extend radially for a short distance from the optic disc. The optic disc is elliptic with the long axis in a horizontal direction. The optic disc is always located in the non-tapetal zone, temporally and slightly below the junctional area. The optic disc in the horse is slightly cupped centrally and usually "salmon pink" in color. The tapetal fundus varies in color from green to bluish-purple. Scattered in an even pattern of distribution through the tapetal area are pigmented dots, (The Stars of Winslow).

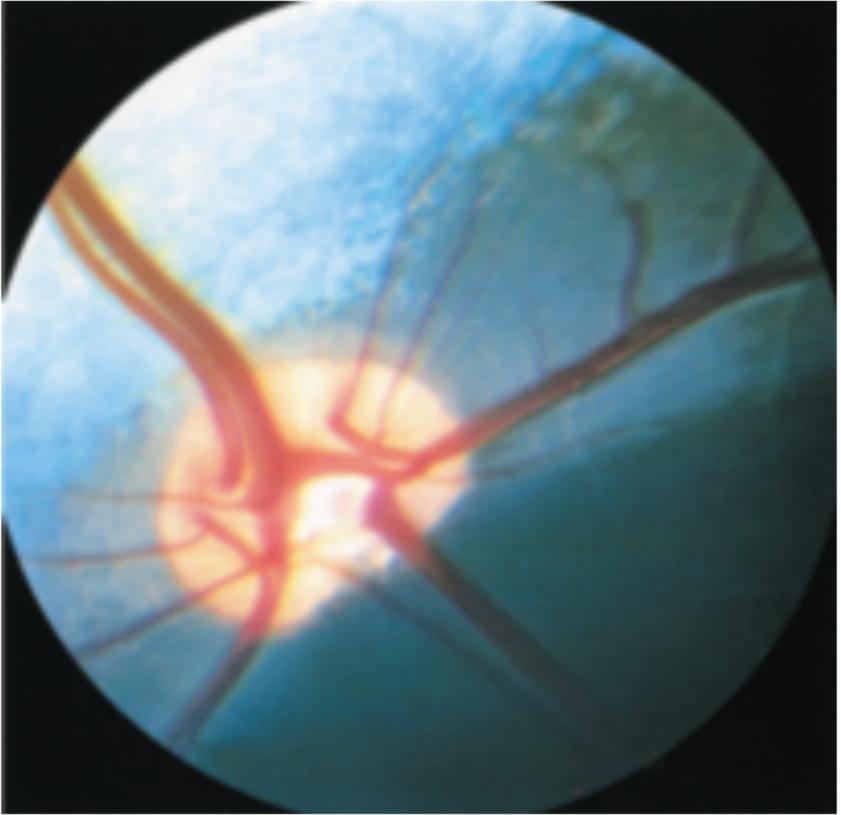


Figure 8. The fundus of the ox and sheep are quite similar, having three or four major venules accompanied by parallel running arterioles. The superior arteriole and vein often twist around each other. The vessels are situated vitread to the optic fibre layer indenting the vitreous. The optic disc is usually round or elliptic with the long axis being horizontal. The tapetal area varies from yellow through bluish-purple. There is frequently the presence of pigment in the tapetal area. Hyaloid remnants attached to the optic nerve are commonly seen in sheep, cattle and goats.

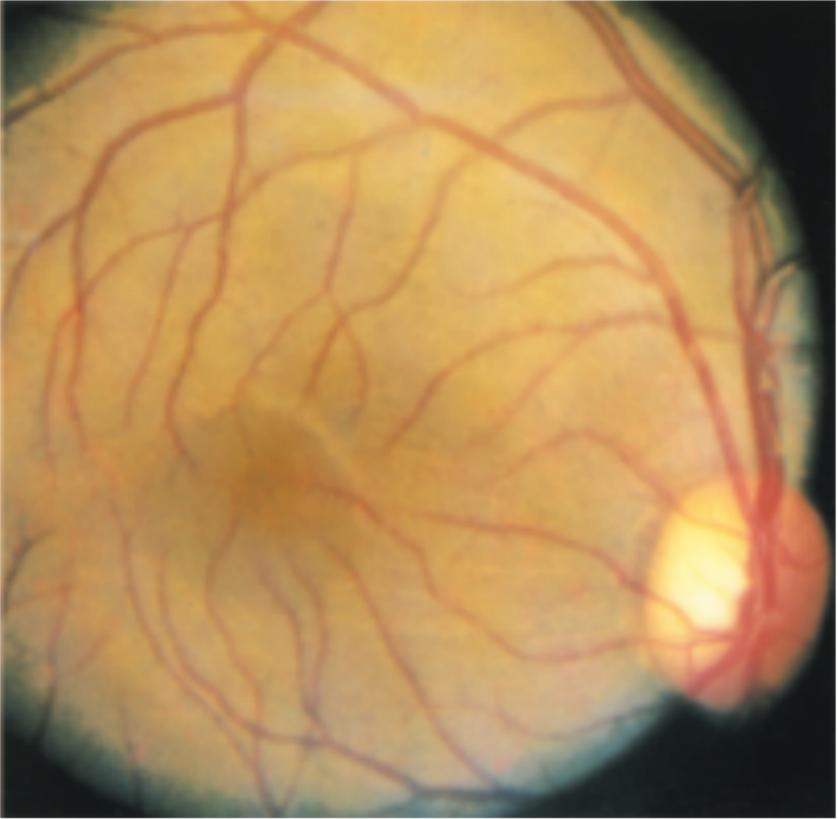


Figure 9. In the normal fundus of the Rhesus monkey, the optic disc is usually elliptic to ovoid with the long axis being vertical. Blood vessels in the primate fundus enter and leave from the central portion of the disc and there is a central artery and vein. The macula is located 2-3 disc diameters lateral to the optic nerve head. There is no tapetum in the primate. The fundus background is usually a shade of brown and occasional choroidal circulation can be seen.

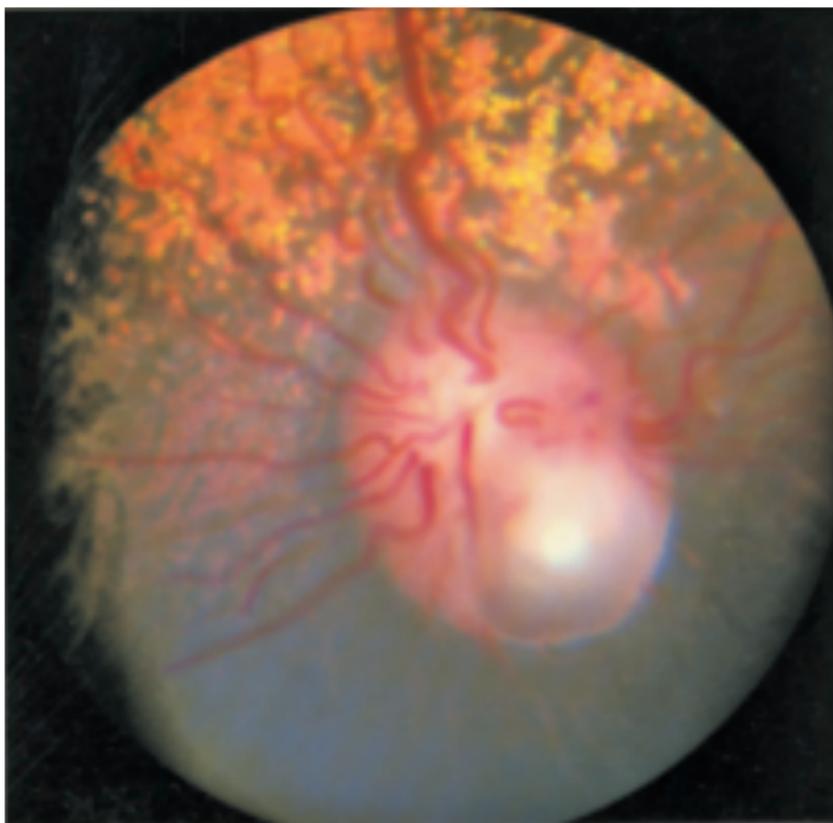


Figure 10. A coloboma of the optic nerve is a congenital defect characterized by a fissure or hole in the optic nerve usually at the 6 o'clock position (typical coloboma). Colobomas are seen most frequently in the collie breed as part of the collie ectasia syndrome. Large colobomatous defects may produce visual field problems.

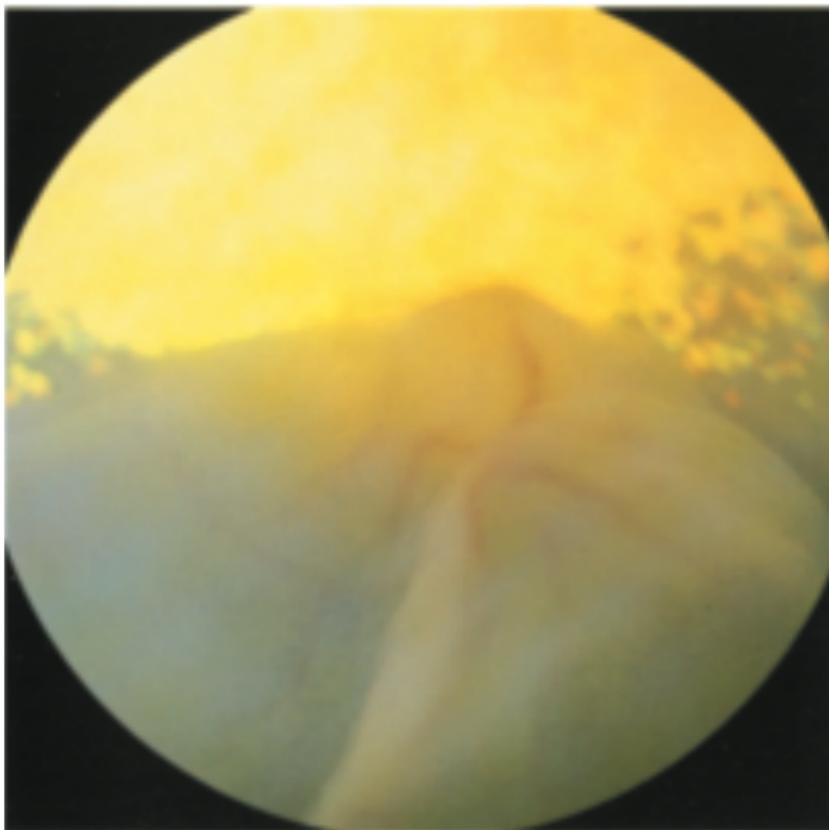


Figure 11. Retinal detachment in the dog, characterized by a grayish-white sheet of retinal tissue detached from the pars ciliaris retinae and remaining attached to the optic nerve. Retinal detachments can be classified on the basis of etiology into 3 different types: (1) exudative detachments; (2) traction detachments; and (3) rhegmatogenous detachments. The rhegmatogenous detachments are associated with retinal holes and are not commonly found in animals. Most types of retinal detachments seen in animals are giant dialyses in which large areas of the retina have become detached.

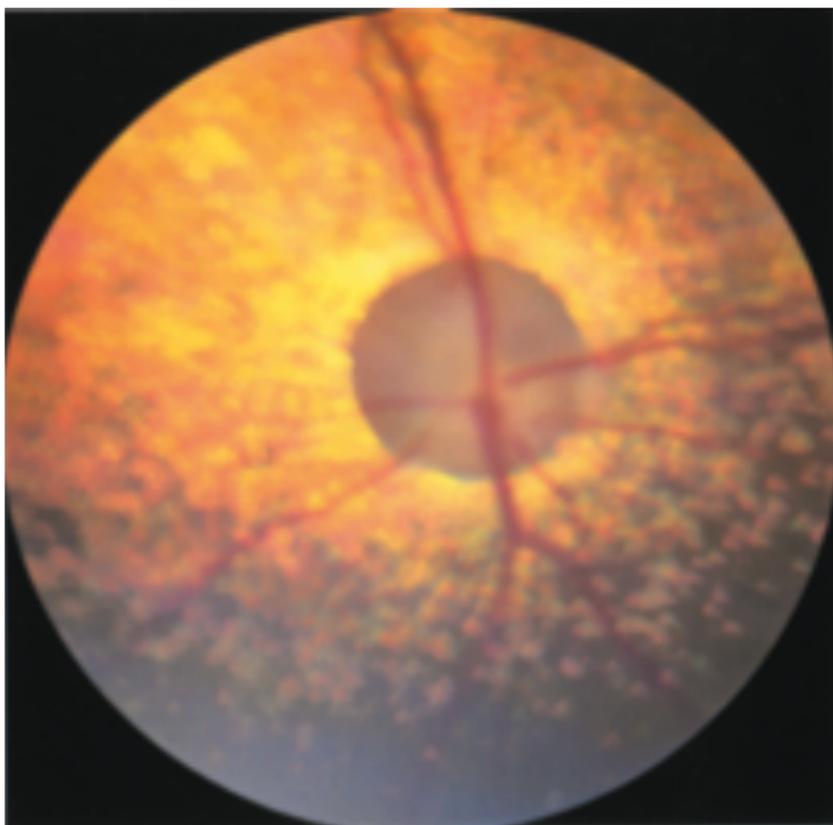


Figure 12. Advanced progressive retinal atrophy in the dog: progressive retinal atrophy has been observed in more than 30 breeds of dogs. Progressive retinal atrophy can be subdivided into generalized progressive retinal atrophy and central progressive retinal atrophy. Those breeds with generalized PRA that have been studied most extensively are the miniature and toy poodle, Irish setter, Cocker Spaniel, Samoyed, and Norwegian Elkhound. In the breeds studied, the pattern of inheritance is autosomal recessive. The clinical signs of generalized PRA are night blindness, loss of peripheral vision, poor pupillary response to light and increased tapetal reflectivity. Central progressive retinal atrophy is a retinal pigment cell dystrophy found in the Golden Retriever, Labrador, Sheffy and other breeds. The disease is characterized by loss of central vision that progresses to total visual loss.

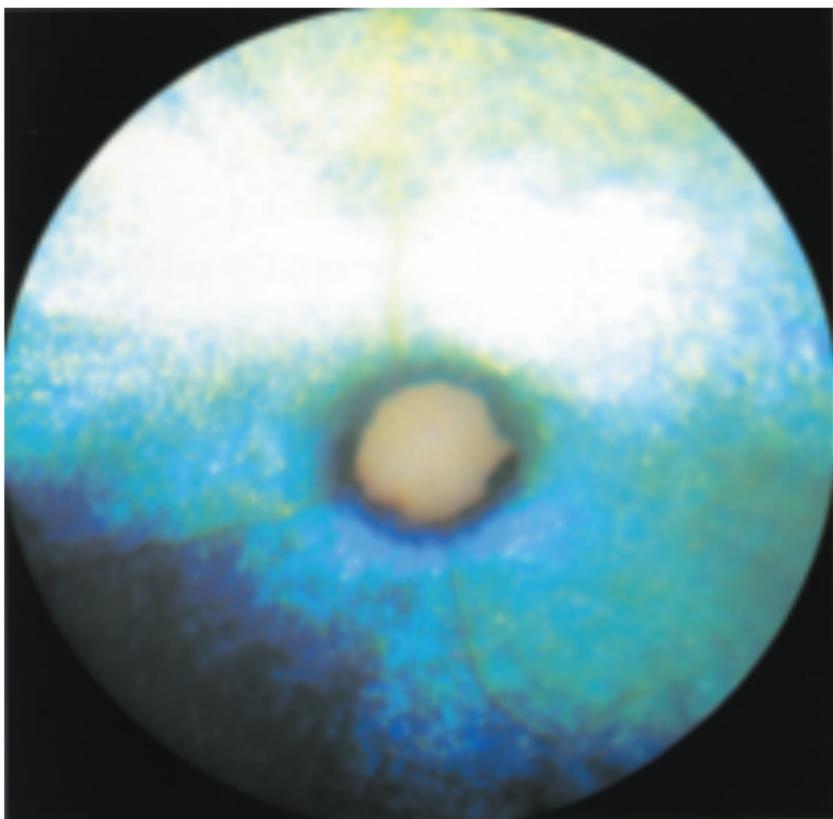


Figure 13. Generalized retinal atrophy in the cat: advanced retinal degeneration in the cat is usually clinically noticed late in the stage of disease once severe visual difficulty is present. The retinal degeneration affects both eyes and is characterized by widely dilated pupil, avascularity of the retina and a greatly increased tapetal reflectivity. Etiology of generalized retinal degeneration is unknown. In the cat, central progressive retinal atrophy that can advance to total retinal degeneration has been associated with a diet deficient in Taurine, an amino acid.

EXAMINATION OF THE EAR IN THE DOG AND CAT

Basic Anatomy of the Ear

The "ear" can be anatomically divided into several areas: The pinna (ear flap) is an extension of the auricular cartilage and is covered by skin on both sides. The shape of the pinna in dogs is usually characteristic for the breed. The pinnas of cats are not highly variable in shape. The auricular cartilage attaches to the external acoustic meatus where the cartilage is rolled into a tube. The horizontal ear canal is formed by the auricular cartilage laterally and the annular cartilage medially. The tympanic membrane separates the horizontal external ear canal from the middle ear. A discussion of the middle and inner ear is not appropriate here, but may be found in the following reference: De Lahunta Alexander; Veterinary Neuroanatomy and Clinical Neurology. W. B. Saunders Company, Philadelphia, 1977.

Inflammation of the external ear canal (otitis externa) is a very common disease problem in the dog and cat. In dogs, the problem is more often associated in those dogs with hair growing in the ear canals and in dogs with pendulous ears. Poodles, Cocker Spaniels and Basset Hounds are particularly prone to developing otitis externa.

OTOSCOPIC EXAMINATION OF THE HORIZONTAL EAR CANAL

An otoscope is required to examine the horizontal ear canal and visualize the tympanic membrane. Welch Allyn otoscopes are available in two types: a “closed head” and an “operating” otoscope with an open head, rotatable magnifying lens and speculum holder. Specula for use with diagnostic and operating otoscopes are available with openings of 4mm, 5mm, 7mm, and 9mm size. The specula are made of polypropylene that can be washed and cleaned with standard germicides, boiled, or autoclaved. In examining the horizontal ear canal, a clean, preferably disinfected otoscope specula of appropriate size should be used. Try to examine a noninfected ear first and avoid examining a non-infected ear with a specula that was initially used to examine an infected ear. To examine the right ear, hold the otoscope in the right hand and the pinna between the thumb and first two fingers of the left hand. Reverse the procedure for the left ear. Draw the ear flap caudally. Insert the otoscope cone carefully in a rostroventral direction but always watch the progress of the tip by looking through the otoscope. When the angle of the meatus is encountered, draw the ear laterally and turn the tip of the instrument medially to straighten the ear canal.

Otoscopes are usually provided with a number of specula and visualization of the ear canal is easiest if the largest one that will fit the canal is used.

The ear drum is a thin membrane with a white, curved bone running from the dorsal margin postventrally. The bone is the handle of the malleus. The tympanic membrane consists of a small upper portion, the pars flaccida, and a large lower part, the pars tensa. The membrane separates the horizontal portion of the ear canal from the tympanic cavity. The tense part of the tympanic membrane is dark because the dark cavity of the middle ear is seen through it. The flaccid part is opaque white with red blood vessels.



Figure 14. To examine the right ear, hold the otoscope in the right hand and the pinna between the thumb and first two fingers of the left hand. Draw the ear flap caudally and insert the otoscope specula carefully in a rostroventral direction. Always watch the progression of the specula tip by looking through the otoscope. When the angle of the ear canal is reached, draw the ear laterally and turn the tip of the instrument medially to straighten the ear canal.

The ear drum can usually be seen in normal dogs less than one year of age. It may be difficult to visualize the eardrum in older dogs because the meatus has narrowed, because the tense part of the eardrum is obscured by the flaccid part, because the lining of the meatus obscures the eardrum or because the eardrum is ruptured.

Chronic otitis externa is a common problem in dogs, and in over 50% of the chronic cases the tympanic membrane is ruptured. In otitis externa, the external ear canal is frequently blocked with cerumen, exudate, and tissue debris. In Poodles, Bedlington Terriers, and Kerry Blue Terriers, the canal contains hair that frequently obscures the view. The hair should be removed, and if the canal is filled with wax, a cerumenolytic agent may be instilled in the ear canal to soften the wax. Deeper portions of the



Figure 15. Deeper portions of the ear canal should be cleaned under direct visualization. The magnifying mirror of the diagnostic otoscope can be rotated out of the way or the operating otoscope can be used.

horizontal ear canal should be cleaned under direct visualization. The magnifying mirror of the Welch Allyn diagnostic otoscope can be rotated out of the way or the Welch Allyn operating otoscope can be used.

CONCLUSION

The instructions given in this manual are presented as a guide to successful ophthalmoscopic and otoscopic examinations. These examinations should always be included in a complete general examination. In addition to aiding diagnosis of ocular and aural diseases, these instruments are useful in determining systemic conditions which can be visualized in the eye or ear. When used regularly and correctly, the ophthalmoscope or otoscope can serve as one of the most effective pieces of diagnostic equipment.

References

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