

Performing Direct Ophthalmoscopy

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An ophthalmoscopic (or fundoscopic) examination evaluates the interior surface of the eye, known as the fundus, and can be accomplished using indirect lenses, a panoptic, or a direct ophthalmoscope. Various lenses can be used for indirect ophthalmoscopy, which gives the examiner a broader picture of the fundus. A panoptic is a useful instrument that can be used to view the fundus, has a larger field of view than the direct ophthalmoscope, and provides a larger working distance from the patient to the examiner. The direct ophthalmoscope provides an upright, unreversed image that is magnified approximately 15 times when the examiner and patient both have normal focused vision (ie, not myopic or hyperopic).

A direct ophthalmoscope allows the examiner to view the optic nerve head (or disc), tapetum lucidum, nontapetum, and retinal vessels by shining a light through the pupil of the eye (see **Glossary**, page 45); however, it provides only a limited view of the fundus and further evaluation may be required when abnormalities are present. A direct ophthalmoscope



▲ **FIGURE 1** Direct ophthalmoscope

is useful when examining depth of lesions within the fundus, as well as obtaining accurate measurements of lesions using the overlying grid feature.

The ophthalmoscope can be useful for diagnosing optic neuritis, chronic glaucoma, and retinal detachments, tears, and degeneration. If a more panoramic view of the retina is desired, such as looking at large retinal lesions or detachments, the examiner should favor an indirect lens. Patient cooperation is essential during examination, and close physical contact between the veterinarian and the patient is required. This article describes how to use a direct ophthalmoscope to examine the fundus.

What is a Direct Ophthalmoscope?

A direct ophthalmoscope is a handheld illuminated instrument, typically with a handle that also serves as the battery pack. (See **Figure 1**.) Many units are rechargeable and portable. The head of the direct ophthalmoscope contains a light source, lenses, filters, and a viewing aperture. The handle can be rotated to turn the light on and off and also acts as a rheostat for adjusting the light intensity. The lenses allow the examiner to correct for refractive error of the user and the patient. The appropriate lens strength is selected by turning the wheel on either side of the instrument head clockwise to increase the green/positive diopter to focus on structures that are close or counterclockwise to increase the red/negative diopter to focus on structures that are far.

The depth and elevation of lesions can be estimated based on the difference between the diopters needed to focus on the lesions and normal structures. Most direct ophthalmoscopes provide a blue light that can be used to examine the cornea for abrasions and ulcers after fluorescein staining. Multiple apertures

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(ie, small, medium, large, half) facilitate evaluation of different sized pupils. For example, the small aperture can be used in a bright room when the patient's pupil is constricted, while the large aperture is appropriate to view a pupil dilated using a mydriatic eyedrop. When a cataract is present, the half aperture allows the examiner to focus on the unobscured portion of the pupil. Many direct ophthalmoscopes also have a slit beam for examining aqueous flare and depth of corneal lesions and an illuminated grid that allows the examiner to measure lesion size.

Steps for Performing Direct Ophthalmoscopy

- 1** Examine the patient's pupillary light reflexes, menace responses, and dazzle reflexes, and ensure that the patient has normal intraocular pressures. If no abnormalities are detected, administer 1 drop of tropicamide in each eye and wait 20 minutes for the pupils to dilate.
- 2** Escort the patient to a dim-to-dark room and place on the examination table, if possible. The examiner's and the patient's eyes should be at the same level, so consider sitting on a stool that faces the patient with the examiner sitting directly in front of the patient. If the patient is too large to safely restrain on the table, the examination can be performed with the patient on the floor. A team member should gently but firmly hold the patient's head to keep it as still as possible during examination.
- 3** Position the ophthalmoscope so it is resting on the examiner's brow and the patient's eye is approximately 25 to 30 cm away from the examiner's eyes.¹ (See **Figure 2**.) The direct ophthalmoscope should be in the hand lateral to the patient's eye that is being examined. For instance, if the examiner is examining a

patient's right eye, the direct ophthalmoscope should be in the examiner's left hand and he or she should open the patient's eyelids with the right hand. The light should be set to a dim setting and gradually increased for better visualization. The lens should be set to a 0 diopter. Then, evaluate the pupil and tapetal reflexes and lens clarity, and locate the tapetal reflection. Slowly move to within 2 to 4 cm of the patient's eye.¹ (See **Figure 3**.)

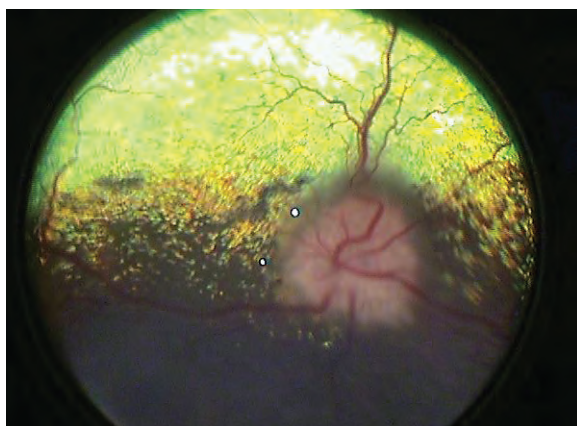


▲ **FIGURE 2** Examining a patient with a direct ophthalmoscope. Start 25 to 30 cm away from the patient, sitting down directly in front of the patient and holding the direct ophthalmoscope as shown.



▲ **FIGURE 3** Slowly move 2 to 4 cm away from the patient's eye to better examine the tapetum, nontapetum, retina, and optic nerve head.

- 4** Locate and focus on the optic nerve head by slowly adjusting the lenses using the focusing wheel to select the appropriate positive or negative diopter.¹ Examine the optic nerve head carefully, and document its color, margins, and shape. Blurry edges suggest peripapillary edema and are consistent



▲ **FIGURE 4** Optic neuritis. Note the blurry margins of the optic nerve head and loss of detail of the retinal vessels as they approach the optic nerve head, consistent with optic neuritis.

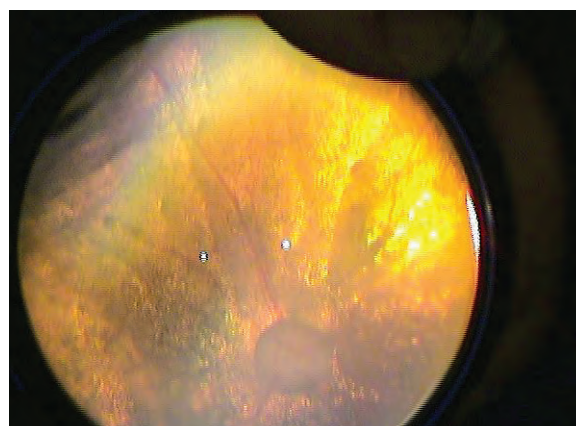
with optic neuritis. (See **Figure 4.**) Examine and document depth of the cup. A depression greater than normal may suggest damage from chronic glaucoma.

- 5** Examine the tapetum lucidum and document its color. Hyperreflection (ie, increased reflectivity associated with thinning of the tapetum) suggests degeneration or progressive retinal atrophy, whereas hyporeflexion (ie, decreased reflectivity associated with the addition of a substance under the retina) suggests subretinal edema or infiltration of cells (ie, bacterial, fungal, neoplastic). Note the presence of subretinal, preretinal, and intraretinal hemorrhages and obvious retinal detachments or tears. (See **Figure 5.**)

- 6** Examine and document the nontapetum. Areas of depigmentation indicate choroidal hypoplasia, uveodermatologic syndrome, and variation of normal in some breeds. Note the presence of subretinal, preretinal, and intraretinal hemorrhages and obvious retinal detachments or tears.



▲ **FIGURE 5** Retinal detachment and subretinal hemorrhages. Note the ventral retinal detachment and multifocal dorsal subretinal hemorrhages.



▲ **FIGURE 6** Retinal degeneration. Note the tapetal hyperreflectivity, decreased vascular caliber and tortuosity, and optic nerve pallor.

Figures courtesy of DJ Haeussler, Jr, MS, DVM, DACVO

Knowing the [direct ophthalmoscope's] abilities and limitations will greatly enhance the results of the examination.

- 7** Examine and document the retinal vessels. Increased vessel caliber and tortuosity suggest systemic hypertension or hyperviscosity syndrome. Decreased vessel caliber, number, and tortuosity suggest retinal degeneration. (See **Figure 6.**)

Conclusion

A direct ophthalmoscope provides a magnified image of the fundus, which can aid in the diagnosis of diseases and conditions of the interior surface of the eye. When used in conjunction with fluorescein staining, a direct ophthalmoscope can facilitate examination of the cornea and identify corneal lesion depth and aqueous flare. The direct ophthalmoscope provides only a limited view of the fundus and patient cooperation is very important. Knowing the instrument's abilities and limitations will greatly enhance the results of the examination. ■

GLOSSARY

- **FUNDUS:** Posterior aspect of the globe composed of the retina, choroid, optic nerve head, and sclera.
- **NONTAPETUM:** Pigmented ventral portion of the fundus not associated with the tapetum.
- **OPTIC NERVE:** Second cranial nerve responsible for transmitting light and impulses responsible for vision to the brain.
- **RETINA:** Structure located between the most posterior aspect of the vitreous and anterior to the choroid responsible for the neurotransmission of visual stimuli.
- **TAPETUM LUCIDUM:** Highly reflective structure found in many domestic species associated with the choroid in the dorsal aspect of the fundus and responsible for the amplification of light.

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See page 46 for product information summary.

Reference

1. Maggs DJ, Miller PE, Ofri R, et al. Basic Diagnostic Techniques. *Slatter's Fundamental of Veterinary Ophthalmology*. 4th edition. St. Louis, MO: Saunders Elsevier; 2008:5;89-90.



DJ HAEUSSLER, Jr., MS, DVM, DACVO, is founder and owner of The Animal Eye Institute, which has locations in Cincinnati and Dayton, Ohio, and Florence, Kentucky. DJ received his MS and DVM from The Ohio State University (OSU), followed by a residency in comparative ophthalmology. He also completed 2 internships at Garden

State Veterinary Specialists, a multidisciplinary referral practice in Tinton Falls, New Jersey. While at OSU, DJ received the top award for professional student research and the top resident award for professional research from the American College of Veterinary Ophthalmologists. He has been published in many recognized peer-reviewed publications, and is the author and publisher of the photographic atlas, *Recognition of Canine Ocular Disease*. He enjoys lecturing to veterinarians and teaching veterinary students who rotate through his practice.

FUN FACT: DJ enjoys spending his free time with his wife, Jayme, who is also a veterinarian, his sons, Trey and Dane, and their pitbull, Charlotte Pickles.

TAKE ACTION

- 1 Become familiar with the parts of the direct ophthalmoscope so the patient examination can focus on the fundus rather than operation of the instrument.
- 2 Ensure that team members are familiar with proper restraint for an ophthalmoscopic examination.
- 3 Document examination findings, including:
 - Optic nerve head color, margins, and shape
 - Tapetum lucidum and nontapetum color
 - Retinal vessel caliber, number, and tortuosity
 - Retinal degeneration and hemorrhage
- 4 Understand the limitations of direct ophthalmoscopy.

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Non-steroidal anti-inflammatory drug for oral use in dogs only

Warning: Repeated use of meloxicam in cats has been associated with acute renal failure and death. Do not administer additional injectable or oral meloxicam to cats. See Contraindications, Warnings, and Precautions for detailed information.

Brief Summary: Before using Loxicom Oral Suspension, consult the product insert, a summary of which follows.

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Description: Meloxicam is a non-steroidal anti-inflammatory drug (NSAID) of the oxicam class.

Indications: Loxicom Oral Suspension is indicated for the control of pain and inflammation associated with osteoarthritis in dogs.

Contraindications: Dogs with known hypersensitivity to meloxicam should not receive Loxicom Oral Suspension. **Do not use Loxicom Oral Suspension in cats. Acute renal failure and death have been associated with the use of meloxicam in cats.**

Warnings: Not for use in humans. Keep this and all medications out of reach of children. Consult a physician in case of accidental ingestion by humans. **For oral use in dogs only.** As with any NSAID all dogs should undergo a thorough history and physical examination before the initiation of NSAID therapy. Appropriate laboratory testing to establish hematological and serum biochemical baseline data is recommended prior to and periodically during administration. To report suspected adverse reactions, to obtain a Safety Data Sheet, or for technical assistance, call Norbrook at 1-866-591-5777.

Precautions: The safe use of Loxicom Oral Suspension in dogs younger than 6 months of age, dogs used for breeding,

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Adverse Reactions: Field safety was evaluated in 306 dogs. Based on the results of two studies, GI abnormalities (vomiting, soft stools, diarrhea, and inappetence) were the most common adverse reactions associated with the administration of meloxicam. Of the dogs that took meloxicam (n=157), forty experienced vomiting, nineteen experienced diarrhea/soft stool, five experienced inappetence, and one experienced bloody stool, bleeding gums after dental procedure, lethargy/swollen carpus, and epiphora. Of the dogs that took the placebo (n=149), twenty-three experienced vomiting, eleven experienced diarrhea/soft stool, and one experienced inappetence. In foreign suspected adverse drug reaction (SADR) reporting over a 9 year period, incidences of adverse reactions related to meloxicam administration included: auto-immune hemolytic anemia (1 dog), thrombocytopenia (1 dog), polyarthritis (1 dog), nursing puppy lethargy (1 dog), and pyoderma (1 dog).

Effectiveness: The effectiveness of meloxicam was

demonstrated in two field studies involving a total of 277 dogs representing various breeds, between six months and sixteen years of age, all diagnosed with osteoarthritis. Both of the placebo-controlled, masked studies were conducted for 14 days. All dogs received 0.2 mg/kg on day 1. All dogs were maintained on 0.1 mg/kg oral meloxicam from days 2 through 14 of both studies. Parameters evaluated by veterinarians included lameness, weight-bearing, pain on palpation, and overall improvement. Parameters assessed by owners included mobility, ability to rise, limping, and overall improvement. In the first field study (n=109), dogs showed clinical improvement with statistical significance after 14 days of meloxicam treatment for all parameters. In the second field study (n=48), dogs receiving meloxicam showed a clinical improvement after 14 days of therapy for all parameters; however, statistical significance was demonstrated only for the overall investigator evaluation on day 7, and for the owner evaluation on day 14.

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