OPHTHALMOLOGY COMMUNICATIONS

Heather Gray, DVM, DACVO **Issue 1 – April 2009**

The electroretinogram (ERG) is a common test used to assess the function of several types of retinal cells in response to a light stimulus. This response represents the summation of several component waves. The a-wave reflects photoreceptor, bipolar and Müller cell activity and the b-wave is thought to arise from the activity of both Müller and bipolar cells. Various light stimuli and background conditions allow isolation of the rod and cone contributions to the ERG. It is a useful tool for the differential diagnosis of various ophthalmic diseases in small and large animals. For some retinal diseases involving degeneration, the ERG provides an early diagnosis compared to ophthalmoscopy or to behavioral evaluation tests.

INDICATIONS OF THE ERG: The ERG is used for the diagnosis and evaluation of retinal function. ERGs are used in the early diagnosis of hereditary retinal degeneration. In most breeds in which *Progressive Retinal Atrophy (PRA)* has been studied electrophysiologically, *changes in the ERG appear long before the appearance of clinical signs.* This early diagnosis is a vital tool in efforts to eradicate the disease through preventive breeding.

Pre-operative screening of cataract patients is another common indication for electroretinography. In these cases ERGs are used to determine if there is any sign of retinal degeneration prior to undertaking phacoemulsification.

An ERG is the only way to definitively differentiate *Sudden Acquired Retinal Degeneration (SARD)* in its acute form from optic neuritis in the dog. The ERG is also used to diagnose inherited and nutritional photoreceptor degenerations in the *cat*, and retinal disorders in a number of other animal species such as congenital stationary night blindness in *horses*.

OBTAINING THE ERG: A corneal electrode shaped like a contact lens is used to record the ERG. The ERG reflects the difference in potential existing between the active (corneal) electrode and the reference electrode placed at the lateral canthus. Electrical interferences are minimized using the ground electrode, differential amplification and purification (filtering) of the response.

Several controllable factors can lead to changes in the ERG measurements obtained including pupillary diameter, anesthetic type and plane, ambient temperature, equipment, type, intensity and wavelength of the stimulus, intraocular pressure, and adaptation of the retina to luminosity

ANALYZING THE ERG: The most important components recorded by the ERG are the “a” wave, the oscillatory potentials, and the “b” wave. The “a” wave, negative deflection, corresponds to hyperpolarization of retinal photoreceptors such as cones and rods. The rods exert a more effective function than the cones in environments of low luminosity or scotopic, being therefore specialized for night vision. They provide low visual resolution in the various grey tones, but are useful for the detection of movement. In contrast, the cones are specialized for daytime or photopic vision and are responsible for color vision, being able to adapt to repeated light stimuli, but being nonresponsive to low levels of illumination.

The oscillatory potentials (OPs) are rhythmic waves that primarily appear in the ERG during the ascending phase of the “b” wave. They originate in the inner plexiform layer (distal to ganglion cells and proximal to receptor cells). The “b” wave, positive deflection, follows the “a” wave and is directly related to the activity of Müller cells and indirectly related to bipolar cells.

SUMMARY: The electroretinogram is a widely used objective test to assess the outer retinal function. It is a useful test for the diagnosis of retinal dystrophies and for pre-operative evaluation of retinal function in conjunction with cataract surgery.

VEC’s Ophthalmology Service uses the handheld, portable HMsERG (RetVetCorp), one of the newest and most powerful electroretinograms (ERGs) on the market today. Although the ERGs used in veterinary medicine in the past have been very limited in their diagnostic abilities, the HMsERG has been developed in conjunction with world renowned Veterinary Ophthalmologists for use in both clinical and research settings. Because of its state-of-the-art technology the HMsERG allows comprehensive ERGs which permit separation of the rod and cone function. It is a portable unit enabling it to be used easily in small and large animals. As a result, this ERG can be utilized in the diagnosis of a huge range of retinal degenerative processes including: early diagnosis of PRA (prior to the onset of clinical signs and retinal changes), SARD, Congenital Stationary Night Blindness, and other types of retinal degenerative diseases in all species. Dr. Gray performs ERGs on nonsedated and sedated animals (depending on the individual animal and the retinal disease suspected). General anesthesia is not required.

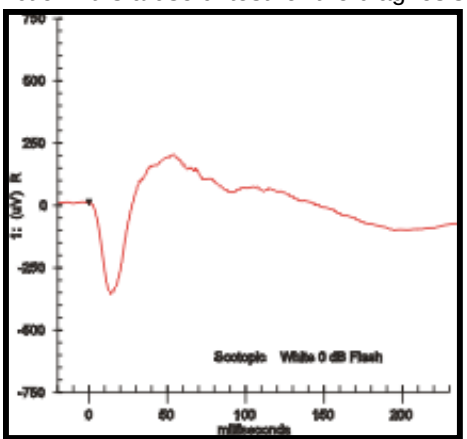

Image from www.wikipedia.com

Please feel free to contact Dr. Gray to discuss the appropriateness of the use of an ERG in your patients or if you have any questions about ERGs or the other diagnostic tests available for retinal disease. Dr. Gray may be reached at 416-920-2002 or by e mailing her at eyecareforanimals@rogers.com

TO BOOK AN APPOINTMENT WITH A VEC SPECIALIST PLEASE CALL (416) 920-2002

This and other VEC faxes can now be downloaded online at

http://www.vectoronto.com/newsletter.php