A Brainstem Auditory Evoked Response (BAER) is a test that is most commonly used to screen for deafness, but also has applications in determining the health of the brainstem in conditions such as neoplasia, strokes, head trauma, and vestibular disease. The BAER is an electrophysiologic study. Electrophysiologic studies are common within veterinary medicine and record the spontaneous or stimulated electrical activity in various body systems. The most common example would be the ECG that records the spontaneous electrical activity of the heart and creates the familiar PQRS complexes that are monitored during anesthesia. The BAER works on the same principles and records the electrical activity of the auditory pathway (nerves and brainstem) when stimulated by sound.

According to the OFA (Orthopedic Foundation for Animals), the BAER test is the only accepted method of diagnosis for deafness. Deafness is a failure in auditory function caused by either a disturbance in sound conduction or in sound sensation. The disturbance may be acquired from various causes (Table 1) or congenital in nature. Breeds that are susceptible to congenital deafness include the Dalmatian, Australian Shepherd, Boxer, Collie, and French bulldog with breeds of white pigmentation being the most affected overall. Animals can be affected unilaterally (affecting one ear) or bilaterally (affecting both ears) and owners often notice vague symptoms such as inattentiveness, being difficult to wake up, or a change in obedience. As these behavioral signs are subjective in nature and non-localizing, the BAER test is a good objective way to identify hearing abnormalities. Clients need to understand, however, that BAER testing only determines whether an ear can hear or not and does not identify the inciting cause.

Table 1 - Causes of Sudden Onset of Deafness

- Drug toxicity (ototoxicity) from administration or application of a drug or chemical which either directly or indirectly destroys cochlear hair cells.
- General anesthesia may cause bilateral deafness from unknown causes.
- Noise trauma, depending on the loudness, can produce temporary or permanent hearing loss.
- Infections of the middle ear (otitis media) or inner ear (otitis interna) can produce transient or permanent deafness.
- Presbycusis (age-related hearing loss), which is progressive with time and cannot be prevented or reversed.

Source: Strain, GM, Causes of Sudden Onset of Deafness, Comparative Biomedical Sciences School of Veterinary Medicine, Louisiana State University, June 2006, Web.

BAER testing is a short and relatively painless procedure. At BVNS, we perform outpatient BAER testing on patients routinely. Patients must be at least 35 days old or have fully developed hearing capability before they qualify for the BAER. While sedation is not required for the procedure, a light amount may be used in order to remove the potential for movement artifact. Dosages may vary according to the patient and veterinarian in charge.
but a good starting point at BVNS would be 2-8 ug/kg of Dexdomitor. The test can usually be completed in 10-15 minutes. Equipment needed for measuring the BAER includes headphones or tubal inserts, 3 electrodes (recording, ground, and reference), an electrode board (channel board), and a computer that serves as the amplifier, signal averager, and stimulator. Proper setup and technique is extremely important for accuracy and interpretation of results. Three small gauge needle electrodes are placed subcutaneously on the patient’s head—one is placed at the top of the head (the vertex), another below the ear being examined, and the third electrode (the ground) is placed either in front of the opposite ear or over the dorsal spinous process of the first thoracic vertebra. The computer generates an acoustic signal, or a click, of a specific frequency and strength which is transferred to the ear being tested by an insert or headphones. Waveforms are generated in response to the auditory stimulus. Minimally, OFA requires that each ear must be tested at a stimulus intensity of 70 dB for at least 200 total clicks.

Inferences about the animals’ ability to hear are ultimately made by evaluating the generated electrical waveforms. The response waveform consists of a series of peaks numbered with Roman numerals from I–VII (Figure 1). The presence or absence of waveforms, their width (latency) and their height (amplitude) are all considered in the final evaluation by the neurologist. In a deaf animal, there will be no waveforms and only a straight line (Figure 2). Each of these waveforms is associated with a particular structure or region along the hearing pathway. In particular, the earliest waves are generated in the auditory nerve and brain stem so assessment of these waveforms can be used to diagnose brain death in emergency situations.

References