A Behavioral Assay for Diagnosing Domoic Acid Toxicosis in Stranded California Sea Lions

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Domoic acid, a neurotoxic metabolite of the algal diatom *pseudonitzschia australis*, has been identified as the primary cause of numerous California sea lion (*Zalophus californianus*) stranding and mortality events along the California coast. Although hundreds of stranded California sea lions with neurotoxic exposure enter rehabilitation facilities each year, diagnosis of domoic acid toxicosis remains time-intensive and expensive, relying heavily on neuroimaging techniques. In this study, a simple, rapid, non-invasive auditory habituation paradigm was assessed as a diagnostic tool in California sea lions with suspected brain damage resulting from neurotoxic exposure to domoic acid. Domoic acid is a glutamate agonist with high affinity for AMPA and kainite receptors. Although the toxin generally clears the body quickly, it causes persistent changes in the brain, including abnormal mossy fiber sprouting in the dentate gyrus. These changes can lead to chronic temporal lobe epilepsy, which in turn results in damage to the hippocampus and surrounding medial temporal areas in the brain. Studies of laboratory animals suggest that habituation of orienting responses to non-aversive stimuli rely on these brain areas; further, habituation measures are easy to obtain in experimentally naïve animals. Here it was found that behavioral orienting responses to a series of non-aversive auditory stimuli habituate more slowly in stranded California sea lions with domoic acid toxicosis than in stranded California sea lions with no apparent neurological deficits. A signal detection analysis indicates that a measure based on this contrast in habituation rate shows functional diagnostic value. Due to its sensitivity and ease of use, this measure shows promise for augmenting diagnosis in a veterinary setting. An ongoing follow-up procedure probing habituation and dishabituation to auditory stimuli presented from multiple locations is also discussed. [Work supported by NSF Graduate Fellowship]