# Auditory Brainstem Responses and Otoacoustic Emissions in Lizards: Comparisons Across Species and Temperatures

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Given the large morphological variation across species, the lizard ear provides a unique window into how sound is transformed from vibrations in air into neural signals (i.e., forward transduction). For example, properties such as the number of hair cells (ranging over 50-2000) and tectorial membrane (TM) morphology can vary significantly across species. Recent reports have used stimulus-frequency otoacoustic emissions (SFOAEs) to explore how various morphological features, in addition to temperature variations (lizards are ecothermic), affect certain functional aspects of the lizard ear such as frequency selectivity. However, a more direct connection between SFOAE generation mechanisms and actual forward transduction is desirable. To this end, we measured both auditory brainstem responses (ABRs) and SFOAEs in the same animal for several different species: Whiptail lizards (Aspidoscelis), Tegus (Tupinambis), & Alligator lizards (Elgaria). Furthermore, these measurements were made in both 'cold' (~25ºC) and 'warm' (~30ºC) conditions. In all species, ABR thresholds decreased by 5-20 dB at higher frequencies (>1 kHz) with increasing body temperature. The latency of the first ABR peak decreased with increasing body temperature. The latencies (in ms) for the cold/warm conditions were as follows: Aspidoscelis - 1.89/0.99, Tupinambis - 2.2/1.6, and Elgaria 1.51/1.06. SFOAE characteristics were highly similar to ABRs. Robust SFOAE activity (evoked using a 20 dB SPL stimulus) occurred at frequencies matching the most sensitive regions of the ABR audiogram. Furthermore, SFOAE magnitudes shifted upwards in frequency with temperature in a fashion similar to ABRs. Overall, temperature effects appeared more pronounced in species with a continuous overlying tectorial membrane (Aspidoscelis, Tupinambis) than those without (Elgaria). As previously suggested by Manley, this disparity likely stems from differences in coupling strength across hair cells.