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Development of Auditory Sensitivity in Belgian Waterslager (BWS) Canaries

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Canaries have been selectively bred for their song and plumage for over a century. One strain, the Belgian Waterslager (BWS) canary, has become noted for its loud, low-pitched song, and its high-frequency hearing loss, which results from missing and/or damaged hair cells on the basilar papilla. Recent experiments have shown that hatchling BWS canaries have a normal complement of hair cells and stereovilli. This study tracked the development of auditory sensitivity in nestling BWS and non-BWS canaries using the auditory brain stem response (ABR). ABRs were recorded in adult BWS and non-BWS canaries as well. Non-BWS adult canary ABR audiograms were similar in shape to behavioral audiograms but were elevated by 20-30 dB. BWS adult canary ABR audiograms were flatter than behavioral curves and elevated by 25-50 dB. Reliable responses were obtained for P5 in non-BWS and P8 in BWS nestlings for almost all frequencies tested. Thresholds for all frequencies were above 80-90 dB SPL but improved over the next 10 days in both strains. Non-BWS canaries were within 1SD of the adult average by P20. Thresholds for BWS canaries improved until about P17 and then gradually worsened from P19-38. By P51, thresholds were within 1SD of the BWS adult average for all frequencies except 0.5 kHz. Experimental crosses between BWS and non-BWS canaries indicate a sex-linked, recessive inheritance pattern. Anatomical findings of similar cell numbers in NM and NL of adult BWS and non-BWS canaries also suggests a later developing hearing loss since, typically, cell loss in brainstem auditory nuclei only occurs with very early onset auditory deprivation. This work was supported by NIDCD grants MH-00982 to RJD and BMR.