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Authors

RIBAK, CE
ROBERTS, RC
KIM, HL

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RIBAK, Charles E., Rosalinda C. ROBERTS* and Howard L. KIM*, Department of Anatomy, University of California, Irvine.
Increased neuronal numbers within the inferior colliculi of seizuring offspring from a cross between nonseizuring Sprague-Dawley and genetically epilepsy prone rats.

Previous work from our laboratory has shown that the central nucleus of the inferior colliculus (ICCN) of adult genetically epilepsy prone rats (GEPRs) displays an increase in the total number of neurons and an increase in the number of GABAergic neurons as compared to Sprague-Dawley (SD) rats. To determine if the increase in cell number is genetically linked to audiogenic seizure behavior, GEPRs were bred to nonseizuring SD rats. F_1 progeny with low or no seizure records were bred and produced progeny with either high (7) or low (0-1) audiogenic response scores (ARS). The brains of five F_2 rats with high (7) ARS, four F_2 rats with low (0-1) ARS, and four age-matched SD rats were analyzed in light microscopic Nissl-stained preparations. Neurons were classified according to size and counted from a grid placed over the ventral lateral portion of the ICCN from 10 sections through its rostrocaudal extent. Statistically significant increases in the number of both small (70%) and medium-sized (14%) neurons occurred in the high seizuring rats as compared to either the low seizuring or SD rats. The data indicated: 30.6±9.6 small, 10.0±4.0 medium and 1.4±1.3 large neurons per unit area in the F_2 (7) rats, 20.4± 5.2 small, 8.4± 4.0 medium and 1.8±1.4 large neurons per unit area in the F_2 (0) rats, and 18.0±6 small, 8.8± 4 medium and 1.9± 1.6 large neurons per unit area in the SD rats. These data indicate that the seizuring progeny from the cross between GEPRs and SD rats have an increase in cell density within the ICCN whereas the nonseizuring offspring do not. These increases are similar in magnitude to those previously observed in GEPRs (100% and 30% increases in the number of small and medium-sized neurons, respectively). Since the seizuring rats used in the present study had ARS of 7 as opposed to 9 for GEPRs, it appears that the magnitude of the increase may correlate with the intensity of the seizures. Therefore, these data suggest that the increase in cell density may be a determinant of seizure susceptibility as well as seizure severity. Supported by NIH grant NS-15669 and the Klingenstein Foundation.