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NON-GRANULE CELLS OF THE HIPPOCAMPAL DENTATE GYRUS - A NISSL, GOLGI AND IMMUNO-CYTOCHEMICAL STUDY

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SERESS, László and Charles E. RIBAK, Department of Anatomy, University of California, Irvine, California. (Sponsored by Roland A. Giolli)
Non-granule cells of the hippocampal dentate gyrus: A Nissl, Golgi and immunocytochemical study.

The granule cells of the hippocampal dentate gyrus are the most prevalent cell type and represent well over 90% of all neurons in this brain region. Other neurons, the non-granule cells, are found throughout the three layers of the dentate gyrus, and display an assortment of morphological types. First, the molecular layer contains small neurons with dendritic patterns which are different from granule cells. The frequency of these neurons in the molecular layer is the smallest for non-granule cells of the dentate gyrus. Second, the granule cell layer has associated with it four varieties of basket cells which are considerably larger than granule cells. The basket cell somata are 1) pyramidal-shaped when located at the border between the hilus (polymorph layer) and the granule cell layer, 2) fusiform when inserted within the granule cell layer, and 3) round when located superficial to the granule cell layer. Third, the hilus contains a wide variety of non-granule cells as described by Amaral (1978). These hilar cells have different sizes and shapes and represent the most numerous population of non-granule cells in the dentate gyrus.

Previous results from immunocytochemical studies indicated that pyramidal basket cells contained glutamic acid decarboxylase (GAD), the synthesizing enzyme for the inhibitory neurotransmitter, GABA. These same preparations show GAD within other non-granule cell types including the two other types of basket cells located in the granule cell layer. Furthermore, about 80% of the non-granule cells in the hilus contain GAD. Since previous studies indicated that hilar cells give rise to associational and commissural hippocampal pathways, these results suggest that a part of these pathways are GABAergic. This notion is consistent with recent physiological data which show that stimulation of the hilus causes inhibition of spontaneous cell firing in 25% of the granule cells (Buzsáki and Czéh, 1981). In conclusion, many of the non-granule cells of the dentate gyrus are inhibitory local circuit and projection neurons.

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