

听觉电生理实时分析系统及其在大鼠下丘信息编码研究中的应用

冯蕾、武小静、乔志梅、高上凯、洪波*
清华大学

基于TDT神经电生理软硬件平台和Matlab软件环境,开发了专用于听觉电生理研究的实时分析软件。通过对神经元胞外记录信号的在线处理和分析,可以在实验过程中得到刺激后放电活动时间直方图、平均发放率、首次发放潜伏期等定量分析结果,以及刺激参数变化时神经元发放率的变化曲线,如发放率-刺激强度曲线等。此分析软件被用于大鼠下丘神经元听觉信息编码的研究中,观察到下丘神经元对于纯音和噪声刺激不同的时间响应模式,以及神经元发放率和首次发放潜伏期对声音刺激强度的编码。

A Real-time Auditory Neurophysiology Toolbox and its Application in the Study of Information Encoding in Rat Inferior Colliculus

A real-time auditory neurophysiology toolbox was developed based on the TDT workstation and Matlab software. This toolbox was a user-customizable application designed for access of the TDT data tank and implementing fundamental analysis of neuronal data from extracellular recording, including post-stimulus time histogram, average firing rate, first spike latency, and tuning curve of auditory neuron's response to different stimuli with changing parameters during the experiment. The user interface of the toolbox was developed with GUI of Matlab, which was flexible to add new modules or to modify old ones. Besides, all functions used in the toolbox were standard script M-files which could be edited in Matlab and could be used separately by other applications in Matlab. SD rat was chosen as the animal model of inferior colliculus (IC) neurophysiology, in which the function of aforementioned real-time toolbox was tested. Preliminary experimental results revealed different temporal response patterns of IC neurons and indicated that the intensity of stimuli could be encoded by the firing rate and first spike latency.

关键词

听觉电生理(Auditory neurophysiology); 实时分析(Real-time analysis); 下丘(Inferior colliculus); 大鼠(Rat)