Responses of neurons in primary auditory cortex (A1) to pure tones in the halothane-anesthetized cat

By nelken
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By nelken January 5, 2011


Abstract:

The responses of primary auditory cortex (A1) neurons to pure tones in anesthetized animals are usually described as having mostly narrow, unimodal frequency tuning and phasic responses. Thus A1 neurons are believed not to carry much information about pure tones beyond sound onset. In awake cats, however, tuning may be wider and responses may have substantially longer duration. Here we analyze frequency-response areas (FRAs) and temporal-response patterns of 1,828 units in A1 of halothane-anesthetized cats. Tuning was generally wide: the total bandwidth at 40 dB above threshold was 4 octaves on average. FRA shapes were highly variable and many were diffuse, not fitting into standard classification schemes. Analyzing the temporal patterns of the largest responses of each unit revealed that only 9% of the units had pure onset responses. About 40% of the units had sustained responses throughout stimulus duration (115 ms) and 13% of the units had significant and informative responses lasting 300 ms and more after stimulus offset. We conclude that under halothane anesthesia, neural responses show many of the characteristics of awake responses. Furthermore, A1 units maintain sensory information in their activity not only throughout sound presentation but also for hundreds of milliseconds after stimulus offset, thus possibly playing a role in sensory memory.

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