Response Properties of Neurons in the Anteroventral Cochlear Nucleus of the Cat to Complex Temporal Patterns of Electrical Stimulation

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Complex temporal patterns of electrical stimulation may provide a better simulation of the acoustic input. Currently little is known about the physiological or psychophysical responses to variations of the time intervals between pulses and their relative amplitudes. This knowledge could lead to a new generation of speech processing strategies. In this investigation we are examining physiological responses of neurons in the anteroventral cochlear nucleus to electrical stimulation using the Melbourne/Cochlear scala tympani banded electrode array. Two stimulus paradigms are being investigated: (1) a 50 ms burst of charged balanced biphasic electrical pulses delivered at constant rates with varying amplitudes; and (2) pulse pairs with varying interpulse intervals. The synchrony and the effectiveness in eliciting neural responses under both stimulus conditions is determined with extracellular and intracellular recordings. The amplitude of depolarising potentials recorded intracellularly is being plotted as a function of electrical stimulus pulse rate. In neurons where depolarising potentials are shown to be excitatory postsynaptic potentials, the latency of the evoked response is examined in order to determine whether they are of mono or polysynaptic origin. Neurons in this nucleus are also morphologically characterised and correlated with their physiological response properties. Discharge synchrony and entrainment are shown to be inversely proportional to stimulus pulse rate. Discharge synchrony is dependent on interpulse interval between the pulse pair.

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