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INTRACELLULAR RESPONSES OF VENTRAL COCHLEAR NUCLEUS NEURONES TO ACOUSTIC STIMULATION IN THE RAT

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The ventral cochlear nucleus (VCN) is the first relay station of the auditory pathway. Presently, little is known about the acoustically evoked intracellular response of neurones in the VCN. We investigated the effect of acoustic stimulation on neurones in the rat VCN using *in vivo* intracellular recordings and dye-filling. In male rats anaesthetised with urethane (1.3g/kg i.p) microelectrodes containing 1M potassium acetate, or with 4% neurobiotin, were inserted into the VCN. Stable impalements were made from 37 neurones classified as having a Primary-like (n=13), Primary-like with notch (n=4) and Chopper (n=20) response to acoustic stimulation (50 ms pure tones, 5 ms r/f time, 0.2 Hz repetition). In 7 cells, three identified as spherical bushy cells, the Primary-like response was associated with sustained depolarisation at characteristic frequency (CF) with spikes usually followed by hyperpolarisation. Off CF stimulation resulted in sustained hyperpolarisation below resting potential. The remaining 6 Primary-like cells responded with an initial sustained depolarisation with spikes. This depolarisation did not last the duration of the stimulus, returning to resting levels whereupon dendritic and synaptic potentials were prevalent. This response was also seen in two identified globular bushy cells and in three Primary-like with notch responders. At low frequencies close to or at CF, these neurones showed depolarising potentials that are phase-locked and present at every cycle of the stimulus making them particularly adapted to preserving temporal information. Chopper neurones could be differentiated into two response types. The first (n=12), identified as stellate in 6 and multipolar cells in 1, responded with sustained chopping at low stimulus intensities with transient chopping evident at higher intensities, sustained depolarisation and spike frequency adaptation. Spikes were followed by a short afterhyperpolarisation. Off CF no hyperpolarisation was evident with the neurone responding with a decrease in the number of spikes. The second (n=8) identified as multipolar cells in 5, responded with transient chopping in the absence of sustained depolarisation. This study provides evidence for the existence of local inhibition on bushy (Primary-like) cells which may be mediated by stellate (Chopper) neurones which do not appear to receive prominent inhibitory drive.

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