

685 Specificity of Connections in the Dorsal Cochlear Nucleus Revealed by Dual Whole Cell Recordings

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Pyramidal cells in the dorsal cochlear nucleus (DCN) receive direct auditory information via the eighth nerve and non-auditory information from parallel fibers synapsing onto both pyramidal and cartwheel cells. The cartwheel cell inhibitory feedforward loop is an interesting component of the DCN circuitry, because cartwheel cells show immunoreactivity for both γ -amino-butyric acid (GABA) and glycine, raising the possibility of transmitter co-release onto target cells. We used a brainstem slice preparation of the DCN to study the properties of cartwheel connections onto both pyramidal and other cartwheel cells. In addition, we analyzed ongoing inhibitory postsynaptic potentials (IPSPs) and currents (IPSCs) in cartwheel and pyramidal cells. Dual whole cell recordings in the DCN suggest that pyramidal cells do not connect to either near by cartwheel (0/15 pairs) or pyramidal cells (0/2 pairs). Cartwheel cells, on the other hand, synapse onto both near by pyramidal (10/15 pairs) and cartwheel cells (2/2 pairs). Evoked cartwheel cell IPSPs onto pyramidal cells had amplitudes of 1.3 ± 0.9 mV (mean \pm SD) and times-to-peak (ttp) of 3.7 ± 1.2 msec ($n = 8$). The paired pulse ratio of IPSPs was 0.5 ± 0.2 at an interval of 20 msec ($n = 8$), indicating shortterm synaptic depression. Cartwheel cell IPSPs onto nearby cartwheel cells had amplitudes of 0.2 mV and ttp of 20.6 msec ($n = 2$). Analysis of voltage traces in simultaneously recorded pairs often showed correlated activity. IPSPs in cartwheel cells that were correlated with IPSPs in pyramidal cells were smaller (amp = 0.7 ± 0.4 mV) and slower (ttp = 12.3 ± 5.7 msec) than those occurring in pyramidal cells (amp = 1.2 ± 1.2 mV; ttp = 4.0 ± 1.9 msec; $n = 85$ events in 2 pairs). Taken together these data suggest that the same inhibitory interneuron could produce IPSPs with different kinetics depending on the target cell. Supported by DC00425 to PBM.