Neural Correlates of the Huggins Dichotic Pitch

Kenneth E. Hancock, Bertrand Delgutte *Eaton-Peabody Laboratory, Massachusetts Eye & Ear Infirmary, 243 Charles St., Boston, MA 02114*

Dichotic pitch is a phenomenon in which changes in the interaural phase relationship of dichotically presented noise produce a tonal percept. One example is the Huggins pitch (HP), in which the interaural phase difference (IPD) of the noise has a given value, ϕ, in a narrow signal band and is ϕ-π at all other frequencies. These stimuli produce a tonal percept at the center frequency of the band, regardless of whether the band is in phase (ϕ=0, HP_+) or antiphasic (ϕ=π, HP_-).

To search for neural correlates of dichotic pitch, we presented HP_+ and HP_- stimuli to anesthetized cats and recorded the responses of delay-sensitive units in the inferior colliculus (IC). The overall interaural time difference (ITD) of each stimulus was set to the best and worst ITD of the unit, and responses were recorded as a function of signal band center frequency. The bandwidth was always 8% of the center frequency. In conditions where the signal band was positioned at a favorable ITD (HP_+ at the best ITD or HP_- at the worst ITD), the vast majority of units showed a peak in firing rate when the band center frequency matched the unit CF. On the other hand, when the signal band was at an unfavorable ITD (HP_+ at the worst ITD or HP_- at the best ITD), most units showed a notch in the firing rate when the signal band matched CF. For a few units, responses were measured as a function of ITD. The majority of these showed a significant decrease in ITD sensitivity (both a drop in rate at the best ITD and an increase in rate at the worst ITD) when the signal band center frequency coincided with CF. These results are consistent with an interaural cross-correlation model for delay-sensitive IC neurons, and generally support existing models of dichotic pitch.

Supported by NIH grants P01 DC00119 and F32 DC05295-01.