**Distribution and projection of VIP expressing cells in the Inferior Colliculus in mice.**

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**Objective:** To identify the distribution and projection of vasoactive intestinal peptide expressing (VIP+) cells in the inferior colliculus (IC).

**Background:** The IC is the main hub in the central auditory system, serving a critical role in the ascending and descending auditory pathways. The IC contains three major subdivisions with different functions. The lateral cortex helps localize sounds in space. The dorsal cortex serves auditory attention and vigilance. The central nucleus is involved in the main pathway for sound perception1. VIP is a neuropeptide that serves as a co-transmitter. We hypothesized that VIP+ cells may represent a functional subtype of IC neurons.

**Methods**: We used 7 mice that were genetically engineered to express cre-recombinase and a red fluorescent protein in VIP+ cells. Three mice were used to identify the distribution of VIP+ cells. Five mice were stereotaxically injected with an adeno-associated virus into the left IC for viewing VIP+ cell projection patterns. Mice brains were fixed and sliced horizontally, coronally, or sagittally. Brain sections were viewed on a fluorescence microscope. A computerized system was used to analyze the distribution of VIP+ cells in the IC and to track their projections to IC targets in other brain regions.

**Results:** We found that VIP+ cells are expressed in all three subdivisions of the IC with a majority of the cells being in the dorsal cortex of the IC (>70%) specifically in the caudal parts. We also found that VIP+ cells project to most major outputs of the IC, contributing to both ascending and descending auditory pathways.

**Conclusions:** VIP+ neurons could contribute to perception, vigilance, and attention. They could be the reason why we assign priorities to sounds and the reason why we wake up to our crying child and not a loud truck.

**References:** 1Winer JA, Schreiner CE. The Central Auditory System: A Functional Analysis. In: The Auditory Cortex . New York, NY: Springer ; 2011. p. 1–68.

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