Volume 13

Washington University
Undergraduate Research Digest

Spring 2018

Exploration of the Role of the Anterior and Posterior Cerebellar Vermis During Vestibular Stimulation

Angela Yim
Washington University in St. Louis

Ruyan Zhang
Washington University in St. Louis

Exploration of the Role of the Anterior and Posterior Cerebellar Vermis during Vestibular Stimulation

Angela Yim and Ruyan Zhang

Mentor: Pablo Blazquez

An intact cerebellum is essential for accurate spatial navigation. Previous studies in monkeys have demonstrated that the posterior cerebellar vermis (PV), a region that receives strong projections from the vestibular nerve, encodes inertial acceleration information. Remarkably, evidence suggest that this inertial acceleration signal is computed by the PV by combining semicircular canals and otolith related information. In this study we investigated whether other regions of the cerebellar vermis with abundant vestibular inputs, such as the anterior vermis, also perform similar computations. We recorded single unit activity in the anterior vermis (lobules 1 and 2) and posterior vermis (lobules 9 and 10) of mice during vestibular stimulation that stimulate the otolith and semicircular canals, alone or in combination. Mice were implanted with a recording chamber above the cerebellum to allow insertion of tungsten and glass electrodes. To gain insight into the temporal response properties of Purkinje cells, we used vestibular stimulation consisting of sinusoidal translation and rotations at different frequencies (0.18-2 Hz). To gain insight into the spatial response properties of Purkinje cells, vestibular stimulation was done in 3 azimuth orientations (0, +45, and -45 deg direction from the straight orientation). Our data suggest that anterior vermis Purkinje cells carry gravito-inertial information (like the otoliths) while posterior vermis Purkinje cells carry translational information respectively. The strong vestibular response in both anterior and posterior vermis and the differences between both areas suggest that they play important but differential roles in balance and spatial navigations.