Keeping balanced in space

Andreescu CE, De Zeeuw CI, De Jeu MTG
Department of Neuroscience, Erasmus MC, Rotterdam

On earth the sensory information from the vestibular system, the optokinetic system and the proprioceptors is necessary to maintain balance and a stable retinal image. In space the sensory information provided by the otolith organs is absent or very small due to the lack of gravity (microgravity). Here, on earth, we studied the influence of gravity and the consequences of gravity perception loss on eye movements using a mutant mouse lacking the otoconia, which serve as the gravito-inertial loading of the otolith organs (the tilted mouse, *tlt*). The horizontal and vertical vestibulo-ocular reflex (VOR), optokinetic reflex (OKR) and visually enhanced vestibulo-ocular reflex (VVOR) were recorded in *tlt* and control littermate mice, using a video eye-tracking technique. Furthermore, otolith sensitivity was studied by positioning the mouse in different roll angles. The otolith-ocular responsiveness to various gravitational forces was significantly attenuated in the mutant mice, indicating that these mice do not have functional otolith organs. VOR gains were lower and VOR phases were higher in *tlt* mice compared to littermates, regardless of the head position with respect to gravity. In all tested conditions the OKR gain in *tlt* mice was significantly higher than in the control mice, with no phase difference between the two groups. Despite the higher OKR gain in the *tlt* mice, the mutant mice couldn't reach the VVOR gain of the control mice. The increased OKR gain is a frequency dependent compensatory mechanism, which is not influenced either by the position of the mouse or by the eye movement plane. This study clearly reveals that there is a functional synergy in the processing of otolith and optokinetic signals regarding the gravito-inertial acceleration. This mechanism might also be important for maintaining balance and stable retinal images in space.

Corina E Andreescu, Department of Neuroscience, Erasmus MC, 3000 DR Rotterdam, PO Box 1738, The Netherlands, t 0630003170, e-mail c.andreescu@erasmusmc.nl

Poster session: Neuroscience Posters 2 (Neuroscience 2 on Thursday 3rd June