Swimming Behaviour and Otolith Characteristics of wildtype and mutant Zebrafish (AIE) under diminished Gravity Conditions

J. Weigele, R. Anken, **R. Hilbig**

Zoological Institute, University of Stuttgart-Hohenheim, Garbenstr. 30, D-70593 Stuttgart, Germany

During microgravity, humans often suffer from sensorimotor disorders (e.g., motion sickness, a kinetosis). Using fish as vertebrate model systems, we could previously provide ample evidence that the individually different susceptibility to such disorders is based on an individually differently pronounced asymmetric mineralisation (calcification) of inner ear stones (otoliths). In the course of a preliminary study, we subjected mutant zebrafish Danio rerio (due to malformation of the inner ear - see below - this mutant was termed “Asymmetric Inner Ear, AIE”) to diminished gravity conditions during parabolic aircraft flight (PF). As compared to wildtype (WT) animals, the mutants showed a pronounced kinetotic behaviour. The gross-morphology of the inner ears of AIE and WT animals strikingly differed: In WT specimens, the saccular otoliths were located at the periphery of the inner ear, whereas the utricular stones were positioned mediad as it is usually the case in teleosts; in most AIE animals dissected, however, the respective otoliths were positioned in an opposite arrangement. Moreover, the mutants sported transparent otoliths, whereas the otoliths of WT specimens had an opaque appearance. This finding clearly indicates that mutant otoliths differed from wildtype ones in their lattice structure (i.e., the calcium carbonate polymorph) and thus the compostion of the proteinacious matrix, which is a template for calcium carbonate deposition. In the course of the present study (the PF experiment is scheduled to be carried out in March 2006), we intend to statistically verify our preliminary findings using AIE mutants. Besides an analysis of the gross-morphology of the inner ear, we especially intend to clarify the calcification status of otoliths by employing a fluorescent calcium tracer (Alizarin Complexone). The data to be gained will be communicated at the meeting. Acknowledgement: This work is being financially supported by the German Aerospace Center (DLR) (FKZ: 50 WB 0527).