Efficiency of the Regulation of Otolith Mineralisation and Susceptibility to kinetotic Behaviour in Parabolic Aircraft Flights

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Under diminished gravity (e.g., during the respective phase in the course of parabolic aircraft flight, PF), humans often suffer from motion sickness (a kinetsosis) due to sensorimotor disorders. Using fish as a model system, we previously provided ample evidence that an individually differently pronounced asymmetric mineralisation (calcification) of inner ear stones (otoliths) leads to the individually different susceptibility to such disorders. Depending on the disposition of an individual fish, the mineralisation of otoliths is more or less strictly regulated by the central nervous system via a gravity-dependent feedback loop. Long-term hypergravity (centrifuge), e.g., slows down otolith mineralisation whereas simulated microgravity (clinostat) yields opposite results. Such long-term experiments under altered gravity moreover affect otolith asymmetry. According to our working hypothesis, the efficiency of the respective regulatory mechanism differs among individual animals. This efficiency is postulated to be high in animals who behave normally under microgravity conditions, whereas it is assumed to be low in such individuals, who reveal a kinetotic behaviour at diminished G-forces. In order to test this hypothesis, two groups of larval cichlid fish (Oreochromis mossambicus) were kept under long-term hypergravity (centrifuge) and simulated microgravity (clinostat), respectively, in order to manipulate the efficiency of the aforementioned regulatory mechanism. Subsequently, the animals were subjected to diminished gravity in the course of PFs, and it was analysed, whether the two groups of larvae revealed a different percentual ratio of kinetosis susceptibility. Further analyses were focused on the calcification status of the otoliths. Preliminary results regarding the swimming behaviour during PF indicate that the ratio of kinetosis was highest in the animals, which had been kept under hypergravity prior to the PFs, whereas it was lowest in the clinorotated individuals (an intermediate frequency of kinetoses was observed in untreated control fish). Final results concerning the animals' behaviour as well as the data on otoliths will be communicated at the meeting.
Acknowledgement: This work was financially supported by the German Aerospace Center (DLR) (FKZ: 50 WB 9997/50 WB 0527).