SPACE LIFE SCIENCES SYMPOSIUM (A1)
Biology in Space (7)

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LONG-DURATION SPACE FLIGHT PROMOTES GALECTIN-3 EXPRESSION IN THYROID GLAND

Abstract

Thyroid cells in culture have been used to study the effect of space environment on cell function. We have demonstrated in vitro that during space missions thyroid FTRL-5 cells acquired a pro-apoptotic phenotype and produced low level of cAMP in response to Thyroid Stimulating Hormone (TSH) treatment due to decreased TSH-TSH receptor interaction (1-3). These results were a springboard to investigate in vivo possible thyroid function impairment, which would explain most of the musculoskeletal, nervous, cardiovascular and immune system alterations of astronauts. At this end we participated to the Mouse Drawer System (MDS) Tissue Sharing Program and we performed experiments in mice maintained onboard the International Space Station during the long-duration (91 days) exploration mission STS-129. Out of the 3 wild type animals only 1 returned to Earth alive. Mice maintained in the Vivarium of the Advanced Biotechnology Center in Genova, Italy, were used as controls. Thyroids were isolated and used in part for cAMP dosage and in part for morphological and immunohistochemical analysis for Galectin-3, Mib-1 and HBME-1 detection as marker of tumour transformation. Results showed that spaceflight animals had a more homogenous thyroid tissue structure as compared to the control samples, with a prevalence of ordered and large follicles and reduction of interfollicular spaces. The values of cAMP production after treatment with 10-7 M TSH for 1 hour were significantly lower than those obtained on Earth. While immunostaining for Mib-1 and HBME-1 did not show significant differences with respect to the controls, galectin-3 was strongly expressed in the spaceflight samples. Since this protein is absent in normal thyroid, this finding represents a promising avenue for future studies on thyroid damage during long-duration space missions. 1. Albi E., Cataldi S., Rossi G., Viola Magni M. Toller M., Casani S., and Perrella G. 2008. Arch. Biochem. Biophys. 478, 52-58. 2. Albi E., Ambesi-Impiombato F.S., Villani M., De Pol I., Spelat R., Lazzarini R., Perrella G. 2010. Astrobiology, 10(8):811-820. 3. Albi, E., Ambesi-Impiombato, F.S., Peverini, M., Damaskopoulou, E., Fontanini E., Lazzarini, R., Curcio, F., and Perrella, G. 2011. Astrobiology, 11:57-64.