

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

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THE HEALTH OF THE ASTRONAUTS IN THE LONG-DURATION SPACE FLIGHT
CONFINEMENT : THE IMPORTANCE OF THE THYROID GLAND**Abstract**

Thyroid hormones play a key role in energy homeostasis of humans. Their production and secretion by the thyroid gland is regulated via the hypothalamus-pituitary-thyroid axis. The hormones are transported into the cell of various organs where they can bind to the thyroid hormone receptors. In this way thyroid gland control cardiovascular, musculoskeletal, nervous and immune systems activity. During space flights, astronauts live in conditions different from those in which they normally are on the ground, that is, living in a confined environment and in a space environment. The aim of our study was to verify the effect of both these conditions on the thyroid gland of mice. At this end we participated to the Mouse Drawer System (MDS) Tissue Sharing Program and we performed experiments in mice maintained on-board the International Space Station during the long-duration (91 days) exploration mission STS-129. In MDS animals were individually housed in cages equipped by food bars, drinking valves for water delivery, cameras for video observation, white and infrared LED's for illumination and sensors for air composition monitoring and control. Separated cages permit olfactory but not physical contact between animals. Mice in MDS on ground were used to study the effect of confinement whereas mice maintained in the Vivarium of the Advanced Biotechnology Center in Genova, Italy, were used as controls. The structure and function of thyroid gland were analysed by microscopy, immunoblotting, immunofluorescence and immunohistochemistry techniques. Results have shown that confinement changes follicular and parafollicular cells which produce T3-T4 and calcitonin hormones, respectively. Distribution of thyrotropin receptor, caveolin1, sphingomyelinase and sphingomyelin-synthase is different in comparison to those of control animals. Differences are much more marked in animals which had participated in the space mission. Our results clearly indicate that the observed changes of the thyroid gland after the re-entry from space mission are the sum of the effects of the confinement and the space environment.