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Life and Physical Sciences under reduced Gravity (7)

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GROWTH AND REGENERATION OF XENOPUS LAEVIS TADPOLES ON THE ISS (XENOGRISS)

Abstract

The XENOGRISS experiment was selected by ASI, within the frame of the mission "Beyond" educational call YiSS - Youth ISS Science", among others due to the active involvement of students into a multidisciplinary project aimed at studying the effect of microgravity on growth and regeneration processes, using an animal model (tadpoles of Xenopus laevis) that allows observing both processes simultaneously. The project involved the design and test of a flight apparatus able to maintain during flight, on board of the ISS, 6 tadpoles of Xenopus laevis within a Xenopus Experiment Unit (XEU, Kayser Italia). To study the effect of microgravity on tissue regeneration, half of the animals have undergone the amputation of a small tail segment, strictly following the procedures indicated by the ethics committee and the regulatory bodies on experimentation with animal models. The XEU has been integrated in a powered Biokon. The payload was launched on December 5th 2019 with the mission SpaceX CRS-19 and activated upon arrival on the ISS, by the Captain Luca Parmitano. The activation of the power ensured the feeding of the tadpoles, the exchange of water and the acquisition of images through a camera, to monitor the growth, regeneration and the swimming pattern. The control electronics, including the acquisition system, have been designed and realized by the students with engineering support of Kayser Italia, taking in to account all the experiment and ISS requirements. The facility has been recovered with the same capsule and the payload opened after totally 39,6 days to allow the post flight analyses on the tadpoles and the retrieval

of the experimental data for the correct replication in 1-g and simulated micro-g on ground using 3d clinostat. The preliminary evaluation of the information acquired with this experiment indicate a delay in tail regeneration and tadpole development within the system, while intact tadpoles presented huge tail lordosis probably due to altered swimming pattern in microgravity. Data obtained by mean of real and simulated microgravity on these aspects will help to understand the mechanisms underlying the processes of growth, repair and regeneration of tissues and also the role of gravity and mechanical factors in these processes. A better understanding of the impact of unloading conditions is relevant to define protocols for the management of traumatic injuries, wounds and chronic ulcers both in space environment and on Earth.