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# THE RELEVANCE OF A TOPICAL TEAM IN THE INVESTIGATION, ADVANCEMENT AND OPPORTUNITIES IN THE RESEARCH FROM THE SCIENTIFIC COMMUNITY THROUGH SPACE TECHNOLOGIES TO TERRESTRIAL IMPACTS.

**Abstract**

In July 2021, the Fondazione E. Amaldi , together with ESA, set up a Topical Team (TT) for bone tissue engineering. TTs are platforms which bring together various spheres, their knowledge and expertise to gain a better insight, in an innovative and creative manner. Cross-collaboration between experts worldwide widens the breadth of exploration, with research advancements in selected topics, can assist in formulating ESA's future scientific direction and expand their focus from different viewpoints. Furthermore, TT's aim to bridge the gap between industry and scientists. The goal of the Topical Team "Bone tissue engineering in space" is to provide guidelines for improving the current knowledge about the pathological mechanisms of bone degeneration experienced by astronauts during spaceflight in view of future effective bone tissue engineering approaches. The understanding of the molecular and cellular mechanisms

underlying the processes of adaptation to spaceflight, the resultant pathophysiological changes and health risks is of key importance to prevent the onset of diseases, prepare effective countermeasures and develop tools for diagnostics. In particular, the combination of multicellular cultures, biomimetic scaffolds, and controlled signals in bioreactors could represent an effective strategy for investigating in vitro bone mechanisms. Moreover, Space could be also used as an accelerated model to understand the biological mechanisms leading to bone resorption, with important inputs both upstream, considering human space exploration, and downstream for all those bone diseases that have common mechanisms. Even on Earth, in fact, bone fracture is a critical socio-clinical issue, and the incidence is constantly growing, dramatically affecting the quality of life and the costs of national healthcare systems. The aging population is the leading cause of bone fragility fractures, accounting for 2.7 million in 2017 in six European countries (Italy, France, Germany, Spain, Sweden, and the United Kingdom), and is expected to reach 3.3 million cases by 2030. Given the projected increase in the aged population, the annual number of osteoporotic fractures in Europe is projected to rise by +24.8% in the period ranging 2019-2034. There is evidence that implanted prostheses lead to a number of complications (infection, implant loosening and intramedullary device breakages) in mid- and long-term use. Hence, alternative solutions are urgently needed; in terms of knowledge acquisition, this Topical Team can make a valuable contribution. This paper contributes to exploiting results attained by the TT and how resources and discoveries related to this issue are beneficial for both the space and non-space community.