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ALTERATIONS OF CARDIOVASCULAR FUNCTION IN PARABOLIC FLIGHT

Abstract

BACKGROUND: Since decades, it has been one of the endeavours of mankind to conquer space. Recently, efforts to enhance strategies for the implementation of prolonged extra-terrestrial stays of humans have increased. It is without doubt that any conductions of space missions should be well planned. In this process, the assurance of ongoing good health status of all participants of the mission is primary. It is well known that changes of phases of gravity are associated with diverse response mechanisms of the human organ systems. In this context, pathological response mechanisms of the cardiovascular system in particular may have serious medical implications. However, the exact algorithms and magnitude of changes of the cardiovascular system under these conditions are mostly unknown. Depending on the setup of the conducted space mission, the possibilities of recognition of underlying pathological processes and subsequent adequate therapeutic interventions to counteract these mechanisms might be limited as apt instruments for early detections of these mechanisms have been lacking. Bearing these facts in mind, the continual effort in scientifical work pertaining the cardiovascular system and function in different phases of gravity seems warranted.

OBJECTIVE: The aim of our scientific approach is to investigate about changes of cardiovascular function during different phases of gravitation [with focus on 0 G (weightlessness) and 1 G (regular gravity)], induced by parabolic flight manoeuvres as part of the Parabolic Flight Campaign in Bordeaux (France) in March 2018.

METHODS: In total, the survey of 12 healthy humans is scheduled. We will explore the change of diverse hemodynamic parameters of the macrocirculation, by implementation of CNAP® monitoring with beat-to-beat documentation of hemodynamic flow parameters. Furthermore, we will document changes of parameters of sublingual microcirculation, applying the MicroScan® Microscope, for intravital microscopic acquisition of two-dimensional video sequences with the SDF-imaging technique. Additionally, on ground, we will perform blood analysis of diverse serum parameters associated with cardiovascular function, before and after each flight. Thereby, we intend to learn about possible blood serum correlates of the observed hemodynamic alterations aboard.

RESULTS: The results of the conducted study would be presented at the IAC Conference in October 2018.

CONCLUSIONS: With our research approach, we hope to improve knowledge about cardiovascular function under different conditions of gravity. Our results might help with the development of adequate tools of timely detection of pathological cardiovascular response mechanisms under these conditions to disclose potentially helpful therapeutic options for humans on space missions to come.