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# PRECISION HEALTH FOR CHILDREN TAKES FIRST STEPS IN SPACE

**Abstract**

The UN Sustainable Development Goal (SDG) 3 "Good Health and Well-Being" aims at ensuring healthy lives and promoting well-being for all, also stating that over the last 15 years, child mortality rate has been cut in half and that it's possible to win the fight against most diseases, theoretically equally all over the world. Advancements of Inborn Errors of Metabolism (IEM) research allowed to lower child mortality and the associated intellectual disability. Additional diseases as heart and neurodevelopmental disorders (eg. congenital heart defects, autism spectrum disorders etc.) threaten children health and demand for more research. The apparent heterogeneity of the disorders and of the pathophysiology clashes with the common attitude of labeling children in a diagnostic category thus supporting the need of increasing the knowledge about underlying mechanisms and processes, aka contributing to precision health. Why could Space research lead to a new generation of precision health? The exposure to Space environment causes on average a 10-fold accelerated pathophysiological dysregulation. It alters different biomarkers (biochemical, hormonal, cell signals/components and their cross-talk), triggers a complex molecular damage and persistent oxidative stress, contributes to a complex network of pathophysiological mechanisms, which orchestrate the different metabolic pathways, identified as common determinants of several IEMs, neurodevelopmental and heart disorders. In this paper we discuss how investigating in Space (or microgravity) conditions the dysregulation of metabolic pathways enables the design of

therapies and food solutions for pediatric patients. This is relevant and timely if we also consider the experiments conducted on Ax-3 mission focused on studying oxidative stress caused by the exposure of the human body to Space environment, and the effect of antioxidative countermeasures. Moreover, by using the accelerated model from Space we 1) suggest new approaches to address the metabolic pathways dysregulation in childhood disorders and malnutrition 2) highlight precision health fall-outs and spin-out opportunities with a special focus on developing or undeveloped countries and childhood under/malnutrition 3) propose an equal precision health for children also starting from missions to Mars research experiments exploitation. Space environment reveals the extreme vulnerability of the human biology, and the International Space Station represents the real breakthrough to study the its plasticity in order to find countermeasures to the degenerative processes affecting children, the future humans.