

Space Physiology Fisiología espacial

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Delegates from countries in several continents, including Europe, South America, Central America, North America and Asia attended an outstanding Space Physiology Satellite meeting on Saturday June 1st 2019 in Cuba. This symposium crossed borders and oceans to bring together experts in space physiology and medicine at Varadero Beach, located about two hours east of Havana. Cuba has the distinction of having one crew member, Arnaldo Tamayo Méndez, who flew on the Soviet space station Mir. Moreover, Cuba originated the famous Cuban Boot countermeasure;⁽¹⁾ and Varadero Beach was where many cosmonauts recovered after their prolonged space flights.

This satellite meeting directly followed the PANAM-2019 Physiology without Borders congress during 27-31 May 2019 in Havana, Cuba. Our follow-on Space Physiology satellite symposium stimulated creative exchanges of ideas and generated collaborative possibilities among attendees. All delegates who presented talks and contributed to discussions voiced much appreciation for the quality of the meeting, hospitality and expertise of the organizers and the friendliness of the Cuban people in general.

The following presenters and their titles were given at the Space Physiology Satellite meeting and most are available as short communications in the present issue of this Journal.

Welcome was given by Alberto Juan Dorta Contreras, who was the President of the Local Organizing Committee of the 2nd Pan American Congress of Physiological Sciences and he also presented a paper about the Cuban medical experiments on Tamayo-Romanenko flight and their contributions to Space Flights.⁽²⁾

Later several papers were presented such as *Physiology and Exercise during Deep Space Missions* by Alan Hargens from United States who reviewed previous exercise hardware and recommended better exercise concepts for astronauts on deep-space missions. A short communication is follows in this issue. Tatjana Paunesku spoke about the Space Radiation that the astronauts suffer in their flights and the consequences of it.

Later an important paper about the possible stress that the future Mars missions have to suffer in an experiment of a group of selected women in an isolated environment. This paper by a young scientist Noah C. Venables and his team. is also provided in this issue.

Professor Laurence Vico (Lyon, France) presented an outstanding paper concerning the consequences of the spaceflight asking on the skeleton of several cosmonauts. You can find her review in this issue as well. Professor Susan Bloomfield (United States) presented a paper *Modeling Reduced Gravity Environments and Exposures to Space Radiation*⁽³⁾ Moreover, Professor Brinda Rana from the same country reviewed molecular and -omic adaptations to long-duration space travel based on tests of identical twins in space.⁽⁴⁾

Jojo Sayson from United States presented his experiences in exercise countermeasures for the spine in microgravity and Professor Guido Ferreti from Italy discussed a mathematical approach to the maximal oxygen consumption concept. Both have provided mini-reviews in this issue. Importantly, Aubrie O' Rourke from the United States discussed the surprising invasion of microbes from astronauts within the International Space Station.

Bolivia is a country whose population has adapted to living in a high-altitude and thus, hypoxic environment. Based on his studies, Professor Gustavo Zubieta-Calleja (Bolivia) spoke about *Space Travel in a High-Altitude Environment: Biology Bypassing the Pressure Laws of Physics and BioSpaceForming*. A short communication of his paper is located in this issue. Finally and importantly, Professor Richard Hughson from Canada presented an extensive review of vascular adaptations to spaceflight: *Results from the Vascular Series Experiments*. A short communication from his extensive studies on orbit is provided in this issue as well.

Delegates, including myself, wish to acknowledge and congratulate the organizers of the meeting and we hope to see all the participants with a larger group for another meeting

in Cuba. Most importantly, we thank and congratulate Professor Dorta and his team for collecting and reviewing many results from our satellite meeting for publication in Revista Cubana de Investigaciones Biomédicas.

REFERENCES

1. Connors MM, Harrison AA, Akins FR. Living Aloft: Human Requirements for Extended Spaceflight. NASA Ames Research Center, Scientific and Technical Information Branch, National Aeronautics and Space Administration. Washington, DC, 1985 [cited 11/8/2019]. Available from: <https://history.nasa.gov/SP-483/ch2-3.htm>
2. Dorta Contreras AJ. Ciencias fisiológicas cubanas en el cosmos. Rev Cubana Invest Biomed. 2010 [cited 10/8/2019];29(3). Available in: http://bvs.sld.cu/revistas/ibi/vol29_3_10/ibi08310.htm
3. Bokhari RS, Metzger CE, Black JM, Franklin KA, Boudreaux RD, Allen MR, et al. Positive impact of low-dose, high-energy radiation on bone in partial- and/or full-weightbearing mice. NPJ Microgravity. 2019;4(5):13. doi: 10.1038/s41526-019-0074-3. eCollection 2019. PubMed PMID: 31231675; PubMed Central PMCID: PMC6547738.
4. Garrett Bakelman FE, Darshi M, Green SJ, Gur RC, Lin L, Macias BR, et al. The NASA Twins Study: A multidimensional analysis of a year-long human spaceflight. Science. 2019 Apr 12;364(6436). pii: eaau8650. doi: 10.1126/science. aau 8650. PubMed PMID: 30975860.

Conflict of interests

There is no conflict of interest in relation to the research presented.