Physiology without Borders: US and Cuban Scientists Meet in Space

Alberto Juan Dorta-Contreras MS PhD

Over 400 delegates from 28 countries gathered recently in Havana for the 2nd Pan-American Congress of Physiological Sciences (May, 2019). It was quite an event, the level of science attesting to the quality of participants from the world over. The conference attracted more US scientists to Cuba than any other in the field of medicine over the last several years: 228. I find this number particularly noteworthy amidst the pressures they faced to keep them from coming.

However, such robust US participation was no accident: the event's International Scientific Committee encouraged it, and the US delegates themselves were clearly determined to attend despite the rumor-mongering, the new restrictions announced by the White House and the added bureaucracy of traveling to Cuba—even legally. One by one the obstacles to their participation were overcome and so they joined other prestigious scientists from Latin America and the world, including Cubans. Unfortunately, several NASA specialists were prohibited from attending the Satellite Symposium on Space Physiology—which proved to be one of the most fascinating sessions.

The Symposium was a high-level meeting, with participation by both European and US organizations and institutions. The themes were quite original, many of them unfamiliar to many attendees, such as the medical-biological experiments carried out by Cuban Arnaldo Tamayo Méndez and Soviet Yuri Romanenko during their joint space flight in September 1980, almost 40 years ago.

Some of these experiments were purely Cuban[1,2] and were conducted on this and subsequent flights of the Intercosmos program, and later referenced by virtually all astronauts. This is the case of the so-called "Cuban boots", a life-support experiment carried out for the first time by Tamayo and Romanenko. It addressed the problem of spacial disorientation, specifically the sense of verticality during prolonged weightlessness.

The Cuban boots were designed to "apply pressure to the bottoms of the feet to simulate standing on solid ground" in 1 g conditions, and thus were also one of the features to help distinguish "floor" from "ceiling."[1–3] A Soyuz 38 cosmonaut noted that use of the boots "reduced the severity of spatial illusions and motor disturbances, phenomena thought to be produced by conditions which also produce motion sickness."[3]

A number of other experiments were presented related to astronauts' health during and after long space voyages, including prevention of such problems in preparation for any travel to Mars—a 34 million-mile trip that would take 6 months. The adverse health effects addressed included effects on body and bone mass, vision issues, shortening of telomeres and other DNA alterations that have afflicted astronauts in previous flights.

Ecologists learned of the germs that astronauts would take to Mars and that might contaminate that planet, because of course these human space explorers are also microbial vectors. Presenters also referred to high-resistance tests and psychological analyses, such as those involving the six women who crossed Antarctica, assessing problems they encountered along their trek when exposed to extreme natural conditions while reaching the limits of their endurance, followed by psychological analyses. Another study compared molecular adaptation between a set of identical twins, both astronauts, associated with the different trips made by each.

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Training needs for future astronauts were also projected, including recommended exercises during prolonged space voyages, based on specially equipped pre-flight simulators. Yet another area of research looked into the consequences of inactivity during long space flights, which can reduce insulin resistance, among other effects on vascular health.

In summary, this event illustrated that such scientific research can build bridges of useful exchange and cooperation, in particular between professionals in the USA and Cuba. The congress, whose theme was "physiology without borders," proves once again that we can work jointly in the interests of health. It offered further evidence that for scientists, walls are simply meant to be scaled, preferably together.

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Disclosures: None
Correspondence: adorta@infomed.sld.cu