ACUPUNCTURE Today

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Acupuncturist Wanted: For Mission to Mars

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Sounds pretty fanciful right? Well, you'll be pleased to know that NASA and other government agencies have been researching acupuncture for more than a decade – to replace hundreds of pounds of medications for space travel.

A manned mission to Mars can take approximately six months to a year, which is a significant amount of time to spend in space, and you can imagine what it takes to prepare for such a voyage. (A lighthearted book full of factoids about preparing for a trip to Mars is Mary Roach's *Packing for Mars: The Curious Science of Life in the Void*. Unfortunately, there are no references to acupuncture.)

French, Chinese and Russian space programs have already used acupuncture in space to prevent and treat a number of conditions relating to living in a microgravity environment. (Full disclosure: I was an aerospace engineer before studying acupuncture and worked closely with space shuttle payload specialists launching satellites into space.) Hollywood will reference "zero gravity," but that doesn't actually occur in space since there are all kinds of objects pulling in various directions.

The Health Consequences of a Microgravity Environment

I attended the International Congress on Integrative Medicine and Health; one of the presenters was discussing microbiome support for astronauts (food as well as environmental considerations). He said it's not uncommon for astronauts to suffer from leukopenia, muscle atrophy, weakness of T cell-mediated immunity, increased inflammatory markers, "space sickness," osteopenia, impaired vision, decreased kidney function, body fluid loss, radiation exposure and insomnia (most of which can be effectively treated with acupuncture, with no adverse effects). That was the driver for me to submit an abstract to present at an aerospace medicine conference on the topic. Unfortunately, the conference was cancelled due to COVID, so I had to shelf the idea for the time being.

The majority of studies on the long-term biological effects of a microgravity environment have been performed on the International Space Station (ISS), since space shuttle missions average about a week. Here are a few of their findings in the past 24 years.

Since blood floats in space, the heart is essentially on vacation, and it wasn't uncommon for astronauts early in our space program to pass out upon returning to Earth. Flight surgeons found that otherwise-healthy astronauts had reduced ejection fractions because they were suffering from mild heart failure, known in the aerospace world as "cardiovascular deconditioning."

Today, there are a number of mandatory aerobic activities (such as riding a stationary bike) on the space station to keep the myocardium strong and maintain astronauts' cardiovascular health.

Similarly, equilibrium fluid floats in space, causing a mismatch between visual stimuli and the vestibular system information sent to the brain, leading to nausea and vomiting (also known as space adaptation syndrome). Trust me, the last thing you want to do is vomit in the helmet of your space suit during an EVA (extravehicular activity).

On Earth, daily activities such as walking with a natural arm swing pull on our tendons to maintain bone density, which is why resistance exercise is crucial in our senior years. Weightlessness,

unfortunately, will lead to osteopenia by inducing higher levels of bone resorption. Long periods in space and exposure to radiation can cause leukopenia and reduced T cell-mediated immunity, both of which can be effectively treated with acupuncture. Furthermore, lack of light and dark cycles can affect astronauts' circadian rhythms, leading to poor sleep quality.

Scientists also have simulated microgravity environments to study cellular mechanotransduction in human and animal models.

Gut microbiome changes occur in space, leading to a whole host of health issues. A healthy microbiome protects us from metabolic diseases, allergic diseases,and inflammatory bowel disease, while dysbiosis in the gut can result in various pathologies and negatively affect the immune system. (There's an ongoing study, "The Astronaut Microbiome Project," looking at microbiome changes due to long-term space flight.)

Interestingly, data from the MARS500 project (six astronauts were confined within a simulated Mars-surface habitat for 520 days, starting in 2007) found that the microbiome was altered during the study. Another study of four astronauts before, during and following spaceflight on the ISS demonstrated that their microbiome composition changed during spaceflight, but returned to normal following return to Earth.

Why Acupuncture?

It costs a whopping $10,000 to put one pound of payload into space. You can imagine that storing common medications for a crew over a period of a year, not including once they arrive at Mars and their return, can get pretty pricey and require extra storage space.

Another thing to keep in mind is that drugs like Benadryl will "ground" a pilot or crew member for up to 60 hours after the last dosage, which can impact the mission. In addition, water is recycled onboard the space ship, including urine, which can contain trace drugs and exert negative effects on the entire crew. (There's an entire "closed loop" system on the ISS that captures astronaut wastewater such as urine, sweat and even water vapor from their breath; then impurities and contaminants are filtered out of the water to be used again.)

One of the concerns pointed out in the literature is the possibility of a needle falling out during a treatment and floating around the spacecraft. Since they're quite small and made of stainless steel, there's a possibility of them shorting out critical electronics.

Some studies are evaluating laser acupuncture as a way to limit the additional supplies required to maintain clean-needle technique and avoid FOD (foreign object damage) to the spacecraft. Also, the Chinese have self-contained electrostimulation devices that can be worn on the knee or elbow to provide pain relief. Press tack needles (that are taped to the skin) have also been evaluated.

Far from science fiction, acupuncture and traditional Chinese medicine can and will be used on NASA's manned mission to Mars, currently scheduled for the late 2030s.

Suggested Reading

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