

An small microbial ecosystem has formed on the International Space Station

“One of the more similar environments to the ISS was in the isolation dorms on the UCSD campus during the COVID-19 pandemic. All surfaces were continuously sterilized, so that microbial signatures would be erased by the time another person would show up,” Benitez said. So, one of the first solutions to the ISS microbial diversity problem he and his colleagues suggested was that they perhaps should ease up on sterilizing the station so much.

“The extensive use of disinfection chemicals might not be the best approach to maintaining a healthy microbial environment, although there is certainly plenty of research to be conducted,” Benitez said.

Space-faring gardens

He suggested that introducing microbes that are beneficial to human health might be better than constantly struggling to wipe out all microbial life on the station. And while some modules up there do need to be sterilized, keeping some beneficial microbes alive could be achieved by designing future spacecraft in a way that accounts for how the microbes spread.

“We found that microbes in modules with little human activity tend to stay in those modules without spreading. When human activity is high in a module, then the microbes spread to adjacent modules,” Zhao said. She said spacecraft could be

designed to put modules with high human activity at one end and the modules with little to no human activity at the opposite end, so the busy modules don't contaminate the ones that need to remain sterile. "We are of course talking as microbiologists and chemists—perhaps spacecraft engineers have more pressing reasons to put certain modules at certain spots," Zhao said. "These are just preliminary ideas."

But what about crewed deep space missions to Mars and other destinations in the Solar System? Should we carefully design the microbial composition beforehand, plant the microbes on the spacecraft and hope this artificial, closed ecosystem will work for years without any interventions from Earth?

"I'd take a more holistic ecosystem approach," Benitez said. He imagines in the future we could build spacecraft and space stations hosting entire gardens with microbes that would interact with plants, pollinators, and animals to create balanced, self-sustaining ecosystems. "We'd not only need to think about sending the astronauts and the machines they need to function, but also about all other lifeforms we will need to send along with them," Benitez said

Cell, 2025. DOI: 10.1016/j.cell.2025.01.039

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