Terrestrial bacteria can grow on nutrients from space

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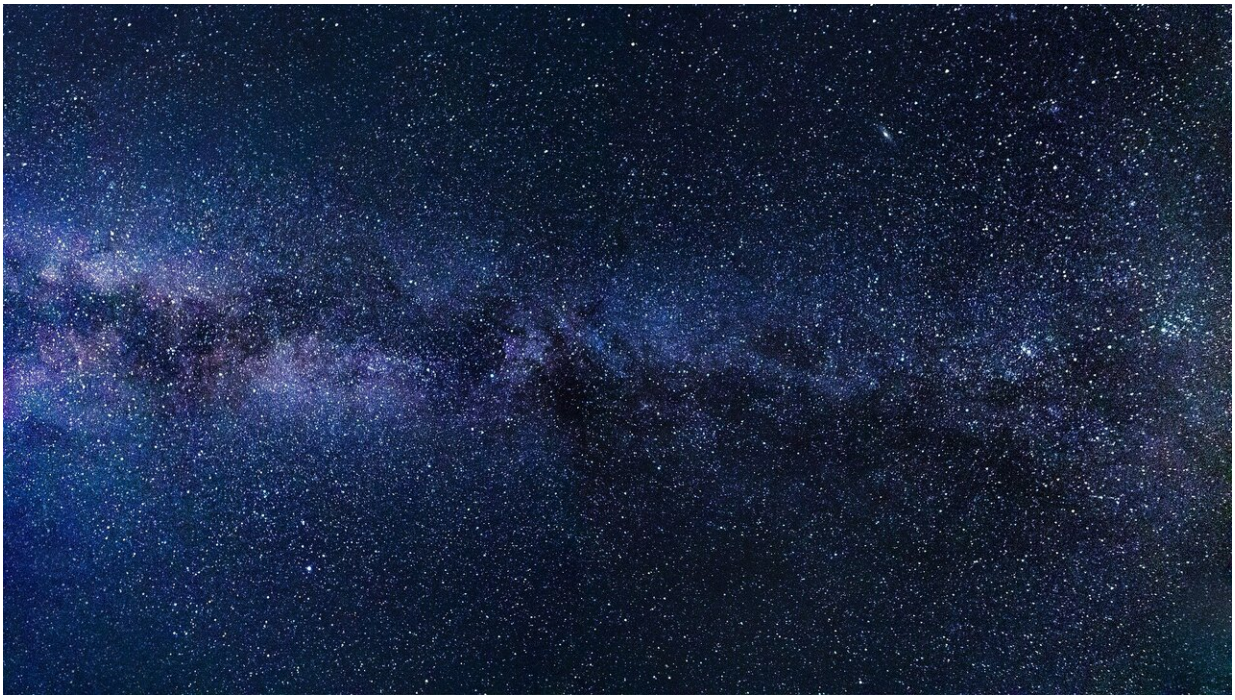

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In the past decade, there has been renewed thinking about human missions to the moon and perhaps even to Mars. Inevitably, terrestrial microorganisms on the bodies of astronauts, spaceships or equipment will come into contact with extraterrestrial environments. Researchers from the Radboudumc describe in an article in *Astrobiology* that bacteria can survive on an "extraterrestrial diet," which affected their pathogenic

potential.

No matter how well astronauts and material are decontaminated, co-traveling microorganisms cannot be prevented. Given the enormous adaptability potential of bacteria, it is conceivable that they could even survive space travel and settle in an extraterrestrial environment.

For this study, four non-fastidious environment-derived bacterial species with pathogenic features were selected, including Klebsiella pneumoniae and Pseudomonas aeruginosa. To determine whether extraterrestrial survival and growth were possible, the researchers developed a minimal bacterial diet based on nitrogen, phosphorus, sulphur, iron and water to which carbohydrates found in carbonaceous meteorites were added. The four bacterial species were shown to survive and multiply on this minimal diet.

In follow-up experiments, the researchers observed that the adaptation of bacteria, especially in the case of K. pneumoniae, caused changes in the cell membrane, as a result of which the immune system reacted more strongly to the bacteria. In short, the bacteria become more immunogenic. Research in cell culture, but also in mice, showed that the bacteria survive on extraterrestrial nutrients and become less virulent as a result of this necessary adaptation. At the same time, this research shows that bacteria can survive under these conditions, which means that the risk of infection among space travelers remains, because—as other researchers have shown—a space journey has negative effects on the functioning of the immune system, making astronauts more susceptible to infections.

More information: Jorge Domínguez-Andrés et al, Growth on Carbohydrates from Carbonaceous Meteorites Alters the Immunogenicity of Environment-Derived Bacterial Pathogens, *Astrobiology* (2020). DOI: 10.1089/ast.2019.2173

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