Assessment of the adaptability of non-fastidious pathogenic bacteria to the Martian environment.

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Understanding the extent to which non-fastidious pathogenic bacteria can survive in extraterrestrial conditions will help to guarantee the safety of astronauts. Despite stringent decontamination protocols, terrestrial microorganisms were previously found to travel on the bodies of astronauts, on spaceships and equipment. This might create the possibility that these microorganisms adapt, grow and evolve in the new environment. In this study we assessed the adaptability of clinically relevant bacteria species which are able to grow on carbon-containing compounds identified in carbonaceous meteorites (*Klebsiella pneumoniae*, *Burkholderia cepacia*, *Serratia marcescens* and *Pseudomonas aeruginosa*). Previous work has shown that bacterial survival and growth under these conditions led to the modification of their cell envelope, in turn altering their pathogenic potential. We continued with this line of research and explored the survival of these bacterial species to a range of Martian conditions: i.e. desiccation, UVC and polychromatic UV irradiation, growth in the presence of perchlorates, growth on Martian soil and Martian atmospheric composition and pressure. Preliminary results showed that growth was enhanced by the addition of Mars Global simulant (mimicking Martian soil). Furthermore, only two of the strains, *K. pneumoniae* and *S. marcescens* are resistant to desiccation, up to 16 days. The UVC irradiation experiments have shown that the bacteria with the highest degree of survival are *P. aeruginosa* and *S. marcescens*. Likewise, the same two strains have shown higher survival rates compared to *K. pneumoniae* and *B. cepacia* following polychromatic UV irradiation, than from UVC irradiation. To understand the consequences of survival and growth under these conditions on virulence and immune recognition, we will analyse the response of immune cells exposed to bacteria adapted to Martian conditions. In addition, gene expression of the adapted bacteria will be further studied. This collaborative study between the DLR and the Radboud UMC, in the Netherlands will improve our insight into the adaptability of pathogenic bacteria to Martian conditions and their effects on virulence and immune recognition to anticipate on the potential risks of infection and inflammation associated with space-travel.