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PANDEMIC PREVENTION AND RESPONSE IN SPACE COLONIES AND SPACECRAFT

Abstract

The global pandemic underscored the importance of sound policy planning and implementation when facing complex disasters. Robust emergency prevention, preparedness, and response measures all stem from a strong and well-thought plan. When challenging events are compounded by additional structural, societal, and environmental characteristics enhancing the inherent difficulty in confronting the unfolding pandemic, the ability to mitigate damage and minimize suffering is severely hampered. This is true on Earth and in space. When looking forward, and envisioning viable colonies on Mars, the risk of pandemic outbreaks cannot be overruled. Indeed, that is a public health challenge that must be planned for and addressed in order to ensure the well-being of humans is space.

Given the unique limitations of space environment, both those of the colonies themselves and the platform of spaceflight, they constitute extreme environments and as such require special measures be taken to ensure adequate pandemic prevention and response (as appropriate).

A closed environment, with limited resources and physical space, poses challenges in terms of public health, especially when confronted with the threat of communicable disease. Depending on the nature of the pathogen, whether passed in droplet form or aerosolized, the requirements in terms of air supply differentiation and compartmentalization are complex. Food safety and disinfection, as well as isolation of infected individuals are challenging as well. All these are compounded by the psychological fear and possible stigma, and the creation of two groups ("well" and "unwell"), with mistrust and apprehension between them.

The study of how to behave during pandemic threat in a closed extreme environment is on-going within an analog Martian environment facility. The first stage of the trial included mimicking isolation of "infected" crewmembers, implementing enhanced strict disinfection protocols of all surfaces and equipment, and detailing public health-oriented EVA behavior guides. The use of screens to partition the environment mimicked the isolation area, with pathogen being droplet-transmission type. Further study is required to explore response measures to aerosolized pathogens as well longer stay protocols detailing day-to-day operations under limitations.

The lessons learnt from the analog environment, and additional research on-going, will hopefully contribute to policymaking in the field.