Humans and their Hidden Companions Cross Antarctica

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INTRODUCTION

The human microbiome (*the microbial inhabitants of the human body*) and metabolome (*the small molecules produced through metabolism*) have both been shown to be an important component of health and disease. Long-term exploration, such as that envisioned for future human space travel, such as manned travel to Mars, could have significant implications for the human microbiome and metabolome, which could impact upon the health of participants, and the potential success of expeditions.

THE TRANS-ANTARCTIC WINTER TRAVERSE (TAWT)

Considered the last major polar challenge, the TAWT (www.thecoldestjourney.org) aimed to travel the 2,000 miles required to cross the Antarctic in the winter months, from Crown Bay to the Amundsen-Scott South Pole Station, and then to Ross Island, in temperatures reaching down to -90°C and in near complete darkness. The five man team travelled predominately on the polar plateau, which averages 2,160 m in thickness. In addition to the inhospitable environmental conditions, the terrain can also be dangerous with crevasses posing particular threat. The initial plan for the TAWT expedition was to complete the Antarctic crossing from March 2013 to September 2013, with several months either side to prepare for the expedition and subsequent uplift. However, in June 2013 after travelling approximately 300 km, and climbing from sea level to an altitude of 3,000 m, the TAWT expedition team decided to abandon the rest of the distance. This was because of a range of technical and logistical issues, as well as the danger posed by unexpected crevasse field ranging up to 100 km in the proposed distance of travel. Nevertheless, the environmental and physiological conditions that the five man expedition team were in for the remainder of the time period in Antarctica still provide for a rare analogous situation to prolonged space travel.

AIMS AND OBJECTIVES OF WORK

The prospect of prolonged human space travel poses a number of novel questions for the role of the human microbiome and metabolome in health and disease. From laboratory *in vitro* and preliminary, pilot-stage *in vivo* studies, the human microbiome and metabolome are suggested to be important in maintaining the health of participants in prolonged human space travel. Prolonged human space travel is not currently envisaged in the short-term. Therefore, terrestrial-based analogies are required to gauge the effects that the environmental and physiological stresses involved in prolonged human space travel may have on the microbiome and metabolome. To this end, the participants of the TAWT expedition conducted during 2013/2014 provided monthly samples and meta-data to help explain how the stresses associated with extreme physiological and environmental stress affect the human microbiome and metabolome. The microbiome of stool and saliva, and the metabolome of stool, saliva, and blood plasma will be analysed. Manuscripts are currently in preparation for submission to Antarctic Science and other high-impact publications.