Novel outer membrane-like proteins from spores of the highly resistant *Bacillus odysseyi*.

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Bacillus odysseyi, a novel exosporium-bearing spore-forming organism, was isolated from the surfaces of the Mars Odyssey spacecraft. A previous study showed that of the bacteria isolated from this source, *B. odysseyi* spores possessed the highest resistance when challenged with H_2O_2 (26% survival), UV_{254} (10% survival at 660 J/m^2), 0.5 Mrad γ-radiation (0.4% survival), and desiccation (100% survival). These abilities are in excess of the already significant resistance properties commonly associated with *Bacillus* spores. The extraordinary resistance properties as well as unusually tight adherence to spacecraft materials might be due to the exosporium that surrounds the spore. To explore this, we have set about identifying novel *B. odysseyi* exosporium proteins that could be responsible for adherence. Initially, existing protocols were modified to harvest and concentrate *B. odysseyi* exosporium proteins followed by fractionation by SDS-PAGE. Proteins were then isolated from several SDS-PAGE bands and were characterized by LC-MS/MS to identify the proteins. We identified 14 proteins that have not been found, so far, in either *B. anthracis* or *B. cereus*, the only other organisms that possess exosporia where this type of data has been collected. Of particular note are homologues to the outer membrane proteins OmpF and Omp3a from *E. coli*. Possibly, outer membrane-like structural features in these proteins allow them to associate with a membrane component in the exosporium, and an external domain could participate in adherence. These proteins could be an important target for spacecraft decontamination strategies. Better characterization of exosporium proteins from a variety of ecologically distinct species may permit a deeper understanding of the presumably diverse environmental roles of these structures.