Bacterial survival in response to desiccation and high humidity at above zero and subzero temperatures

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Earthly microorganisms might have contaminated Mars for millions of years by intellectual activities or natural transfer. Knowledge on the preservation of microorganisms will help our searching for life on outer planets, particularly Mars-contaminated earthly microorganisms at ancient time. Extreme dryness is one of the current Mars characteristics. However, a humid or watery Mars at earlier time was suggested by evidence accumulated in recent decades. It raises the question that whether water helps preservation of the microorganisms or not, particularly those with high possibility of interplanetary transfer like spores or Deinococci. We examined the effects of desiccation and high humidity on survival and DNA double strand breaks (DSB) of *Escherichia coli* , *Deinococcus radiodurans* and spores of *Bacillus pumilus* at 25, 4 and -70 ^{o}C. They exhibited different survival rates and DSB patterns under desiccation and high humidity at above zero temperatures. Higher survival and less DSB occurred at lower temperature. We suggest that some Mars-contaminated bacteria might have been viably preserved on cold Mars regions for long periods, regardless of water availability. It is likely to find ancient spores more than ancient Deinococci on Mars. In our search for preserved extraterrestrial life, priority should be given to the Mars Polar Regions.