Understanding the formation of water droplets on microbial cell surface under a variety of humidity conditions

Wenfa Ng

Citizen scientist, Singapore, Email: ngwenfa771@hotmail.com

Abstract

Various cell surface appendages such as curli and fimbriae dot the surface of microbial cells, serving as attachment sites for different molecules and ions in the water contact environment. In addition, the surface of most microbial cells is covered with extracellular molecular layers such as S-proteins, lipopolysaccharides layer, or peptidoglycan layers. The behavior of these proteins and biomolecules under varying humidity conditions in air remains poorly understood. Given the presence of microbes in air and the possibility that these cells could serve as cloud condensation nuclei, there is a need to gain greater understanding of the possible roles microbes play in cloud formation. Thus, the objective of this study is to determine the properties of different bacterial and fungal cells and spores in retaining a liquid layer on the cell surface in air, as well as their roles in nucleating ice crystals that could lead to the formation of clouds. To this end, *Aeronomas* spp. and other fungal and bacterial species would be exposed to differing levels of moisture in air in a cloud chamber with controllable humidity conditions. Optical microscopy would be used in understanding the formation dynamics of water droplets and ice crystals on the surfaces of the microbial spores and cells. In addition, expression of additional copies of genes coding for cell surface proteins could illuminate the effect of different cell surface proteins in initiating water droplet or ice crystal formation. Overall, the study would provide greater understanding of the possible roles played by microbial cells and their cell surface proteins in initiating ice crystals and water droplet formation necessary for subsequent cloud formation. Knowledge of these areas would provide a deeper understanding of how microbial cells serve as cloud condensation nuclei, and their roles in affecting cloud formation dynamics and rainfall.

Keywords: cloud condensation nuclei, cell surface appendages, microbial cells, ice crystals, water droplets,

Subject areas: microbiology, biophysics, biochemistry, molecular biology, biotechnology,

Conflicts of interest

The author declares no conflicts of interest.

Funding

No funding was used in this work.