Size Distribution and CCN Activation Ratio of Bacteria Ghosts

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Overview

Bacteria ghosts (BG) are non-living bacterial cell envelopes of Gram-negative bacteria. BG carrying ice nucleation proteins (INP-BG) have been shown to be effective ice nuclei. Experiments are being conducted at the University of North Dakota to collect lab data such as the size distribution and cloud condensation nuclei (CCN) activation ratio. The CCN activation ratio is an indication that the bacteria ghosts could be a good immersion ice nuclei.

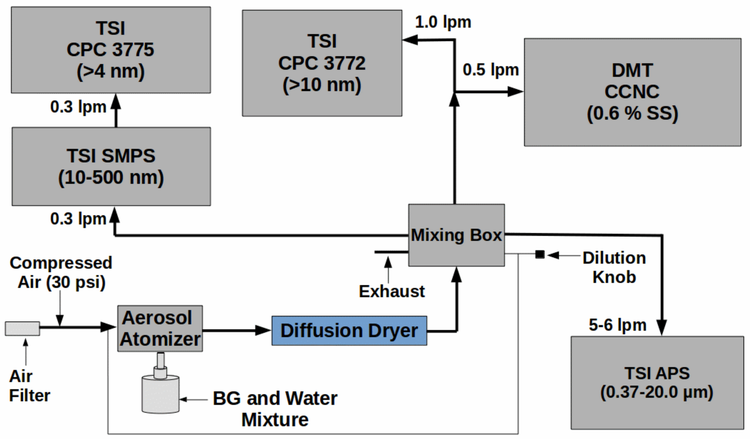

Image showing the instrument setup for obtaining the size distribution and CCN activation Size of bacteria ghosts (BG).

Acknowledgments

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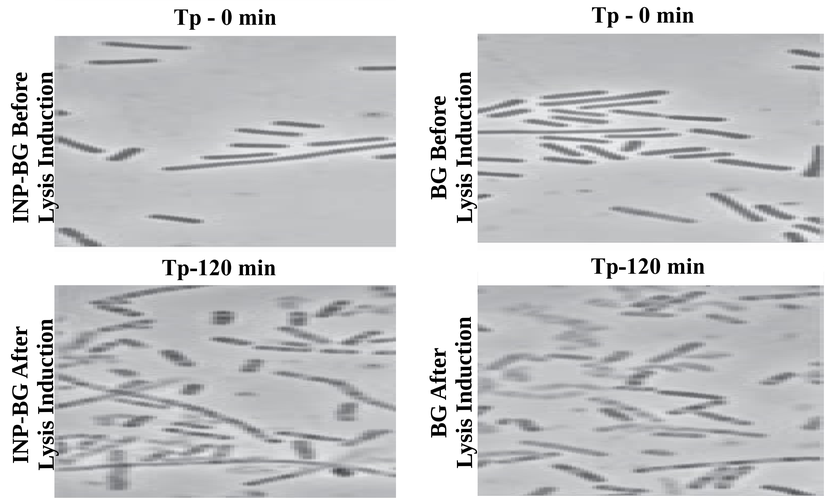
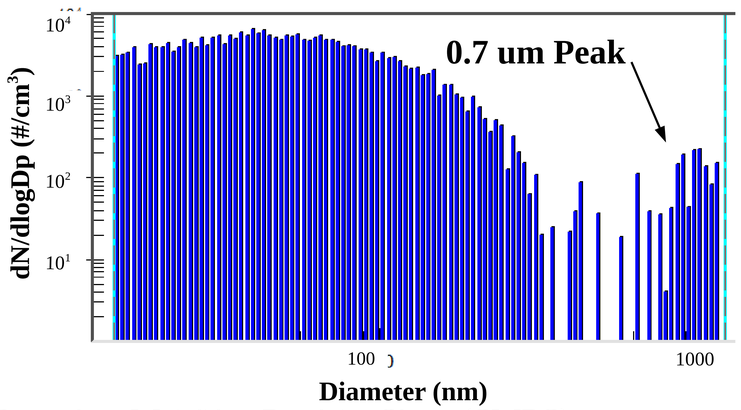
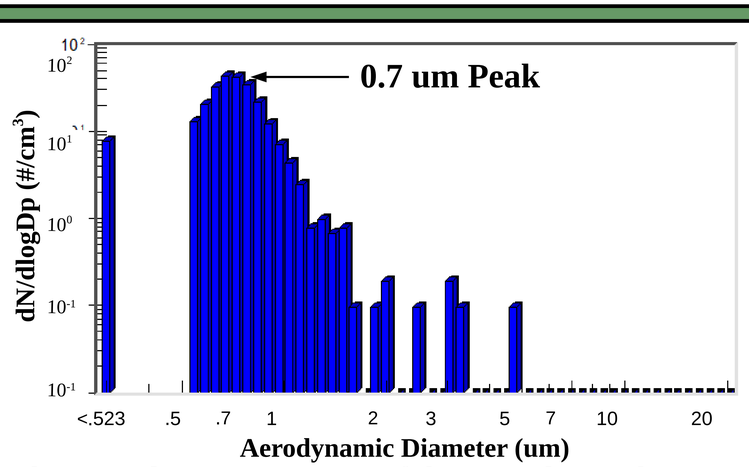


Microscopy images of the E. Coli C 41 bacteria.



Scanning Mobility Particle Sizer (SMPS) measurements of the E. Coli C41 bacteria ghosts.



The particle size spectrum of the E. Coli C41 bacteria ghosts using a Aerodynamic Particle Sizer (APS).

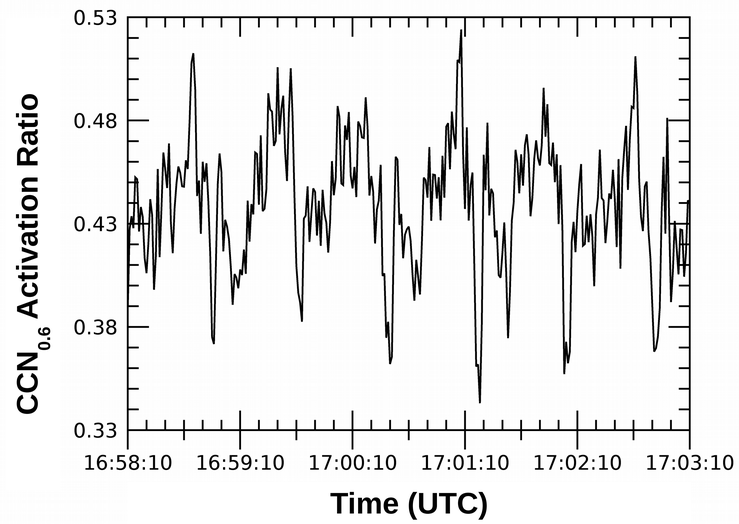


Image showing the CCN activation ratio of the E. Coli C41 bacteria ghosts, which is obtained from concurrent CCN counter at 0.6 % super saturation and Condensation Particle Counter (CPC) measurements. The mean CCN activation ratio is 0.44 +/- 0.03.

Results

- The size distribution is bimodal with a peak at 70 nm and 0.7 µm, with the 70 nm peak 100 times larger.
- Approximately 44 percent of the bacteria ghosts activates as cloud condensation nuclei which indicates the potential for good immersion ice nuclei.

Future Work

- Create code to combine the APS and SMPS data to better combine the two size peaks.
- Compare E. Coli C41 bacteria ghosts and E. Coli C41 bacteria ghosts with the lnaZ protein.
- Determine the activation ratio as a function of particle size of the bacteria ghosts.