



# Insights on microbe viability and collection from aerosol phase

Jani Hakala

VTT

# Introduction

- The purpose of the study
  - Study the viability of airborne microbes
  - Study different microbe collection methods
- Microbes used
  - Phi6-bacteriophage virus
    - Enveloped, easy to kill
  - *Bacillus atrophaeus* bacterial spore
    - Hard to kill

# Methods

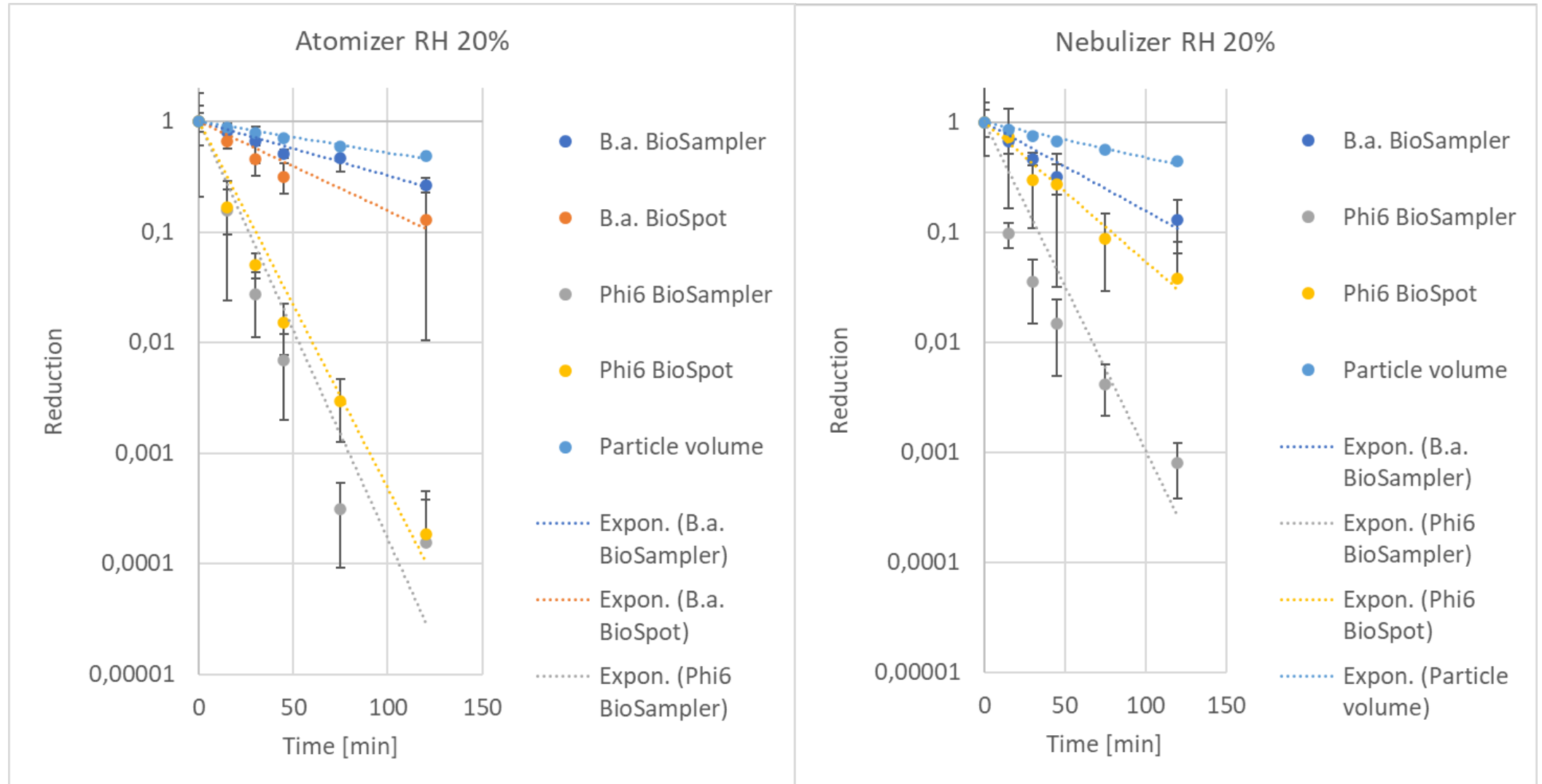
- Microbe samplers
  - SKC BioSampler
  - BioSpot-VIVAS
  - 6-stage Andersen impactor



# Methods

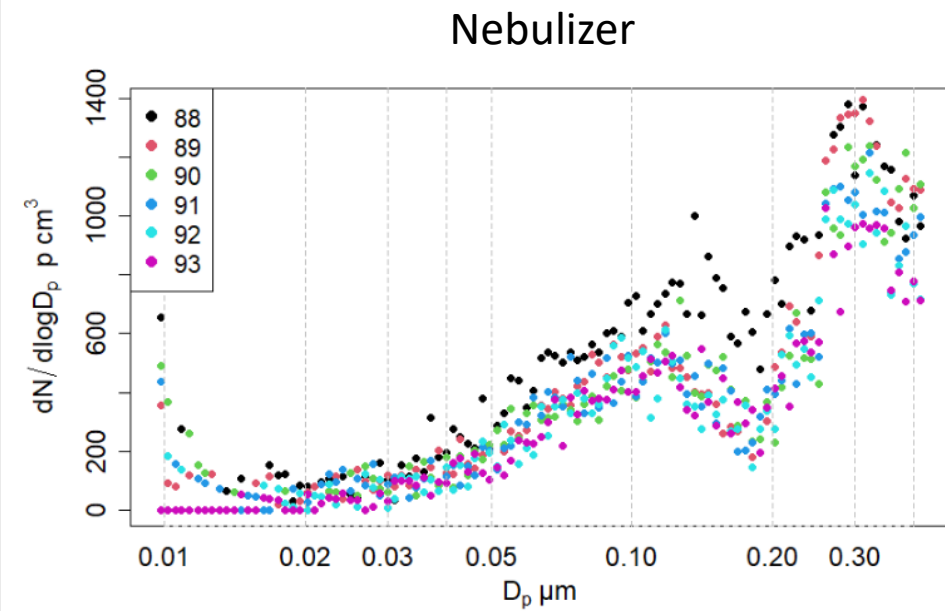
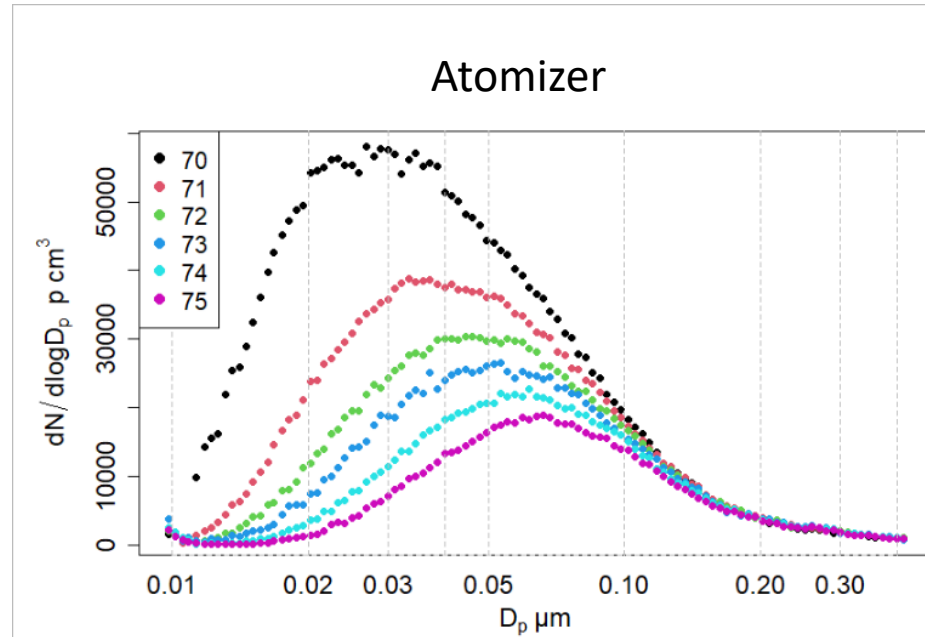
- 30 m<sup>3</sup> chamber
  - Particle free air
- Microbial aerosol introduced with
  - Atomizer
  - Nebulizer
- 20% and 60% RH

# Results



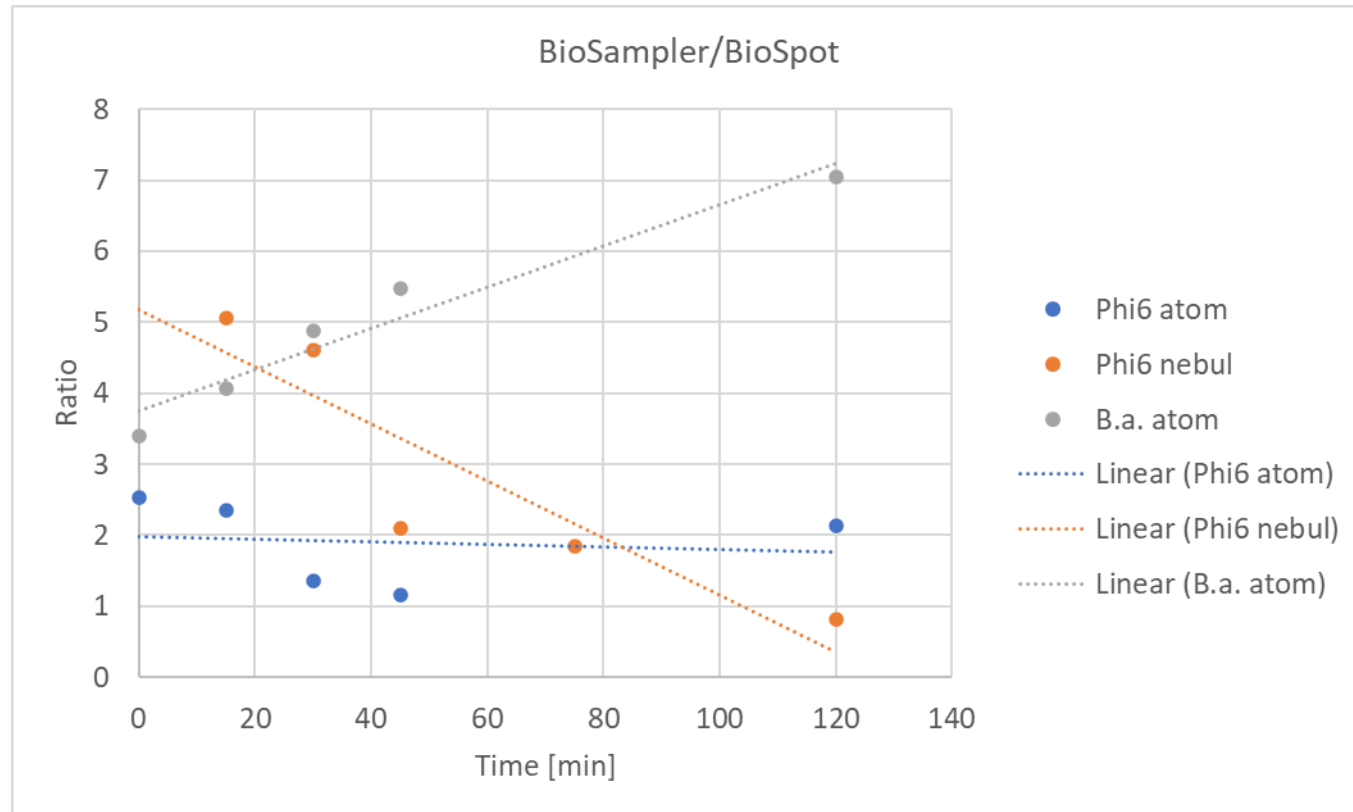
# Results

- Number size distributions





# Results

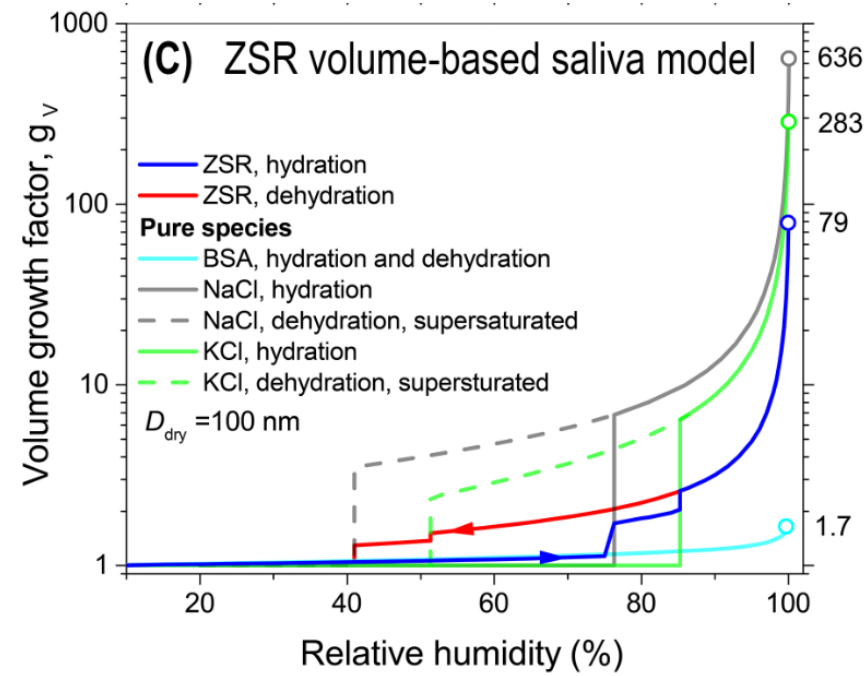


# Results

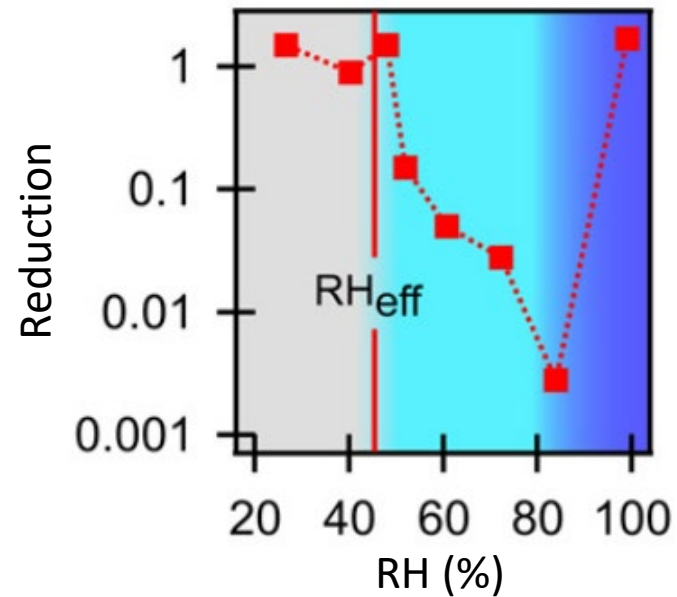
- Most stages of the Andersen impactor were overloaded
  - Collects directly on the substrate, no dilution
- All Phi6 were inactivated after 20 min at 60% RH, *B. atropheus* were fine
- BioSpot did not collect any *B. atrophaeus* when nebulized



# Discussion



Pöhlker et al, 2021



Influenza  
Huynh et al, 2021

# Conclusions

- At RH 60%, particles are metastable droplets supersaturated with NaCl
  - This seems to be deadly for Phi6
  - No notable effect on *B. atrophaeus*
- Phi6 may stay viable for longer in larger particles
- BioSpot seem to lose large particles
  - They probably grow too large in the growth tube and are lost due deposition
- Collecting directly on the substrate is by far the most sensitive sampling method

# Thank you!

- Contributors

- VTT: Jani Hakala, Satu Salo, Jaana Huotari, Aku Karvinen, Hannu Salmela
- TAU: Paavo Heikkilä, Ville Silvonen, Topi Rönkkö
- FMI: Eija Asmi, Hilikka Timonen, Joel Kuula, Kimmo Teinilä
- UHEL: Ramus Malmgren, Martin Romantschuk, Olga Kivelä, Julija Salokas, Nina Atanasova
- THL: Martin Täubel