RAPID QUANTIFICATION OF BIOAEROSOLS CONTAINING *LEGIONELLA PNEUMOPHILA* BY CHEMILUMINESCENCE ANTIBODY MICROARRAYS

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/ CONTEXT

Bioaerosols containing ***Legionella*** may cause Legionnaires' disease and Pontiac fever in humans. *Legionella* occur in natural and artificial water systems and are ubiquitous therein. Infection of humans is only caused by inhaling bioaerosols containing these bacteria. Those bioaerosols are, for example, generated by hot water systems, air-conditioning systems, while showering or by cooling towers and can be a threat for the health of people in surrounding areas. **Rapid detection methods** are essential to combine sampling of bioaerosols with **multiplexed analysis** for specification and **quantification of *Legionella* species in air.** The rapid quantification of bacteria with **flow-through chemiluminescence microarrays** was established in our laboratories and is applied for bioaerosol analysis in this work [1].

/ MATERIALS

- Coriolis µ, sterile cones and 10mL of sterile water.
- Impinger (Type AGI-30) and 20mL of sterile water.
- Viable cells of *E. coli* and heat-inactivated *L. pneumophila* (serogroup utilized as model organisms and spread into an aerosol chamber

/ PROTOCOL

- Coriolis air sampling: 300L/min, 10 min.
- Impinger air sampling: 10.5 +/- 0.4L/min, 10 min.
- Quantification by flow cytometry and a flow-through microarray chip reader applying antibody microarrays for chemiluminescence sandwich immunoassays.

/ RESULTS

The efficiency of bioaerosol sampling with Coriolis µ was examined by nebulizing living *E. coli* in a chamber and quantifying them with flow cytometry after sampling. A recovery of 34±10% was found with a high reproducibility between 5×105 and 2×107 cells/mL. The impinger AGI-30 was compared to the cyclone separator Coriolis µ by quantification of collected *L. pneumophila* with microarray sandwich immunoassay analysis (Fig.1).

Similar recoveries were determined for both samplers (Fig.2). However, **the detection limit with Coriolis µ was lower by a factor of 100 due to the higher sampling rate.**

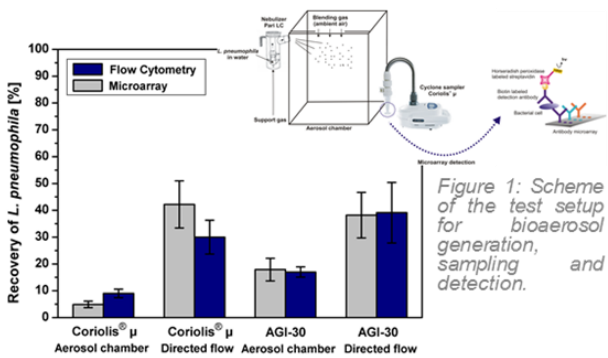

Figure 1: Scheme of the test setup for bioaerosol generation, sampling and detection.

Figure 2: Recovery of L. pneumophila comparing Coriolis µ and AGI-30 for sampling from aerosol chamber and with directed flow. Quantification is carried out with flow cytometry and antibody microarrays. The initial concentration in the nebulizer was 8×10⁶ cells/mL.

[1] V. Langer et al. Rapid quantification of bioaerosols containing L. pneumophila by Coriolis® µ air sampler and chemiluminescence antibody microarrays, Journal of Aerosol Science, Vol. 48 (June 2012), pp. 46-55, doi:10.1016/j.jaerosci.2012.02.001

/ CONCLUSION

The **Coriolis µ** coupled with a **chemiluminescence antibody microarrays** allowed a rapid collection and quantification down to 4x103 cells/m3 of different ***Legionella*** **species** which fulfills the requirements for **bioaerosol measurements in the environment and in the interior.**

Therefore this method is potentially of interest for monitoring applications of bioaerosol samples within 1h.

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