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Developmental Testing of a Biological Hydrosol Concentrator

Author Block: D. S. Alburty¹, A. E. Page¹, P. S. Murowchick², Z. A. Packingham¹;

¹Innovaprep, Drexel, MO, ²AlburtyLab, Inc., Drexel, MO.

Abstract:

Background

Rapid and effective surface and aerosol monitoring has become more important than ever. Highly efficient aerosol collectors have been developed that can pull in hundreds of liters of air a minute and capture the particles into a relatively small liquid volume, turning the aerosol into a hydrosol. Many surface samplers, such as the one used here, also collect into a liquid.

Methods

Most modern aerosol collectors produce a hydrosol sample volume of about 5 to 10 mL. Surface samplers collect into volumes from about 1 mL to 250 mL. A portion of the hydrosol sample is transferred directly to a detector. Great strides have been made in recent years in detector technology making them faster and more accurate than ever. However, these advanced detection systems are only capable of analyzing volumes from around 0.005 mL to 0.1 mL of liquid at a time, and there is a need to concentrate the hydrosol from the collector into a volume matched to the detector analysis volume. An effective hydrosol concentrator accomplishes this task by functioning as a macro-to-micro interface. The final sample size should be settable to quickly reduce the initial sample to the desired analysis volume.

Results

Known quantities of *Bacillus atrophaeus* spores were wet-deposited on laminate sampling tickets. They were removed from the surfaces into a liquid using a backpack surface sampler into volumes of approximately 50 mL and concentrated using a hollow fiber filter hydrosol concentrator. Concentrated and unconcentrated samples were analyzed using lateral flow assays. Concentrated sample volumes were 100 uL. The theoretical concentration factor is thus up to 500X. Results presented here include sampling efficiency, concentration efficiency, concentration factor, and time-to-detect.

Conclusions

The concentration process is rapid and effective. When coupled with aerosol sampling or surface sampling into a liquid, a concentration step reduces the time needed for detection and allows the use of inexpensive small-volume analytical methods.

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Author Disclosure Information: D. S. Alburty,
AlburtyLab