Evaluation of Sampling Media for Use in a Nanoparticle Respiratory Deposition Sampler

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Background
• Exposure to nanoparticles is an increasing health concern
• Current exposure assessment methods for nanoparticles are expensive
• Sampling for metals may be obscured by metallic content of the sampling media
• Current Nanoparticle Respiratory Deposition (NRD) sampler uses nylon mesh containing metals

Objective
• To broaden the applicability of an innovative nanoparticle respiratory deposition (NRD) sampler by identifying alternate sampling media to collect and quantify multiple metals.

Methods
Evaluation of Sampling Media Collection Efficiency
• Sampling media were identified and classified into several groups: membranes, foams, mesh screens, and granular beds.
• Test aerosol was generated using a spark discharge system and neutralized using a 210Po neutralizer.
• Two chambers were used to mix and coagulate the aerosol to achieve particle sizes from 10-300 nm.
• Fast mobility particle sizer (FMPS; 3091, TSI, US) flow was balanced to achieve 2.5 liters per minute in the sampler.

Results
Collection efficiency by particle diameter for fibrous, Nucleopore, and mesh media with the NPM curve representing the target efficiency.

Conclusions
• Different sampling media (foams, mesh screens, cellulose, and granular beds) can be designed to collect particles with efficiencies matching human lung deposition for particles smaller than 300 nm.
• Low metals content of commercially available sampling media, such as cellulose and some foams, indicate that they would be appropriate for sampling and analysis of airborne metals using the NRD sampler.
• SEM imaging can be used to quantify sampling media parameters such as fiber diameter and pore size for development of a theoretical collection efficiency model.

Future Research
• Continue evaluation of sampling media at varying solidities
• Identify and evaluate new sampling media
• Evaluate pressure drop across sampling media

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