Abstract #: 319 **Presented by: Adam Marty, MSPH, Graduate Student**

Nanoparticle Generation and Size Characterization

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Keywords: nanoparticle, aerosol, generation, agglomeration

Objective: The generation of nanoparticles is a necessary component for determining health outcomes as they relate to exposure in animal models. Unfortunately, a bulk nanopowder cannot simply be aerosolized into nano-sized particles due to the agglomeration that nanoparticles undergo. The objectives of this research are two-fold; to generate and characterize three different kinds of nanoparticles including one from a bulk source.

Methods: This research attempts to generate nanoparticles using three different methods, namely, from a sodium chloride solution, a metal salt solution, and from a bulk nanopowder source. Test aerosols are characterized using three particle counters. Samples are concurrently collected for visual inspection using electron microscopy. Comparative data analysis of the three particle counters relative to visual inspection is performed.

Results: Since this research is a work in progress, only limited data has been generated. Preliminary results indicate that NaCl particles can be generated at a predetermined size. One trial produced an aerosol with a dominate particle size of 20 nm. A second trial produced an aerosol with a dominate particle size of 100 nm. Visual inspection of the aerosol has yet to be performed.

Conclusion: The generation of particles from salt solutions is not new or novel. For the purpose of this research, it is a necessary aspect as a demonstration of our ability to characterize an aerosol. However, the generation of a nano-aerosol from a bulk nano-powder would be significant. If this method proves successful, it could offer a means to do research on the exposure, dose, and effect of nanoparticles in an animal model.

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Abstract #: 320 **Presented by: Daniel Medina, MSPH, Graduate Student**

Filtration Performance of a NIOSH Approved N95 Filtering Facepiece Respirator with Stapled Head Straps

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Keywords: Disposable, Filter, Efficiency, Polystyrene Latex Spheres, Aerosol

Objective: Are there differences in filtration efficiencies of respirators with stapled head straps vs. no stapled head straps when challenged with 3 different particle sizes?

Methods: Monodisperse polystyrene latex (PSL) spheres 0.5, 1, and 2 micrometers (μm) in diameter, were used to challenge four N95 single use respirators of the same model and made by the same manufacturer. All respirators were sealed onto a custom built testing assembly and tested in a sealed chamber. Particles were generated using a Collison nebulizer and passed through a diffusion dryer and a Krypton-85 radioactive source prior to entering the test chamber. The test chamber was constructed from glass and had dimensions of 32 x 53 x 122 centimeters. The respirators were challenged as received from the manufacturer and the same testing procedure was repeated for each respirator after sealing the stapled areas of filter medium with silicon rubber. Testing was conducted at a flow rate of 85 liters per minute, similar to the procedure utilized by NIOSH in the respirator testing protocol. A laser particle counter was used to measure the concentration inside and outside of the respirator.

Results: The results showed unsealed efficiencies for particle sizes 0.5, 1, and 2 μm to be 96.68%, 99.72%, 99.88% and sealed efficiencies of 97.35%, 99.82%, 99.93% respectively. There were no differences for particle size or sealing at 1.0 and 2.0 μm. A statistically significant drop in efficiency was observed when testing with 0.5 μm spheres.

Conclusion: The drops in efficiency are not sufficient to reduce the integrity of the respirator for N95 certification. However, the leakages detected will have a cumulative effect when added to other sources of single use respirator leakage in the field.

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