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Purpose: Asymmetric particles are known to affect particle deposition and retention inside the lung, implicating interesting potential for pulmonary drug delivery, provided they can be made form biocompatible and biodegradable materials. This paper describes a new technique to produce such multifunctional microfibers (MF) with defined dimensions.

Methods: MFs are obtained by an extended template technique (Kohler et al, Advanced Materials, in reply), essentially by infiltrating Nanoparticles (NP) into porous membranes, followed by NP encapsulation and subsequent template decomposition. Aerodynamic properties were studied in an Anderson cascade impactor (ACI). The epithelial cell line A549 and the MHS alveolar macrophage cell line were used for first biological testing.

Results: Readily dispersible, multifunctional, drug loaded (Fenoterol) MFs with defined aspect ratios, tailorable porosity and NP loading could be prepared from various materials. ACI test yielded large fine particle fractions needed for peripheral lung deposition. Cytotoxicity test with epithelial cells did not reval and significant finding, while macrophage uptake was influenced by the shape and orientation of the MFs.

Conclusions: A new technique to produce MFs with defined dimensions was established. First evaluation of aerosol and biological properties are encouraging further exploration toward pulmonary drug delivery.

P-099 COMPARING THE INTERACTION OF SILVER AND GOLD NANOPARTICLES WITH A 3D MODEL OF THE EPITHELIAL AIRWAY BARRIER

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Due to their antibacterial properties, silver (Ag) nanoparticles (NPs) are currently the fastest growing product category in nanotechnology. Despite this, their interaction with biological systems is currently not fully understood. The aim of this study therefore, is to investigate the potential adverse effects of aerosolized Ag NPs using a 3D *in vitro* triple cell co-culture model of the human epithelial airway barrier in combination with a specifically developed exposure system. Obtained results will be compared to a previous study, which assessed gold (Au) NPs. In this previous study, the triple cell co-culture model was exposed to an aerosol of 15nm Au NPs and post-incubated for 4h and 24h. The mRNA induction of pro-inflammatory chemokines/cytokines (TNFα, IL-8, iNOS) and oxidative stress markers (HO-1, SOD2) was measured. No induction of these markers was observed. Similar results were obtained when the cell culture system was pre-stimulated with lipopolysaccharide (LPS). Additionally, Au NP deposition and cellular uptake was quantitatively analysed by transmission electron microscopy (TEM). A homogeneous deposition was observed and Au NPs were preferentially localised in vesicles of different sizes but not present in the nucleus or mitochondria. Initial investigation using 20nm Ag NPs has shown a homogenous deposition of Ag NPs when visualised via TEM. The interaction between Ag NPs and ions with cells of the triple cell co-culture system is currently being performed.

P-100 EXHALED BREATH CONDENSATE AS A MATRIX FOR NANOPARTICLE EXPOSURE AND HEALTH EFFECT EVALUATION

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Purpose: A non-invasive collection method allowing the determination of the lung inflammatory status would be ideal to assess the health effect of inhaled nanoparticles. The aims of this study were to validate particle number and inflammatory markers measurement methods in exhaled breath condensate (EBC) and apply them to non-smoking male volunteers exposed to environmental tobacco smoke (ETS).

Methods: After method validation for EBC collection (RTube®), particle number concentration measurement (NTA-Nanosight LM20), and H_2O_2 and malondialdehyde (MDA) in EBC, we exposed 15 volunteers to variable ETS levels in controlled conditions. After ethic approval, EBC was collected before, during ETS exposure, and 1 and 2 hours later.

Results: The highest exposure concentration was $\sim 1.2.10^6$ particles/cm^3 (average geometric size ~ 60 nm). ETS particles were mainly organic carbon. The EBC concentration was always smaller than 10.10^8 particle/ml with a broad size distribution (50^{th} percentile ~ 200 nm). A statistically significant particle increase in EBC was only observed after the first exposure to ETS. Two hours post-exposure, H_2O_2 and MDA levels were significantly higher than before exposure, but only H_2O_2 was correlated with the particle mass in the air.

Conclusions: The NTA technique allowed us to measure particle number concentration in EBC. H_2O_2 could be a good marker for inflammation measurement in EBC, whereas ETS compound interferences could explain the absence of correlation with MDA.

P-101 NANOAEROSOLS DEPOSITION MODELING IN REAL LUNG AIRWAYS

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Purpose: Nano-aerosol deposition (including patterns) in lung airways is important to estimate inhalation drug dose delivered, and risk from inhaled toxic particles. Use of real lung airway geometry models to compute deposition and its patterns is of great interest, as it allows for quick initial results for a variety of nano-aerosols and deposition conditions. Methods: Chest CT scan image data was used to obtain real lung airway geometry for computational purposes by selective contouring of the airway regions. The selected airway region was further processed and meshed to obtain a discretized geometry for CFD computation. We used a CFD code FLUENT to simulate flow and predict nano-aerosol deposition patterns. Results: Nano-aerosol deposition patterns and efficiencies were computed for normal quiet breathing conditions in real lung airway geometry. Particle deposition was greater by about 50-70% at the carinae compared to near walls for all bifurcations, with varying deposition patterns for different sized particles. Particle deposition rates computed for