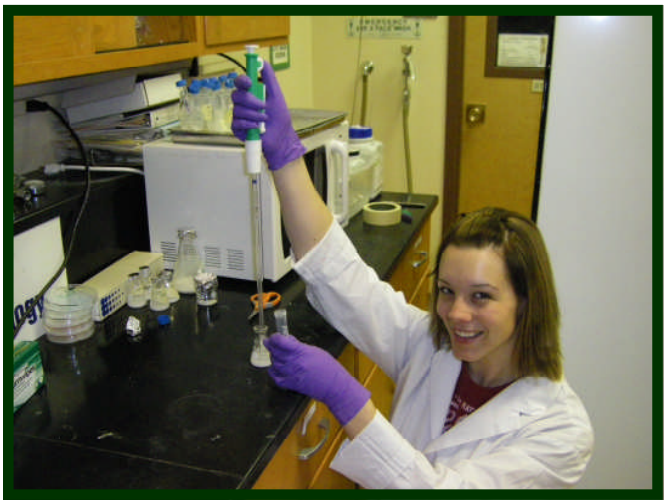
Simulated Nanoparticle Aggregate Behavior in Alveolar Macrophage Cells—Effects of Various Alveolar Physiological Conditions

Ellen Rud



ABSTRACT

Carbon Nanotubes and Titanium Dioxide are among two of the most widely used industrial nanoparticles. Both have great potential to contribute to the future of nanotechnology. However, very little is known about the toxicology of their particle aggregates, which are frequently used in products that range from steel to sunscreen. There is already insurmountable evidence in the medical community that an increase in pathological effects of inhaling particulate matter is inversely proportional to the size of the particle. Thus, nanoparticles have the possibility of being highly toxic in their particulate form. Nanoparticles are mainly used industrially in aggregate form. This increases the size of the inhaled aggregates thereby decreasing the risk of pathogenicity. However, aggregates of nanoparticles are known to disperse under certain conditions, and it is not known if inhaled aggregates may disperse under the varying physiological conditions that may occur in the alveoli.

It has also been shown that the normal method of phagocytic particulate uptake in the alveolar macrophage cells is not the only method of particulate translocation into these cells. Translocation of particles into alveolar macrophages is the initial stage of many pathogenic respiratory and cardiovascular responses to particle inhalation. Thus an understanding of all mechanisms of translocation into these cells is crucial to the treatment and prevention of these conditions.

The aim of this study is to expose nanoparticle aggregates to simulated lung fluid under varying possible physiological pH and salt concentrations in order to determine if any of these conditions promote dissociation.

BIOGRAPHY

My name is Ellen Rud. In 2006, I received my B.S. in Cell and Developmental Biology from the University of Rochester, in Rochester, New York. Upon graduating, I decided to further my interest in the sciences by pursuing a Master's Degree in Mechanical Engineering at Montana Tech, in my hometown of Butte, Montana. While taking the undergraduate prerequisites for my Master's Degree, I learned of the Undergraduate Research Program. I decided to pursue a project in nanotechnology because I love working on, and learning about, cutting edge technology. After some research into the field, I discovered that my biology background gave me a great advantage toward studying the toxicology of nanoparticles. So far I have found my research to be a fascinating way of combining my past knowledge of biology with newly-acquired knowledge in nanotechnology, toxicology and engineering. I hope to continue learning and using nanotechnology for the rest of my life.

DaVinci is one of my great inspirations for my career, as he not only invented new machines for his era, but also made designs to make them much larger and much smaller than ever before. For my masters thesis work, I hope to design a nano-sized machine. Ultimately, I hope to either head a department for a company or own my own company exclusively designing nano-machines for industrial usage.

Aside from my academic interests I also work as a waitress and occasionally as a promotional model for companies ranging from Tylenol to Toyota. I love sports and working out and spending time with my friends, family, my dog Oreo and two cats, Lil' Momma and Sir Eddington Clarence III, Esq.