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# Inhaled Nanoparticles Prompt Inflammatory Responses in the Lung

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Title: Inhaled Nanoparticles Prompt Inflammatory Responses in the Lung

Project: Nanoparticle-induced Inflammatory Response

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Rationale/Context: Inhalation of nanoparticles, often in the course of industrial work, has been linked to lung scarring. Nanoparticles are commonly made from carbon and metals and are therefore non-biological. Typically, the human immune system is thought to react to biological threats, such as viruses and bacteria. However, nanoparticles do elicit strong inflammatory responses in the lung and exacerbate inflammatory lung diseases, including asthma.

Eosinophils are white blood cells involved in the first line of defense against infection. They contain destructive proteins and produce potent agents that destroy parasites. However, eosinophils also play a role in the asthma disease process. When a person suffers from allergies or an asthma attack, eosinophils produce agents that damage the airway epithelial wall. Additional inflammatory cells migrate through blood vessel walls and access the tissue where they promote eosinophil survival.

The goal of this project was to determine whether the accidental inhalation of nanoparticles could affect the severity of asthmatic symptoms.

Approach: Three sets of mice were dosed with carbon-based nanoparticles to simulate inhalation exposure. Lung washes were performed and lung tissue was collected after one day and six days. Wash fluid was analyzed for markers of immune response including eosinophil peroxidase (EPO), which is used to measure the number of eosinophils present in the lungs. Tissue was preserved and stained to facilitate observation of the cell types and particles present.

Findings: Six days after inhaling nanoparticles, mice had dramatically increased numbers of eosinophils in their lungs. This demonstrates a surprising new aspect of nanomaterial health and also has broader implications for the mechanisms of the immune system. Materials currently believed to be immunologically inert may actually be pro-inflammatory for reasons that remain unclear.