Project Title: Respiratory toxicity and tumorgenicity of atmospheric pollutant adsorbed nanoplastics (PANs)

Abstract: Respiratory diseases associated with pollution such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer plague society. Nanoplastics result from environmental degradation of plastics, a ubiquitous material in our society that plagues the earth with nearly 4 million metric tons of virgin plastic produced annually. Atmospheric particulate matter > 2.5 μm is a chemical soup of carcinogens, and nanoplastics are an understudied component. Recent studies have revealed high levels of microplastics in the environment, drinking water, food products, and humans. However, our knowledge of the prevalence and toxicity of nanoplastics is extremely limited do to their small size. Raman spectroscopy and hyperspectral microscopy are two tools that have been utilized to characterize nanoplastics and their biodistribution, yet these methods are still in their infancy. The high surface area to volume ratio characteristic of nanoplastics increases their potential to adsorb pollutants in the environment. We hypothesize that pollutant adsorbed nanoplastics (PANs) alter the transportation and biodistribution of pollutants, exacerbating their toxicity and carcinogenicity in human airways following inhalation, with unknown secondary trafficking throughout the body thereafter. We aim to investigate the prevalence and formation of PANs as a component of air pollution and assess their toxic implications on human health.