Microplastics in the Air as a Public Health Hazard: Development of a Digital Design of a Biodegradable Nose Filter

Morales-Quezada, Maria (School: The School of San Juan)
Abdullah , Samira (School: The School of San Juan)

Microplastics in the air cause respiratory diseases and worsen the health of the population, thus a nose filter with a biodegradable membrane may reduce their adverse effects on the respiratory system. For this research, three air samples were collected for three days in intervals of five minutes each at separate locations: urban, rural, and coastal areas. The air was sucked through a filter media in a stainless-steel funnel using a vacuum pump so that the particles would stay on the surface of the filter media. These filters were stored in petri dishes and put in an oven for 24 hours at 90°C. Microplastics were quantified and categorized according to their morphology in each sample. In the urban area there were: 0.22 fibers, 0.67 filaments, and 7.33 fragments. In the rural area there were 9.22 fragments. The coastal area had 0.33 filaments and 10.56 fragments. Based on this, a digital design of a biodegradable nose filter with a cellulose acetate membrane was developed. The composition of the nose filter would be CFlex material for the outer part of the filter. The inner part would consist of a cellulose acetate membrane obtained by converting cellulose acetate into a fiber using the electrospinning method. The membranes would be kept and distributed in a hydrated gel solution that will emulate the human nasal mucus. The nose filter may be a viable option to address the public health hazard of microplastics in the air and to reduce the prevalence of respiratory diseases in Puerto Rico.

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