Towards the Design of a Novel Antimicrobial/Antiviral Filtration System

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Abstract

A novel broad-spectrum antimicrobial respiration apparatus, designed to fight bacteria, viruses, and fungi to safeguard against biological agents, is critical in halting the current pandemic's trajectory and to contain future outbreaks. We applied a simple, novel and effective electrodeposition method for coating the surfaces of halloysite nanotubes (HNTs) with metal nanoparticles (copper, silver and zinc) know to possess potent antiviral and antimicrobial properties. Metal-coated HNTs (mHNTs) were then added to polylactic acid and extruded to form a mHNT/PLA 3D printer filament. Our antimicrobial/antiviral mHNT/polymer composite 3D printer filament was used to fabricate an N95-style mask with an interchangeable filter with surfaces that will deactivate a virus, reduce or eliminate bacterial adhesion, prevent bacterial growth, and reduce deadly infections. The filter, made of a multilayered antimicrobial blow spun fabric and polymer, is disposable while the mask can be sanitized, reused, and form-fitted for adults and children. We will use in vitro assessment of critical clinical features and assess antibacterial growth inhibition against commonly encountered Methicillin-resistant staphylococci bacterial strains, while also evaluating cytocompatibility and gene expression profiles of mHNTs on adipose-derived stem cells..

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Biography

Currently I am a Ph.D. Candidate at Louisiana Tech University, along with being the Director of Research for Nanomedicine Research & Development LLC, CIO for organicNANO, and an active Ironman triathlete with professional aspirations. I have a B.S. in Biology as well as a M.S in Molecular Sciences & Nanotechnology. My current research is focused on protein and gene expression of adipose-derived stem cells with biomedical engineering applications on protective masks and regenerative bandages.