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Anionic polymers and photoactive coatings to prevent pathogen transmission via fomite

Survival of pathogens on high-touch surfaces in particular, presents a significant problem in disease transmission via fomites. Despite advances made over the years to develop antimicrobial agents and materials, there is a significant need for the development of innovative approaches with which to prevent microbial infections. As a multidisciplinary team at North Carolina State University, we have developed two different classes of novel antimicrobial materials. Anionic multiblock polymers work by rapidly dropping the pH <1, causing non-specific damage and rapid inactivation of Gram-positive and -negative bacteria including drug resistant strains, and of a variety of different viruses both enveloped and non-enveloped, including SARS-CoV-2. Anionic polymers that lose their antimicrobial activity over time can be easily recharged via a mild acid wash, restoring their original properties. The second approach focuses on antimicrobial photodynamic inactivation (aPDI). Photoactive compounds called photosensitizers, are applied via a sprayable and UV crosslinkable formulation to a wide variety of different matrices. Upon exposure to visible light, photosensitizers produce a biocidal form of oxygen, singlet oxygen, that causes non-specific damage to a wide spectrum of pathogens. We demonstrate that the biocidal activity on coated materials lasts over a month after continuos illumination and is able to inactivate notoriously hard to kill pathogens, such as feline calicivirus, a surrogate for norovirus. Major advantages of both of these approaches include the unlikelyhood of development of resistance to the biocidal mechanisms, broad-spectrum antimicrobial activity and long lasting efficacy to prevent recontamination of surfaces.

Biography

Frank Scholle received his PhD from the University of North Carolina at Chapel Hill in 2000 and did his postdoctoral training at the University of Texas Medical Branch in Galveston, TX, USA. He joined North Carolina State University in 2005 and currently holds the rank of Asociate Professor. He serves as director of the recently founded Center for Advanced Viral Experimentation (CAVE) at NCSU which seeks to develop multidisciplinary approaches to study and combat viral infections.

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