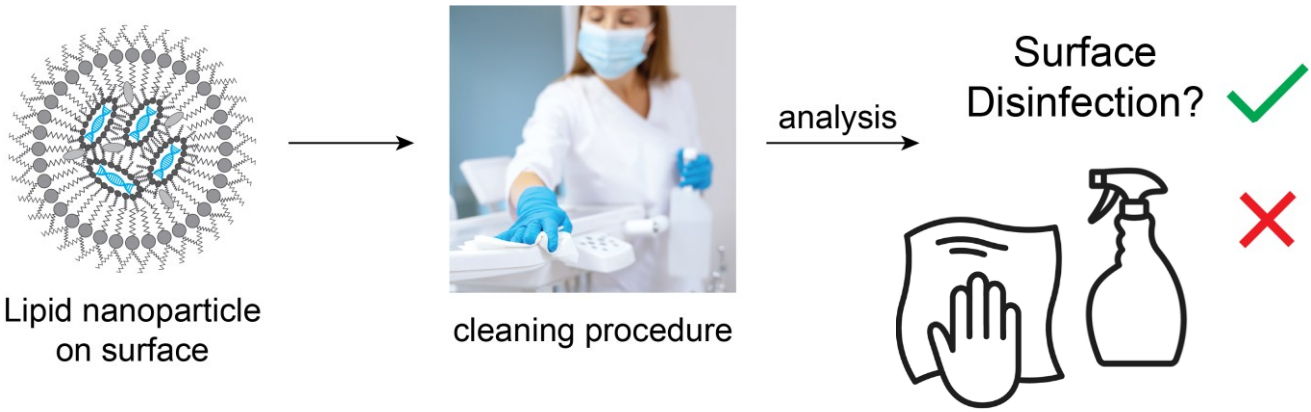
ETH zürich

Licensing Opportunity

Lipid nanoparticles as harmless pathogen proxies for monitoring surface and hand disinfection



Application

Lipid nanoparticles can be used as a surrogate for micro-organisms and can therefore be used to determine the effectiveness of cleaning and disinfection procedures. This makes validation of surface and hand disinfection faster and more sensitive, facilitating hygienic processes and conditions in GMP and healthcare environments.

Features & Benefits

- Ultra-sensitive detection (LOD = 10^{-9} g/l)
- fast analysis (< 1h)
- Non-toxic

Publication

- Pfuderer, L., Stark, W.J., Grass, R.N., *ACS Applied Bio Materials* **2023** *6* (3), 1252-1259, DOI:10.1021/acsabm.3c00004
- Patent pending

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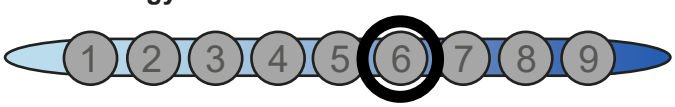
Technology Readiness Level



Background

It is difficult and time-consuming to measure whether a surface has been effectively decontaminated of bacteria and viruses. However, this information is essential for the validation and verification of disinfection and hand washing procedures. This validation is an essential part of good manufacturing practice in the production of pharmaceuticals, medical devices and food. Disinfection of surfaces and hands is also important in healthcare settings, where the transfer of pathogens from surfaces to patients and vice versa via the hands of healthcare workers is problematic and can lead to healthcare-associated infections. The potential consequences of healthcare associated infections are prolonged hospital stays, additional financial burden and excess mortality.

Invention

Lipid nanoparticles encapsulating DNA (LNPs) are used as proxies for bacteria and viruses because their structure, a lipid bilayer membrane, is analogous. Therefore, LNPs show the same susceptibility to disinfection and cleaning with detergents as microbial pathogens. The DNA encapsulated in the lipid membrane of the LNP allows ultra-sensitive and specific detection by qPCR. Using a differential qPCR assay, it is possible to determine whether a surface or hands have been properly disinfected with the appropriate detergents or simply with water. This type of analysis can distinguish between the physical (dilution) and chemical (lipid membrane dissolution) effects of a cleaning or hand washing procedure, providing reliable results within hours. By encapsulating different sequences of DNA within the particles, it is possible to test disinfection strategies at multiple sites at the same time.