

Glycelles for Pathogen Capture

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Technology description

MITRE's pathogen-capture films are ultra-thin, cohesive protein sheets coated on one side with oil and on the other with branching sugar chains that bind to complementary proteins (lectins) on viral, bacterial, and biotoxin surfaces. When mixed under sterile conditions according to patented methods, glycoproteins and oils associate to form transparent, film-coated spheres or "glycelles," which remain stable at room temperature for months. When damp, their sugar coating is slippery, so glycelles do not stick to solid surfaces or extraneous particulate matter. However, when sprayed onto dry paper or cloth containing cellulose, glycelles wrap around the fibers and cannot be readily removed by detergents.

When rehydrated, sugar chains on the exterior surface radiate from the film sheath and bind to complementary lectins of pathogens and biotoxins with which they come into contact. MITRE has demonstrated, using a fluorescent plant lectin, that damp, glycelle-treated wipes can remove sticky biotoxins from solid surfaces without leaving a trace behind.

Microscopic glycelles that are coated with different sugar sequences and color-coded with oil-soluble dyes can be used to detect the expression of specific lectins on bacterial or viral surfaces. The same glycelles can capture and transport pathogens and biotoxins to the surface of an aqueous suspension, where they can be harvested. Glycelles carrying a payload of captured specimens can be used to enhance their visualization or culture. Because sugar receptors are multivalent, they bind like burrs on fur to pathogen surfaces coated with adherent lectin molecules. Therefore pathogens remain bound to glycelles during centrifugation. The same characteristic is observed when glycelle-treated wipes are used to remove pathogens and biotoxins from solid surfaces.

Glycelles are robust, potentially affordable constructs that can be designed to capture specific pathogens by exploiting adhesive proteins required to initiate an infection. Because there is limited variation among sugar sequences on cells that line ports of entry into the human body, both viral and bacterial pathogens bind to the same sets. Glycelles coated with specific sugar receptors could be used to remove antibiotic-resistant strains of bacteria from sensitive surfaces that cannot be disinfected with alcohol or bleach.

Institution

[The Mitre Corporation](#)

联系我们



叶先生

电话 : 021-65679356

手机 : 13414935137

邮箱 : yeyingsheng@zf-ym.com