

Pathogen Capture Using Floating Films

A MITRE Sponsored
Research Project

The logo consists of a cluster of 3D cubes in yellow, orange, and blue, arranged in a stepped pattern.

**MITRE
Technology
Program**

Problem

- **There is a need to monitor the introduction and spread of waterborne infectious disease agents and biotoxins in drinking water.**
- **Low concentrations of harmful microbes and toxins are difficult to detect.**
- **To facilitate the collection of water samples for analysis, we will test a novel method of capturing pathogens and biotoxins at the water surface**

Background

Pathogenic bacterial cells bear “**adhesin proteins**” that bind to specific sugars on host cell surfaces

Velcro-like bond

Animal cells and micelles (bubbles) of “**designer film**” bear **target sugars** on their surfaces

Dissolved glycoprotein also bears target sugar

Objective

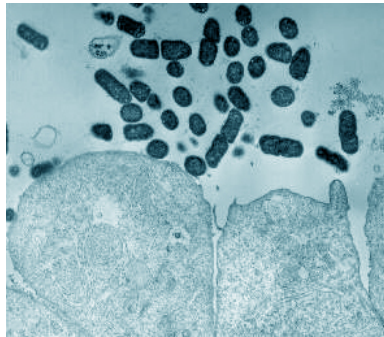
- Identify sugar sequences to which pathogens and biotoxins bind.
- Prepare a floating glycoprotein film that bears target sugars.
- Test specificity and sensitivity of biocapture film.

Activities

- **Optimize and quantify the film's stability and efficiency under different conditions.**
 - Vary film composition and geometry, pathogen concentration, and exposure time.
 - Experimentally measure sensitivity and selectivity of capture surface..
- **Plan and implement field tests.**

Highlight

Several human pathogens and biotoxins bind to “**galabiose tags**” borne on membranes of intestinal and urinary cells.

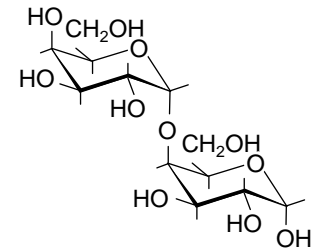
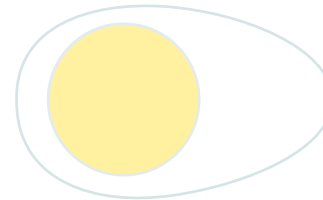


Enterococci adhering to human intestinal cells.

James P. Nataro,* Theodore Steiner,† and Richard L. Guerrant†

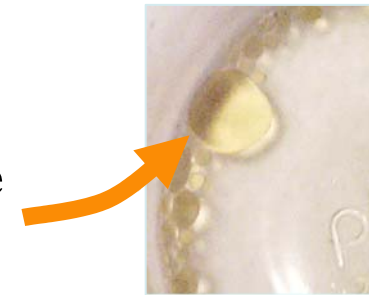
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Galabiose is also found at the tips of carbohydrates bound to glycoproteins in pigeon egg white.



Galabiose

HYPOTHESIS: Floating bubbles of “designer film” made from oil and soluble pigeon egg white proteins bear **galabiose tags** on their external surfaces.



Impacts

- **Biocapture films offer an inexpensive and means of concentrating pathogens and toxins at the water surface.**
- **The technology will facilitate the collection of water samples.**
- **This research will further enhance the capabilities of MITRE staff and will build valuable relationships with other scientists.**