Fraunhofer USA

Centrifugation device for concentrating microorganisms from whole blood

Fraunhofer USA's Center for Manufacturing Innovation is seeking commercial partners to develop further a device that isolates and purifies low concentrations of microorganisms from whole blood.

OVERVIEW

Traditionally, pathogens in the blood have been identified using culture-based methods. Because the pathogens are present at such low concentrations (1–100 CFU per mL of blood), it can take several days to obtain results. To decrease diagnosis time, we are developing a novel device that concentrates and purifies microorganisms from whole blood in less than two hours.

TECHNOLOGY

To obtain purified pathogens from blood, the blood components must be lysed without harming the microorganisms. This is done with a series of three gentle lysis buffers and enzymatic digestions. Each lysis step is followed by a centrifugation step to concentrate the microorganisms. The input to the system is 10 mL of infected blood and the output is a <30 µL pellet of purified, concentrated microorganisms.

FIGURES OF MERIT

- Concentrates microorganisms by a factor of 10^3.
- Seven microorganisms have been extensively tested over a range of concentrations (1–10^6 CFU/mL).
- Method works for fungi, Gram-positive bacteria and Gram-negative bacteria.
- Nearly quantitative recovery obtained with *Staphylococcus aureus*.
- Simple-to-use, low cost disposables.

MARKETS & APPLICATIONS

- Sample preparation: Pellets are clean enough for direct PCR.
- Clinical diagnostics: Pellets can be tested with downstream rapid analysis techniques, *e.g.* PCR, MALDI, SERS, biosensors, etc.

STAGE OF DEVELOPMENT

Currently, this state-of-the-art process is being tested with a model of pooled human blood that has been inoculated with low concentrations of microorganisms. Simultaneously, this technology is being used for a rat blood model of catheter-induced endocarditis. The rats are challenged with *S. aureus* by an IV route. The blood is collected, lysed with the device, and analyzed with SERS. Applying our procedures, we achieved *ca*. 99% recovery of *S. aureus* and 100% accurate identification with SERS.

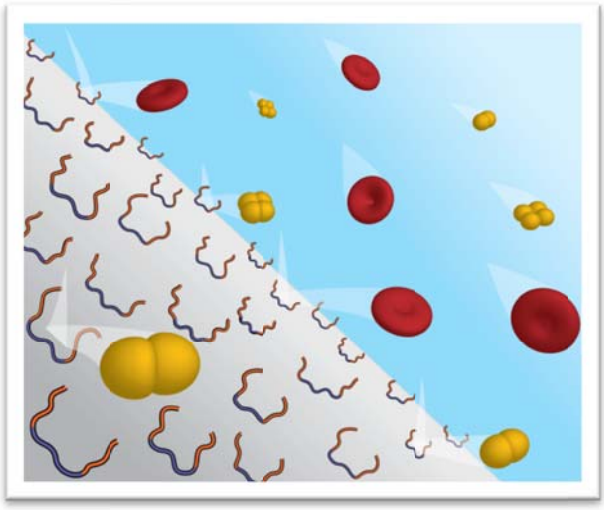
ADDITIONAL INFORMATION

Publications

Boardman, A. K., Allison, S., Sharon, A., & Sauer-Budge, A. F. (2013) Comparison of anti-fouling surface coatings for applications in bacteremia diagnostics. Analytical Methods, DOI: 10.1039/C2AY25662B (article featured on back inside cover; see image below).

Intellectual Property Status

Sharon, Sauer-Budge, Size, Wirz. Disposable separator/concentrator device and method of use. PCT/US2010/033216, filed April 30, 2010. US App# 13/266,980.



CONTACT INFORMATION

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