Liquid Crystal-Based Assay for Rapid and Precise Detection of Endotoxin in the Presence of Masking Agents

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WARF: P09241US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a liquid crystal-based endotoxin detection assay that is compatible with buffers, surfactants and other agents currently causing low endotoxin recovery issues.

In contrast to the widely used LAL assay, this method would allow rapid, precise, sensitive and consistent testing in the presence of masking agents commonly used in the production of therapeutic biologics and nucleotides.

Overview

Bacterial contamination is a major risk in biologics manufacturing and the presence of endotoxin, an outer membrane component of Gram-negative bacteria, is vigorously tested for in protein and DNA/RNA therapeutics. However, many chelators and surfactants can mask endotoxin during testing. This issue, known as low endotoxin recovery (LER), can lead to regulatory delays, including hold times and post-marketing commitments.

Most current methods for detecting or quantifying endotoxin are based on the Limulus Amoebocyte Lysate (LAL) assay first developed in the 1960s. These LAL-based methods are complex and expensive and require the use of skilled technicians and biological reagents. Over the last few decades, complementary assays that overcome some of the shortcomings of these methods have been developed, but LER is a newer issue that the LAL assay and current alternatives don't address.

The Invention

UW–Madison researchers have developed methods and devices for the simple and low cost, yet rapid, sensitive and selective detection of endotoxin in the presence of masking agents. Their assay uses micrometer-sized droplets of liquid crystal dispersed in aqueous solution. When a sensor containing the liquid crystal droplets is exposed to a solution containing endotoxin, the alignment of the liquid crystals quickly changes. This change in alignment is unaffected by common cations, surfactants, buffers or chelating agents and can be detected easily using polarized light or other means.

Applications

- Detection and quantification of endotoxin during biologics manufacturing
- Monitoring of food or water
- Early diagnosis of sepsis, a life-threatening systemic inflammatory response syndrome frequently caused by Gram-negative bacteria

Key Benefits

- Not susceptible to LER
- Enables consistent, precise testing in the presence of common masking agents
- Much less expensive than commercially available LAL assays
- More sensitive (LOD 0.1 to 1 pg/mL) than LAL assays
- Results are available within one minute, which is much faster than current assays.
- Amenable to visual inspection or high throughput processing using a continuous flow device like a flow cytometer
- Uses synthetic, rather than biologic, reagents, allowing for easier calibration and improved consistency

Stage of Development

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Additional Information

Related Intellectual Property

- View Continuation Patent in PDF format.
- View Continuation Patent in PDF format.

Publications

- Lin I.-H., Miller D.S., Bertics P.J., Murphy C.J., de Pablo J.J. and Abbott N.L. 2011. Endotoxin-Induced Structural Transformations in Liquid Crystalline Droplets. Science. 332, 1297-1300. [Epub May 19, 2011]

- Click here for a news release describing this technology.

Tech Fields

- Analytical Instrumentation, Methods & Materials : Sensors
- Medical Devices : Diagnostics & monitoring tools

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854