

Novel method for the detection of cyanobacterial toxin microcystin-LR using a centrifugal microfluidic (Lab-On-A-Disc) sensing system

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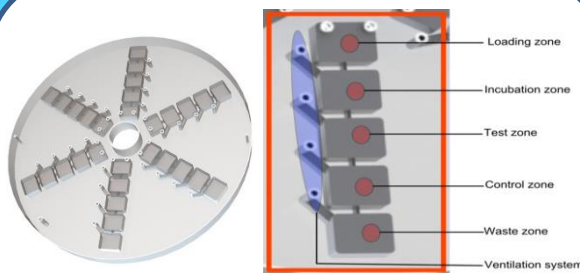
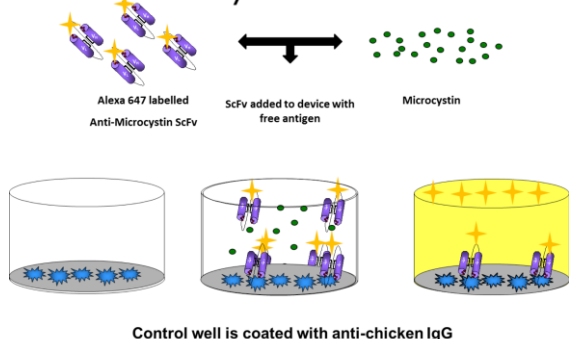
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Introduction: Globally, the most prevalent cyanobacterial toxins, in blooms from fresh and brackish waters, are the cyclic peptide toxins of the microcystin family. The need for on-site algal-toxin monitoring has become increasingly urgent due to the amplified demand for fresh-water and for safe, 'toxin-free' shellfish and fish stocks. Along with routine testing of shellfish stocks for biotoxins including microcystin, the EU also require routine monitoring for the presence of the causative algal species. According to the World Health Organisation (WHO), the guideline value of microcystin LR in drinking water is 1 µg/L. [1]

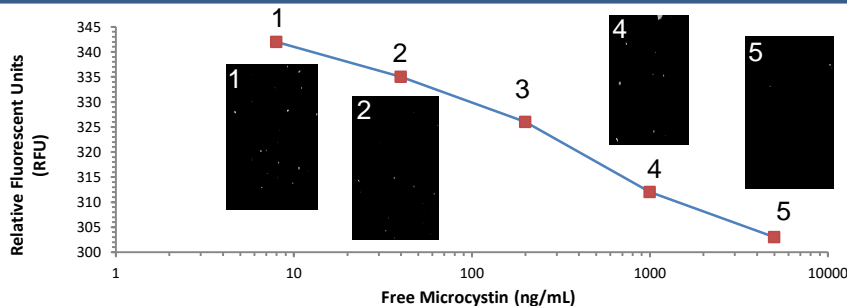
Herein, we demonstrate a novel, Lab-On-A-Disc (LOAD) platform which has been developed to assess microcystin toxin levels *in-situ*. Using recombinant antibody technology, immunofluorescence can be used as a medium of detection in determining microcystin concentration in a sample. Combining this recombinant antibody technology with a centrifugally driven microfluidic LOAD platform is the next step to achieving a cheap, automated, next-generation disposable device for high throughput sampling.

Microcystin-LR Toxi-Sense Assay Schematic



Lab-on-a-disc (LOAD) with corresponding functionalised reservoirs for toxin detection

A Resultant competitive assay graphically illustrates how an increase in microcystin Concentration causes a reduction in the recorded fluorescent signal. This provides the basis of detection.



Conclusion: It has been demonstrated that, by the combination of recombinant antibody technology with LOAD platforms, *in-situ* microcystin detection is highly promising. The use of a LOAD platform significantly increases the sensitivity of the detection, due to the low sample input. As the system is also highly portable, it would also offer future capabilities for *in-situ* testing, with primary technical challenge to develop a fully-automated, microcystin detection system.

[1] - WHO, Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring and management. 1999, Routledge: London and New York.

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