MISSION

MIcrofluidic sensors for rapId detection of cyanotoxins

Water4All
Water security for the planet

Abstract

The MISSION project seeks to contribute to the monitoring of the freshwater systems' status with respect to Cyanobacterial Harmful Algal Blooms (CyanoHABs) by developing novel miniaturized sensing screening tools for rapid and sensitive detection of two groups of cyanotoxins, microcystins and saxitoxins. Screening tools will be designed to be more portable and cost-efficient compared to the currently available analytical methodologies for freshwater quality and adaptable for use outside of the laboratory settings, by operators without specialized training.
The proposed sensing tools are expected to advance understanding of the status of ecosystem services by providing early warning of cyanotoxin risk, by providing data of their presence in surface waters with high spatial and temporal resolution. Sensing tool outputs will complement currently measured indirect indicators of CyanoHABs, such as chlorophyll-a concentration and microscope cell counting, and, thus, contribute to a more efficient and timely management of freshwater waterbodies.

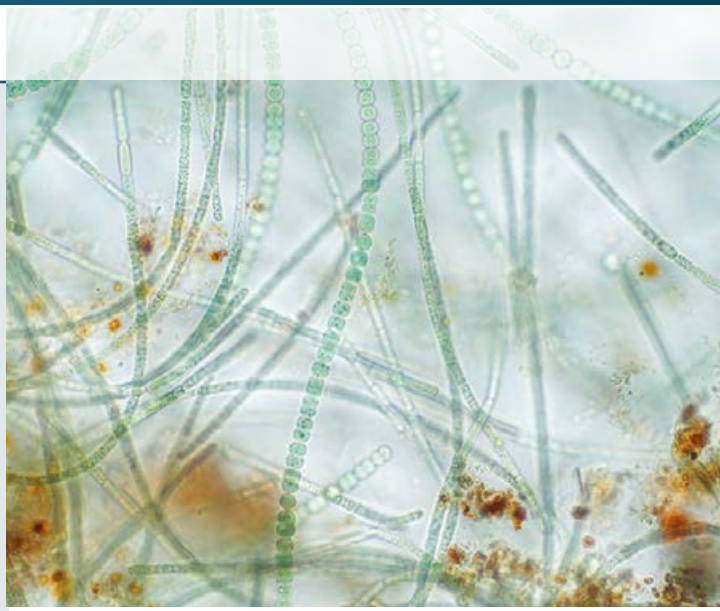
This project proposes development of an electrochemical (bio)chemical sensor / sensor array integrated into a microfluidic network of channels and chambers facilitating manipulation of sample and reagents that is required by the detection method and applicational settings. Upon introduction of sample and reagents in a sequence optimized for target cyanotoxins into microfluidic channel, sensor system will produce response as a function of both type and concentration of toxins under examination.

The project objectives are:

- to develop and optimize a methodology using chemical sensors for simultaneous sensing of two principle groups of cyanotoxins, microcystins and saxitoxins at the concentration levels corresponding to the World Health Organization - WHO guideline values;
- to develop a user-friendly microfluidic architecture to perform measurements in reduced sample volumes (less than 50 μL) in an automated format that could be used to detect toxins outside of laboratory settings by operators without specialized skills and requiring minimal sample preparation;
- to validate and benchmark the developed microfluidic sensing system against conventional analytical techniques, and to estimate its innovation potential;
- to evaluate feasibility of the optical detection of cyanotoxins;
- to create awareness among stakeholders of the management of freshwater systems;
- to improve competences of consortium members.

The MISSION project addresses an important niche – detection of two major groups of cyanotoxins highly relevant for all European countries. Both climate change and anthropological pressures are recognized as important contributors to the increase of frequency, spatial and temporal distribution, and toxicity of CyanoHABs.

MISSION proposes a screening test that can be deployed on site, providing timely data on the cyanotoxins' presence in the surface waters. This data will contribute to improve monitoring and assessment of the ecosystem services' status in the context of a changing world, which is relevant to Topic 1 of the Water4All Joint Transnational Call. MISSION addresses Topic 1.3. as a screening methodology to be developed and validated in collaboration with stakeholders will contribute to the valuation of ecosystem services. Furthermore, proposed screening tools will contribute to the assessment of the effect of different anthropogenic pressures from human activities on ecosystem services, which is relevant to Topic 2.1.



Project coordinator

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Project partners

- PORTUGUESE OF THE SEA AND ATMOSPHERE - PORTUGAL
- «TOR VERGATA» UNIVERSITY OF ROME - ITALY
- STIFTELSEN SINTEF - NORWAY
- NORWEGIAN UNIVERSITY OF LIFE SCIENCES - NORWAY
- LABELEC ESTUDOS, DESENVOLVIMENTO E ATIVIDADES LABORATORIAIS, S.A. - PORTUGAL
- ALGARES SRL - ITALY

Funding organisations

FCT (PORTUGAL) / MUR (ITALY) / RCN (NORWAY)

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3 years

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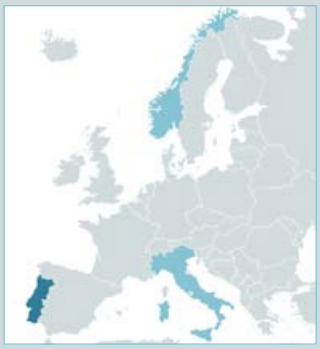

KEYWORDS

cyanotoxins
microcystins
saxitoxin
microfluidic sensors
electronic tongue
chemical sensors