

Enhancing the detection of *Dinophysis* spp. using electrochemical genosensors

Eduarda Pereira^{1,2}, Aurora Silva^{2,3}, Stephanie L. Morais², Estefanía Costa-Rama², Patrícia R. Moreira⁴, M. Fraga-Corral³, Ana M. Torrado³, Francisco Rodríguez^{5,6}, Piedade Barros¹, Agostinho Cruz¹, Cristina Delerue-Matos², M. A. Prieto³, J. Simal-Gandara³, Nádia F. D. Silva², Marlene Santos^{1,7*}, M. Fátima Barroso^{2,*}

¹ CISA, ESS, Polytechnic of Porto, Rua Dr. António Bernardino de Almeida, 4200-072 Porto, Portugal

² REQUIMTE/LAQV, ISEP, Polytechnic of Porto, Rua António Bernardino de Almeida, 4249-015, Porto, Portugal

³ Nutrition and Bromatology Group, Department of Analytical and Food Chemistry, Faculty of Food Science and Technology, University of Vigo, Ourense Campus, E32004 Ourense, Spain,

⁴ Universidade Católica Portuguesa, CITAR - Centro de Investigação em Ciência e Tecnologia das Artes, Escola das Artes, Rua Diogo Botelho 1327, 4169-005, Porto, Portugal

⁵ Centro Nacional Instituto Español de Oceanografía (IEO-CSIC), Centro Oceanográfico de Vigo, 36390 Vigo, Spain

⁶ European Reference Laboratory for Monitoring of Marine Biotoxins (EURLMB), Citexvi, University of Vigo, 36310 Vigo, Spain

⁷ Molecular Oncology & Viral Pathology, IPOPorto Research Center (CI-IPOP), Portuguese Institute of Oncology, Porto, Portugal

*mes@ess.ipp.pt; mfb@isep.ipp.pt

Background: Harmful algal blooms (HABs) pose a significant threat to the environment and public health. These blooms are defined by an accumulation of microscopic algae in water, and they can occur in lakes, rivers, estuaries, or coastal areas. Factors like the unregulated runoff of agricultural and industrial wastes into the aquatic environment [1] are believed to have transformed these ecosystems into favorable habitats for algae growth and proliferation [2]. As a result, the frequency of these blooms is rising worldwide. Although these blooms are mostly harmless, certain species, namely dinoflagellates from the genus *Dinophysis*, produce toxins that pose a risk for human health [3]. Therefore, the need for technological developments towards fast and precise detection of these toxin-producing microalgae is critical to prevent socioeconomical damages, as well as to assess the ecological status of marine ecosystems [1]. **Objective:** In this work, an analytical approach based on an electrochemical genosensor device was developed to create a low-cost platform able to detect two dinoflagellate species from the genus *Dinophysis*: *D.acuminata* and *D.acuta*. **Methods:** The design of the DNA-based sensor involved three key steps: i) Sensing phase: consisted by a mixed self-assembled monolayer composed by a linear DNA capture probe and mercaptohexanol onto the disposable screen-printed gold electrodes surface; ii) Hybridization of complementary DNA sequence by using a sandwich format assay with enzymatic labels and iii) Electrochemical detection by chronoamperometry using an enzymatic scheme to amplify the electrochemical signal. **Results:** The best analytical conditions used to study the relationship between electrochemical signal and DNA target concentration, to produce the best electrochemical genosensor device. Molecular biology tools, namely Polymerase Chain Reaction (PCR), will be used for further validation of the electrochemical genosensor to confirm its reliability. **Conclusions:** These advancements in analytical technologies contribute to the ongoing efforts in environmental management and public health protection by providing effective means for detecting and mitigating the risks associated with HABs. Further research and widespread implementation of these methods are required to ensure the safety and sustainability of aquatic ecosystems, safeguard public health, and facilitate proactive environmental management practices.

Keywords: Dinoflagellates; *Dinophysis* spp.; electrochemistry; genosensor; molecular biology;

Acknowledgements

Funding: This research was funded by the Ibero-American Program on Science and Technology (CYTED—GENOSYSEN, P223RT0141), by European Cooperation in Science and Technology (COST, ENOTTA-CA21147), and was also financially supported by Portuguese national funds through projects UIDB/QUI/50006/2019, UIDB/50006/2020, UIDP/50006/2020, LA/P/0008/2020, PTDC/NAN-MAT/31968/2017 from the Fundação para a Ciência e a Tecnologia (FCT)/Ministério da Ciência, Tecnologia e Ensino Superior (MCTES). Fatima Barroso (2020.03107.CEECIND) is grateful to Fundação para a Ciência e a Tecnologia (FCT) for the investigator contract.

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