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

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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;

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