20837 | Detecting toxic dinoflagellates (*Dinophysis* spp.) using electrochemical genosensors

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Abstract

Aquatic environments are important economic and ecological sources for human activities (e.g. fisheries, tourism, agriculture and aquaculture). However, the increase in those practices has, over the years, compromised the integrity of these ecosystems. Runoffs of terrestrial nutrients (from, for example, agricultural and industrial waste) and higher surface temperatures are believed to have transformed these ecosystems into favourable habitats for algae growth and proliferation. As a result, the frequency in phytoplankton microalgae blooms is rising worldwide. These microorganisms are mostly harmless, however certain species, namely belonging to dinoflagellates (e.g., *Dinophysis* spp.) produce toxins that pose a potential risk for human health. Therefore, the need for technological developments towards fast and precise detection of these toxin-producing microalgae is critical to prevent socioeconomical damages and assess the ecological status of marine ecosystems.

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*, which are lipophilic toxin producers responsible of diarrhetic shellfish poisoning (DSP) in humans.

The design of this DNA-based sensor consists of several steps including: i) Sensing phase: consisted by a mixed self-assembled monolayer (SAM) composed by a linear DNA capture probe

(DNA-CP) and mercaptohexanol (MCH) onto disposable screen-printed gold electrodes (SPGE) surface; ii) Hybridization of complementary DNA sequence (DNA target) by using a sandwich format assay with enzymatic labels and iii) Electrochemical detection by chronoamperometry using an enzymatic scheme to amplify the electrochemical signal.
The best analytical conditions were used to study the relationship between electrochemical signal and DNA target concentration, to produce the best electrochemical genosensor device.

Keywords: dinoflagellates, *Dinophysis* spp., electrochemistry, genosensor.

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