Detection of ciguatoxins in fish and algal samples with an electrochemical biosensor

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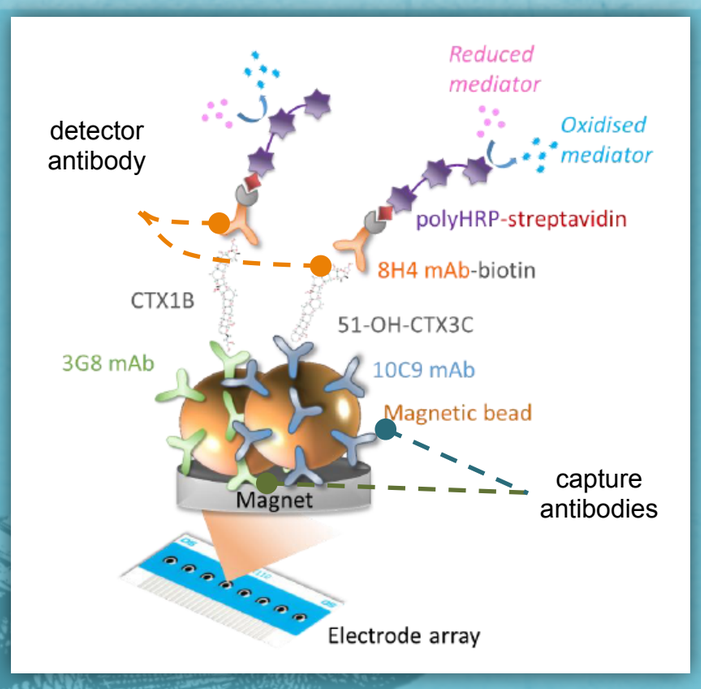
Fish samples

Strategy



Sandwich configuration allows to detect 4 congeners of 2 groups of CTXs:

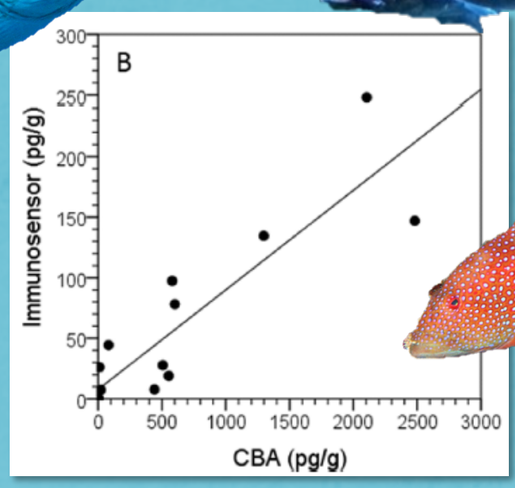
- 3G8+8H4→ CTX1B and 54-deoxyCTX1B
- 10C9+8H4→CTX3C and 51-OH-CTX3C

Capture antibodies were immobilized on magnetic particles and exposed to the fish matrix containing ciguatoxins. Then, 8H4 antibody (previously biotinylated) was added to the mix, followed by polyHRP-streptavidin. Magnetic particles were then immobilized on electrodes with a magnet and, finally, reduction current of the mediator was measured with amperometry. Results were compared with Cell-Based Assay (CBA).

Results

Lutjanus bohar

Thyrsitoides marleyi



Variola louti

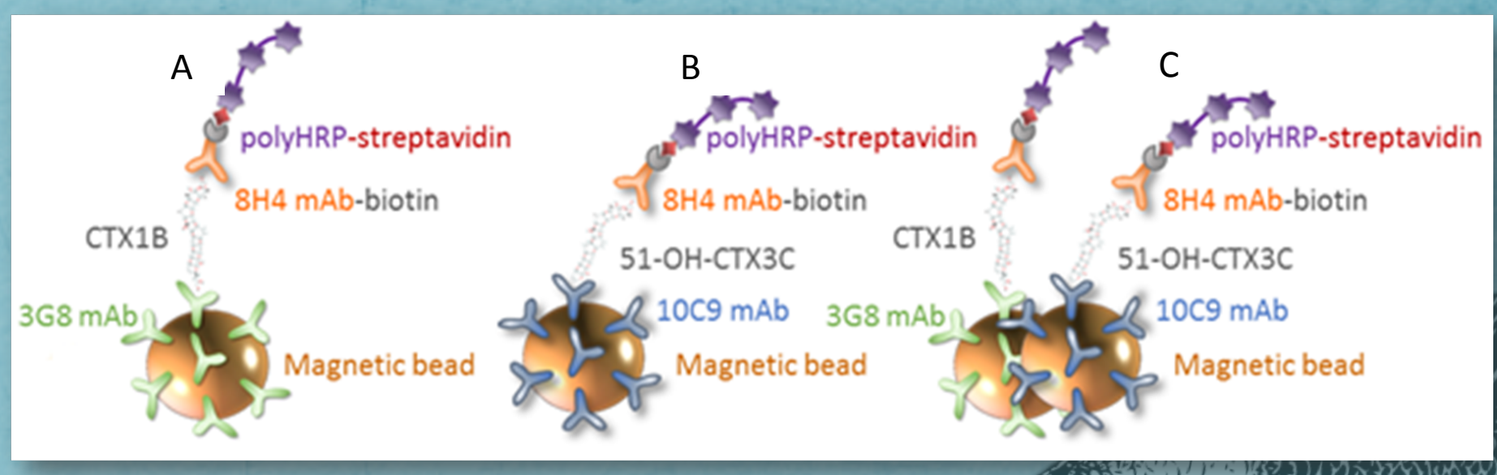
Several *Variola louti*, *Lutjanus bohar*, and a *Thyrsitoides marleyi* from La reunion, that resulted as positive for ciguatoxin with mouse bioassay, were tested. A good correlation was obtained between the immunosensor and the CBA. Matrix effects have been checked and recovery values have been calculated. A negative *Variola louti* has been spiked at the FDA guidance level, proving that our system can detect CTXs at a concentration of ≤0.01 µg/kg of CTX1B equivalent.

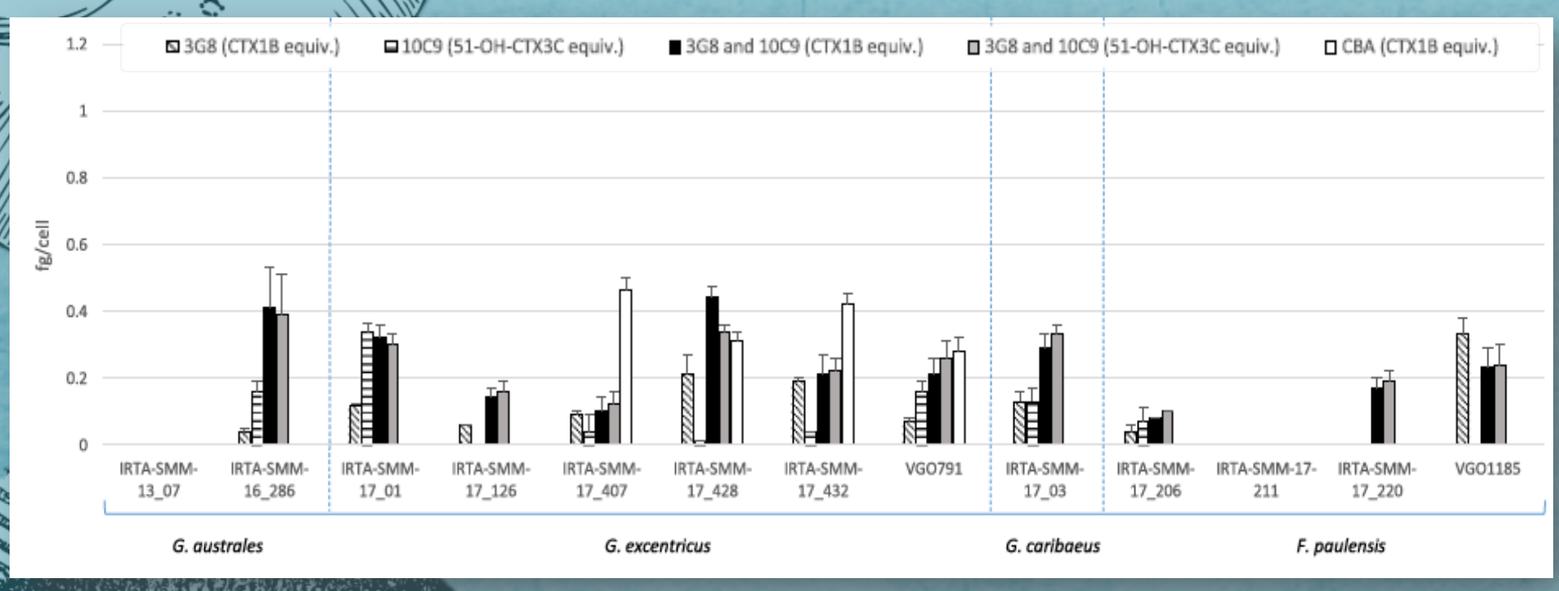
Fish samples from Cyprus are now under analysis, giving promising results.

Algal Samples

Strategy

Antibodies have been exposed to algal extracts separately (A,B) and mixed together (C). This strategy has been used to understand if there were differences in the toxin production between species and strains. Results were compared again with CBA.





Results

For certain strains, toxins of one group of congeners are detected in higher levels than the other. Matrix effects have been checked and recovery values have been calculated. Additionally, toxins were extracted from 20.000 cells, which is a concentration of cells that can be easily found in nature, making our system suitable for the screening of field samples.

Conclusions

The developed biosensor allows the detection of CTXs in fish samples, attaining the FDA guidance level for CTX1B. It provides specificity, simplicity and rapidity and it can be easily implemented in monitoring and research programs. Additionally, it does not require sophisticated instrumentation and highly trained personnel. In the analysis of algal samples, it allowed the separate detection of the two groups of CTX congeners, giving new information regarding the toxin production of the genera.

Ackoledgments: the authors acknowledge financial support from the *Ministerio de Economía y Competitividad* through the through CIGUASENSING (BIO2017-87946-C2-2-R) project. Greta Gaiani acknowledges scholarship from IRTA-URV-BANCO SANTANDER.