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Cyclic imine toxin bioaccumulation by shellfish: Development of receptor-based assays for their detection & identification

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Harmful algal blooms (HABs) occurrence is worldwide increasing because of water eutrophication, aquaculture, maritime transport, global climate change, among other factors. Shellfish that filter feed on harmful phytoplankton accumulate and metabolize marine toxins in their digestive glands and edible tissues constituting a primary vector for their transfer to humans. Therefore, HABs represent a potential threat for Public Health and aquaculture activities that can result in economic losses totalling hundreds of millions of dollars annually. Here, the development of receptor binding assays inspired in the high affinity of cyclic imine toxins towards nicotinic acetylcholine receptors will be discussed.1 Indeed, cyclic imine toxins are potent antagonists of nicotinic acetylcholine receptors.2 Although highly lethal to mice, cyclic imine toxins are not regulated since no human fatalities are associated with them. However, the risk of long-term exposure to sub lethal doses of cyclic imine toxins is of concern given their capacity to cross the digestive and blood-brain barrier in animal models and their nanomolar to picomolar affinities for human neuronal nAChRs *in vitro*. Receptor-Toxin assays are an alternative to antibody ELISA-based methods that advantageously allow the detection of a series of toxin families directed against the same receptor target. Microplate-receptor binding assay is a high throughput method for rapid detection of cyclic imine toxins directly in shellfish extracts with minimal sample handling, high sensitivity and reduced matrix effect. NeuroTorp is a lateral flow early-warning test for detection of cyclic imine toxins in the field by end-users. Receptor-based methods also allow toxin capture/release for their identification by mass spectrometry.3

Biography

Romulo Araoz is a research scientist at Centre National de la Recherche Scientifique (CNRS) and works at the Commissariat a l'Energie Atomique et aux Energies Alternatives, in France. He obtained his PhD from Friedrich-Alexander University Erlangen-Nurnberg, Germany in 1998. He performed Postdoctoral Studies at the CNRS and at Pasteur Institute. His research is centered on the discovery and pharmacological characterization of marine neurotoxins active on nicotinic acetylcholine receptors. He revealed the mechanism of action of several cyclic imine toxins and developed bioassays for their detection (WO2017108115 and WO2012101378A1). He published >50 papers in peer-reviewed journals (h-index 20, RG index 35.42).

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