

## Emerging toxins in Italian seas and risks for human health

In the Mediterranean basin, harmful microalgal species and their toxins are detected in seawater and seafood with increasing frequency. The interest of scientific communities and the concern of Authorities, most importantly the *European Food Safety Authority* (EFSA) are constantly rising due to detection of phycotoxins once found only in areas outside the European borders and whose regulatory limits have not been established yet. These Emerging Marine Biotoxins (EMBs), once occurring mainly in tropical areas, in recent years appeared in temperate latitudes, favored by global warming, causing great concerns for human and environmental health, tourism and fishing industry. Among them, palytoxins and ovatoxins, are of particular concern for the Mediterranean regions while ciguatoxins, tetrodotoxin, azaspiracids, cyclic imines and cyanotoxins (freshwater phycotoxins that have been recently recorded also in the marine environment) are not monitored on a regular basis. Given the high toxic potential of these compounds, the associated hazard characterization and risk management need to be assessed within the next 3 years. Indeed, despite the highly significant impacts related to these phycotoxins, several issues have not been elucidated so far:

- (i) the distribution of EMBs and of the producing microalgae along the Italian coasts;
- (ii) the ecological constraints affecting the harmful algal blooms;
- (iii) assessment of the distribution of EMBs in Mediterranean seafood chain; and
- (iv) the hazard characterization of some of these phycotoxins, including their mechanisms of toxicity.

This knowledge gaps hamper the establishment of EU regulations and make difficult even to assess the actual risks that EMBs pose to humans, particularly to seafood consumers.

This PhD project aims at elucidating the risks associated with the presence of emerging toxins in Italian seas through a multidisciplinary approach, including: the identification of toxic microalgal species in coastal environment and seafood; the study of environmental factors affecting their growth, abundances and toxin production; their transfer to organisms at higher trophic levels, especially those used for human consumption; the validation of chemical methods of analysis enabling the elucidation of the complex toxin profiles and their suitability to quantify the phycotoxins; and isolation of sufficient amounts of some EMB (palytoxins and ovatoxins) for toxicological studies on hazard characterization.

The topic falls within the ERC PE4 *Physical and Analytical Chemical Sciences* sector, with particular reference to sub-sectors PE4\_2 *Spectroscopic and Spectrometric techniques*, PE4\_9 *Method development in chemistry* and PE4\_18 *Environment Chemistry*.

The PhD project is part of the PRIN 2022 project "*Emerging toxins in Italian seas and risks for human health (Tox-IT)*" code 2022KZLJZH coordinated by the Polytechnic University of Marche (Coordinator: S. Accoroni; Heads of Local Units: C. Dell'Aversano, UniNa; M. Pelin, UniTs) and will be financed by it both with regard to the item "*Contracts of non-employee personnel specifically to be recruited on the project*" and to the item "*Other operating costs (raw materials, consumables, courses, congresses, missions abroad)*". During the PhD course, a training period is expected to be carried out at one of the foreign bodies with which the Tutor has International Cooperation Agreements (<https://nrc.canada.ca/en>, <https://www.cawthron.org.nz>, <https://www.cefas.co.uk/>) currently active and/or within the EU MCSA project n° 101086234 BLUESHELLFISH. "*Solutions to prevent and mitigate the impacts of HABs in Aquaculture and Fisheries in the context of global warming*".