

## Innovations to reduce contaminants from seafood products: Paralytic Shellfish Poisoning detoxification process for mussels, clams and scallops



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### SUMMARY

Paralytic shellfish poisoning (PSP) is a serious illness caused by eating shellfish contaminated with dinoflagellate algae, which produce harmful toxins. This output concerns a procedure for the effective detoxification of paralytic toxin-contaminated shellfish. The process is based on an existing EC-approved procedure for cockles (*Acanthocardia tuberculata*), which has been modified to extend detoxification capacity for other bivalve molluscs, namely mussels, clams and scallops. Detoxification is achieved through a thermal process that reduces PSP contamination by almost 85% in bivalve molluscs, making them safe for human consumption, provided the initial level is below a certain threshold.



### KNOWLEDGE NEED

At present, bivalve molluscs containing PSP toxins above the legal limit cannot be collected or processed. Shellfish production areas are regularly closed due to PSP occurrences, often for weeks at a time, leading to significant production and economic losses. There is a need for an effective decontamination procedure that would enable processing and detoxification of bivalve molluscs to safe consumption levels, even where algal blooms occur. A change in EU legislation is also required which would make implementation of such a procedure possible for the seafood industry.



### RESULTS

The detoxification procedure is based on an existing EC-approved thermal procedure for PSP detoxification in cockles which has now been adapted for other bivalves. The method concerns a series of thermal steps: Cleaning, pre-cooking (~95°C), second clean, cooking (~98°C), cooling, conditioning in air-tight containers, sterilization (~116°C; 51 min) or pasteurization (~90°C; 10 min). Results show that PSP contamination in bivalve molluscs is significantly reduced (~85%), making them safe for human consumption, provided the initial level is below 5300 µg of PSP toxins (Saxitoxin (STX) diHCl equivalents) per kg of shellfish meat (a theoretical value based on the obtained percentage of detoxification). The safety levels are based on 800 µg STX diHCl equivalents/Kg shellfish meat as the legally allowed limit, so that the final levels achieved are safe. The protocol has been published in a scientific article and all supporting data are available in open access.



### IMPACTS

If approved in EU legislation, the method would support increased economic activity in the seafood sector by allowing year-round harvesting of shellfish independent of PSP threats, and by eliminating the need to dispose contaminated produce. The method would also increase the availability of safer seafood on the market, improving consumer trust and seafood consumption habits, and contributing to an improved health profile of the European population overall. The method could support an overall increase in seafood sector growth, sustainability and profitability.

**Contributes to the UN Sustainable Development Goal 12:** Responsible consumption and production.

## END-USERS & APPLICATIONS

- ➔ **Shellfish producers:** application of this method would enable shellfish producers to continue harvesting molluscs during PSP outbreaks, allowing for increased economic activity.
- ➔ **Shellfish processing companies:** if legally approved, the shellfish processing industry could implement this method, enabling the safe production and sale of molluscs year-round.

- ➔ **Scientific community:** academics and scientists working in the area of seafood safety can use the validated datasets and new knowledge to support further research into new detoxification methods and tools for contaminated shellfish.
- ➔ **Consumers:** increased availability of safe shellfish on the market may support consumer trust and increase consumption of shellfish, supporting healthy eating.

## DISSEMINATION AND EXPLOITATION

### Dissemination activities for consumers / all users:

- Website news article: [bit.ly/3a70fnH](https://bit.ly/3a70fnH)
- Promotion on Twitter and LinkedIn

### Exploitation activities for seafood industry:

- The method was presented at an Aquaculture Brokerage Event hosted by the Irish Aquaculture technology and Innovative Platform and supported by the Irish Seafood Development Agency in December 2020.
- Results from the pilot trials were presented at three **SEAFOOD<sup>TOMORROW</sup>** demonstration workshops (France, Italy, Spain). All ANFACO-CECOPECA associates, SMEs, regional processing and production companies in Vigo (Spain), France and Italy were contacted directly and invited to attend the project's demonstration workshops. The method was demonstrated to regional stakeholders at ANFACO-CECOPECA at the workshop in Spain.
- Demonstration video: PSP detoxification protocol video by ANFACO-CECOPECA: [vimeo.com/535788736](https://vimeo.com/535788736)
- Horizon Results Platform: [seafoodtomorrow.eu/horizon-results-platform](https://seafoodtomorrow.eu/horizon-results-platform)

### Dissemination activities for scientific community:

- Diogène J, Ferreres L, Rambla-Alegre M. (2020).

Detoxification of paralytic shellfish poisoning toxins in naturally contaminated mussels, clams and scallops by an industrial procedure. Food and Chemical Toxicology, 139, 111386. DOI: 10.1016/j.fct.2020.111386.

- Open access version: [zenodo.org/record/3965479#.YCPJa-j7TIW](https://zenodo.org/record/3965479#.YCPJa-j7TIW)
- Open access validated data sets: [zenodo.org/record/3974510#.YCPJWoj7TIW](https://zenodo.org/record/3974510#.YCPJWoj7TIW)
- Video: explanation of PSP detoxification procedure: [vimeo.com/360226634](https://vimeo.com/360226634)

### Exploitation activities for policy makers:

- Legislative proposal: a proposal outlining recommendations for a change in legislation was prepared by ANFACO as a project deliverable in April 2020: D2.4 - Legislative proposal to harvest and detoxify PSP contaminated molluscs. This proposal and results from this study will be presented to DG SANTE for consideration.
- Monitoring agencies, regulators and policy makers will be reached through the final **SEAFOOD<sup>TOMORROW</sup>** event, info session, and a dedicated EU policy event. Guidance on how the method can be officially recognised and approved by the EC (similar to EC Decision 96/77) is needed to bring this solution to industry.



## INNOVATION STATUS

Technology Readiness Level 5: technology validated in industrially environment- Requires EFSA approval and legislation change

**Patents and IPR:** Not applicable

**Other:** Legislative proposal submitted



## FUTURE RESEARCH

There is significant interest in this method as a solution to PSP, however the legislation around PSP poses a challenge. For the method to be legally implemented and adopted, research projects may be required to verify the results at national level. The method would give producers and processors more control over their produce. There may be some resistance from regulators and a need for new monitoring measures. For example, samples from each batch produced with this detoxification process will need to be tested in order to ensure the satisfactory application of the detoxification process.

## CONTACT AND CONTRIBUTORS

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