

BAMMBO: A SPONGE-MILKING FACTORY

The blue growth project aims to retrieve the many bio-active compounds of sponges in a sustainable manner

The project: Sustainable production of high-value-added marine bio-molecules

Our increasing knowledge of marine biodiversity has recently revealed a high economic potential associated with biomolecular organisms such as algae, fungi, sponges and marine-bacteria produce. While several marine products have already found a market mainly in the nutraceutical, cosmetic and pharmaceutical sectors, the main bottlenecks that hamper their use on a large scale is without doubt the issue of supply. In this context, the blue growth project BAMMBO, funded by EU FP7, seeks to find innovative alternatives for the sustainable production of marine high value-added biomolecules. Over 500 marine fungi and bacteria were studied in the project; and a range of new bacterial enzymes could be isolated. Macroalgae showed great potential in antibacterial properties, as well as in antitumour and anti-inflammatory properties. The Irish SME partner focussed on the extraction of high value compounds from green microalgae with emphasis on astaxanthin, which can provide protection against UV light and act as an immune-response aid.

The partners from the Mediterranean region are dedicated to finding sustainable alternatives to the common chemical synthesis for the production of sponge molecules. Their approach was based on sponge aquaculture, for which the project sought economic and sustainable culturing methods, a process called mariculture. Moreover, the project demonstrated and developed 'sponge-milking' – a new process which focuses on the extraction of compounds while avoiding the destruction of biomass.



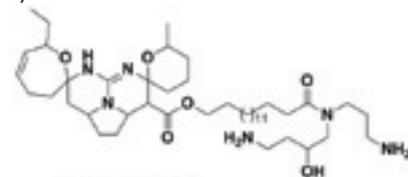
The research results on sponges and related processes will facilitate wider access to the chemical diversity produced by sponges. Sponges are one of the most prolific sources of structurally complex compounds with anti-pathogen properties and anti-fouling agents but are highly difficult to cultivate. A sponge-chemical library has been set up and is accessible to all industries and academic entities.

The product: A new process and pure sponge compounds

Because one of the obstacles to extracting natural compounds is the difficulty in maintaining a continuous supply of huge amounts of sponge tissue, the project emphasised the discovery of new and sustainable processes that avoid the destruction of the biomass. The sponge-milking factory is a direct product of the BAMMBO project. This new and sustainable process allows the yearly harvesting of several grams of pure compounds produced by marine sponges. The method has been applied successfully to several species of sponges. It has proven very efficient for encrusting sponges, and it is also possible to produce compounds from erect branching sponges and massive sponges, though yields are lower.



Crambe crambe



Crambesidin 800

The end-users: Industry, health professionals, consumers, policy makers and legislators

From an industrial perspective, the project outputs are of great value for bio-processing companies, pharma, and the cosmetics industries, as well as for health and care professionals and the consumers of the sponge-derived compounds.

As the derivatives found: legal and field or clinical testing, it would be of interest to regulators and legislators deciding which project outputs will enter the market and may be subject of the future drug and health product legislation.

Development stage: Proof of principle, up-scaling, piloting

The proof of principles of this process, sponge-milking, has been



demonstrated for three species and we are now able to offer between one and ten grams of pure sponge compounds each year for all kinds of applications. A patent will be associated with the automated version of this process in late 2015.

Several compounds have already been shown to exhibit interesting bio-activities like antimicrobial and antitumour activities.

We then propose to research the wide chemical diversity of sponge molecules. We will begin with small quantities (between one and ten milligrams) to assess their potential and larger quantities after that (between one and ten grams) to confirm their economic value. We will address industries concerned with original and natural ingredients, to discover their interest in the sponge-derived compounds. Prices will vary for each sponge product, as sponge aquaculture is highly variable according to the species cultivated.

The inventors: Academics, technology-transfer organisations

With the help of national but also regional funds, researchers of the University of Nice started to build a library of sponge products coming from the Mediterranean in 2007. The EU-funded BAMMBO project helped to develop the sponge-milking factory on a small scale between 2011 and 2014 and subsequent financial support was provided by the Société d'Accélération de Transfert de Technologie Sud-Est, allowing us to scale up this process to reach quantities exceeding 1g of pure compound per year.

Policy impacts: SME and job creation, raising competitiveness, new protection rules

Our sponge-milking factory will open a new perspective in the aquaculture of marine invertebrates for the development of the molecules they produce. A large array of applications will derive from this process and local jobs are expected to be the main result of this new and sustainable approach. Of course new legislations on this original aquaculture will be required to ensure the protection of the marine environment.

Next steps: Spin-off and market analysis

The BAMMBO-project came to a close in spring 2014. As consortium partners who want to go further, we have already had the support of technology-transfer experts in the South of France to scale-

up but also to conduct a market analysis. Now we are ready to build a spin-off company. To begin, we need advice for the construction of this company. Therefore:

- We would like to be involved in networks of marine-biotech companies sharing expertise in aquaculture and marine products.
- We then need access to all possible clients of these sponge products, whether in the private or public sectors.
- We wish to apply our process to species from other regions of the world and then to collaborate with other countries.
- We are finally ready to cooperate with marine engineers for the development of the automated process that will render our process more robust.

At the end of 2014 this sustainable process will be implemented by the SeaRena cooperative, which will offer easy global access to the sponge-chemical library, but also to the sponge-milking factory.



BAMMBO

Project coordinator: University of Nice
Contact: Prof. Olivier Thomas
Email: Olivier.THOMAS@unice.fr
Website: <http://www.bammbo.eu>