

Sustainably exploiting the sea's treasure trove

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Researchers are looking at environmentally friendly ways of extracting valuable bioactive molecules from marine-based organisms.

The barely explored marine environment has already thrown-up a vast treasure-trove of high-value biomolecules. Among them are anticancer and [antiretroviral drugs](#), antibiotics, nutraceuticals such as [polyunsaturated fatty acids](#) and carotenoids, industrial enzymes, anti-fouling agents, antioxidants with medical, industrial and skin-care applications and a host of other potential active ingredients for the cosmetic and personal-care business.

Now a European research project, called BAMMBO, aims to develop alternative ways to cultivate [marine species](#) and harvest bioactive compounds, balancing environmental, health and economic concerns with a holistic, cradle-to-grave approach. In particular, "the project focused all on [marine invertebrate](#) life, so that included macro-algae, microalgae, sponges, bacteria and fungi", says Patrick Murray, principal investigator at the Shannon Applied Biotechnology Centre of the Limerick Institute of Technology, Ireland, and the scientific co-ordinator for the project. "What is limiting the commercial exploitation of this immense resource is not lack of interest, but rather lack of environmentally sound yet cost-effective methods for cultivation and processing," he tells youris.com.

Because of the short lead-times and potential for attractive commercial returns, this is where most business interest is concentrated right now, believes John Day, head of the culture collection of algae and protozoa at the Scottish Marine Institute in Oban, UK. "If you are asking when commercial production is likely to be realistically achievable, it depends on the sector. With biofuels, cost-wise, we are still out by a factor of 10 to 1,000, depending on who you believe. But if you have a high enough value product, it is achievable now. For [the] pharma sector, the production costs are not the issue, but with clinical trials, you will have a minimum 15-year lead-in time," he tells youris.com.

The prospects of a quick return-on-investment are driving the field's development. "Most people investing in algae-biotech are looking for a relatively quick return," Day points out, "with nutraceuticals, the lead-time is only a year, and the market is already there for parallel products, so you see a lot of people producing carotenoids right now." For example, one advance under study in Limerick centres on extracting carotenoids and polyunsaturated fatty from microalgae solutions using a supercritical fluid carbon dioxide system. "This eliminates the hazards and chemical waste associated with tradition solvent extraction. Also the

yields are higher," says Murray.

Extraction is recognised as one of the key sustainability bottlenecks that needs to be addressed in scaling up such processes. "There is a certain ecological footprint associated with solvent extraction. Until recently, most microalgae work has been on biofuels; there has not been so much on nutraceuticals," says Imogen Foubert at the Laboratory of Food and Lipids, Department of Microbial and Molecular Systems, K.U. Leuven, in Kulak, Belgium. "Therefore, the development of an effective extraction process, based on a more environmentally benign supercritical CO₂ or a bio-based solvent, would be a helpful contribution," she tells youris.com

New processes developed through the project are now being rolled out to the two partner companies. Both are expected to have entered commercial production by the end of the project in 2014.

More information: www.bammbo.eu/

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