

The quest for active substances from marine sources

SPC-coordinated CRISP project searches the region's waters for new medicines¹

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Many medicines come from substances of natural origin. Amongst the most famous is quinine from the bark of the cinchona tree — traditionally used by the Quechua Indians in South America — which became the first effective treatment for malaria in Western medicine. Indigenous peoples' traditional knowledge of plants and their medicinal uses has long been a source for modern medicine. But the chemical resources of the marine environment remain underdeveloped, in particular in the vast Pacific region. And while indigenous people have often seen little or no benefit from the commercialisation of medicines originating from their traditional knowledge, recent research has emphasised respect for ownership of such biological resources and intellectual property and the need to ensure benefits are distributed fairly.

Bioprospecting for resources

One objective of CRISP (Coral Reef Initiatives for the Pacific), project coordinated by the Secretariat of the Pacific Community (SPC) and funded by the French Development Agency (AFD), was to explore poorly known marine territories and search for new substances in sponges or algae with possible therapeutic uses. The project also worked to ensure proper benefit-sharing. Active substances identified in marine organisms may have anti-inflammatory, anti-malarial, cancer-fighting or other beneficial properties. But it can take 12 to 15 years from the initial collection of an organism to the commercialisation of a medicine. Isolating an active substance is a complex process that starts with in-situ sampling (bioprospection) and continues with identification and classification (taxonomy), chemical extraction, screening, isolation

and definition and production of the active compounds (pharmaco-chemistry).

Between 2004 and 2007, bioprospecting in Fiji, Solomon Islands and Vanuatu was conducted by the French Research Institute for Development (IRD) in collaboration with the University of the South Pacific (USP) and local authorities, and in accordance with international and national regulations. The researchers collected 2,500 samples (90% of algae and 10% of invertebrates), which were identified as belonging to 419 species of algae and 169 species of invertebrates.

Promising results

Overall, this bioprospecting led to the discovery of 30 species and one genus new to science as well as the scientific description of remote coral reef habitats never surveyed before. In addition to identifying and classifying specimens, researchers preserved samples and sent them to enrich the collections of various institutions, such as the USP Herbarium, the French National Museum of Natural History in Paris and the Queensland Museum in Australia. Data resulting from the research was also added to scientific databases around the world

Examples of active marine substances discovered in Solomon Islands waters

- ➔ Research on *Agelas mauritiana* enabled the structure of new alkaloids with anti-malarial properties to be described.
- ➔ The sponge species *Theonella swinhoei* and *Coscinoderma mathewsi* were investigated, with the discovery of new metabolites that reveal anti-inflammatory activity.
- ➔ The sponge *Ptilocaulis spiculifer* contained new steroids with cytotoxic activity.
- ➔ Some specimens of the sponge genus *Dysidea* contained substances with anti-malarial and other biological properties.
- ➔ Research on marine brown algae from Solomon Islands led to the discovery of active compounds with anti-inflammatory properties.

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making a considerable contribution to global knowledge of marine biodiversity.

The actual search for active substances was performed exclusively on material collected from Fiji and Solomon Islands. The work to extract and test substances and to isolate and identify active ingredients, carried out in several laboratories in Europe, led to the discovery of 30 new bioactive substances. The bioprospecting proved exceptionally fertile in Solomon Islands, with only 17 of 174 sponges not showing any bioactivity (see box).

Protecting national interests

In addition to those promising results and to answer the concerns of Pacific Island governments over their biological resources and intellectual property, the CRISP project has, from its start in 2005, emphasised the need to improve legal frameworks in Pacific countries to enable better access to marine biological resources and better sharing of benefits. Field studies in Fiji, Solomon Islands and Vanuatu were conducted to assess national legal frameworks in terms of natural resource management, the conservation of marine and coastal environments, scientific research, intellectual property and trade. International biodiversity law and customary practices were

also taken into consideration. The results of those studies are presented in three technical reports that are available on the CRISP website along with a synthesis report including recommendations for improvement.

To further reinforce benefit sharing the CRISP project has also focused on training Pacific Island students in this promising area. Five students from Fiji and two from Solomon Islands were trained — some at USP and some in France — and two of them went on to complete PhDs. Another mark of the success of this initiative is the fact that the research led to the publication of 20 scientific articles in well-regarded journals.

Although the road ahead remains long, the exciting initial results allow hope that this work will lead to new medicines that will benefit the people of the Pacific and all of humanity.

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Tropical marine sponges are great sources of active substances.