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Health & Welfare

Concentrations of anti-inflammatory compounds increased in culture studies of coral, microalgae

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Aquaculture can help boost supplies of marine-based drug components

Pseudopterogorgia elisabethae.

As marine organisms including invertebrates, algae and microorganisms have become established as prolific sources of bioactive marine natural products, the marine environment offers a promising venue for drug discovery. However, the lack of available supply has been a major constraint in the development of this resource. Several marine natural products that have been examined in clinical trials had to be isolated from large collections of marine organisms.

Origin of metabolites

While information about the chemical ecology of marine invertebrates is increasing, little is known about the natural functions of most of these compounds, their distributions within organisms, or their variability among individuals and populations. A key question concerning natural products isolated from invertebrates is to identify the cellular origins of their metabolites. The limited data available to date indicates that many compounds isolated from invertebrates are not produced by the host organisms, but rather are biosynthesized by associated microorganisms.

Anti-irritants from coral

The pseudopterosins and fuscol/fuscosides represent two groups of terpenes isolated from gorgonians (Octocoralia) which exhibit potent anti-inflammatory and analgesic activity. Additionally, the pseudopterosins are used in skin care products due to their anti-irritant properties.

At present, the only source of these compounds is the corals collected from nature. As one possible production method, the authors examined the cellular origins of the compounds. Gorgonians are known to harbor high concentrations of symbiotic dinoflagellates, and identification of a dinoflagellate origin of the natural products could be of great value, as such microalgae can be cultured.

The authors discovered that the pseudopterosins and fuscol, as well as certain biosynthetic intermediates, are present in the purified dinoflagellate symbiont of their respective gorgonians.

In tests, the symbiotic dinoflagellates were purified from coral tissue by repeated centrifugation. High-performance liquid chromatography analysis of an extract of the purified algae revealed the presence of high concentrations of the natural products. The ability of the algae to produce the compounds of interest was confirmed through various biosynthetic experiments.

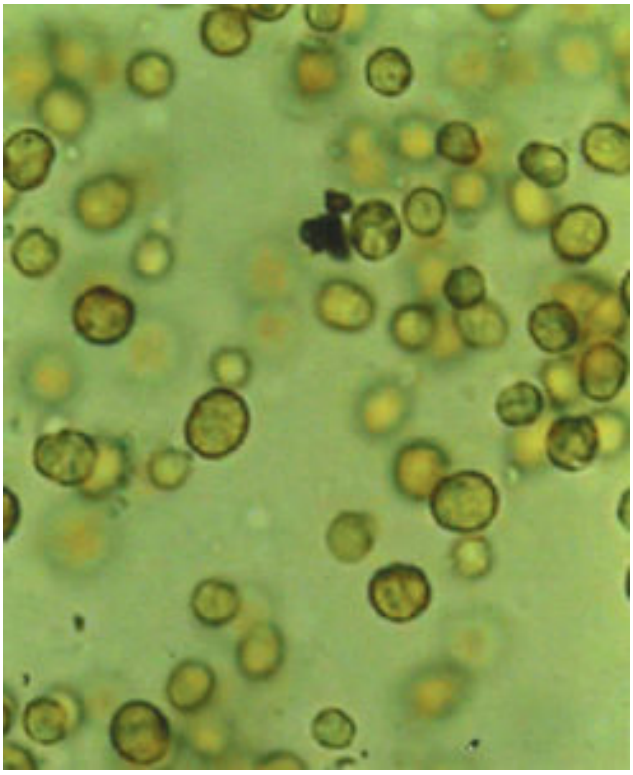
Concentrations increased

The authors have been interested in the possibility of increasing the concentration of pseudopterosins and fuscol/fuscosides in both the gorgonian corals and purified zooxanthellae. This has applications in the production of the natural products in aquaculture or cell culture.

In one set of experiments, intense feeding by the mollusk *Cyphoma gibbosum* resulted in elevated levels of pseudopterosins. The field experiments were conducted by attaching three *C. gibbosum* to *P. elisabethae* specimens in such a way that they could only feed on the coral. Analysis of a branch of the coral prior to and following this treatment indicated the pseudopterosin content increased by 40 percent.

The authors also found that the concentration of pseudopterosins increased approximately 100 percent by decreasing the ultraviolet radiation on specimens of *P. elisabethae*. A clipping of the coral prior to the treatment served as a control with “natural” levels of pseudopterosins. A clipping from the coral following the treatment provided samples with elevated levels of pseudopterosins.

The concentration of natural products such as fuscol in cultured dinoflagellate cells can also be boosted through the use of plant growth factors. The addition of such



Symbiotic dinoflagellate from *P. elisabethae*.

reagents as methyl jasmonate to cultures of symbiotic dinoflagellates can result in increases in fuscol content of 600 percent.

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