

Marine Microbial Symbionts of Marine Invertebrates: The Under-Utilized and Rich Source of Environmentally Friendly Natural Products

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Editorial

Natural products from marine invertebrates greatly expand the chemical diversity available for biotechnological exploitation. Despite a gradual reduction in activities by the pharmaceutical industry in the field of natural compound research in the past 25 years, an average of two new natural compounds were approved as drugs per year during this period [1].

One of the most serious bottlenecks in developing natural products from marine sources during the past decades has been the availability of biomass and/or of optimized cultivation conditions to gain sufficient amounts of substances for preclinical and clinical studies. It is also almost impossible to harvest such large amounts of organisms from nature without destroying the habitats [2-4]. Further problems occur in scenarios in which aquaculture is seen as an alternative solution but sufficient amounts cannot be produced due to low yield compared to wild samples of invertebrates [5].

It has been very well established for more than half a century that terrestrial bacteria and fungi are sources of valuable bioactive metabolites [6]. It has also been noted that the rate at which new compounds are being discovered from traditional microbial resources, however, has diminished significantly in recent decades as exhaustive studies of soil microorganisms repeatedly yield the same species which in turn produce an unacceptably large number of previously described compounds. Therefore, it is reasonable to expect exploration of untapped marine microbial diversity. In particular, the studies regarding screening of secondary metabolite-producing bacterial symbionts are important for understanding their biotechnological potential. In this context, it is critical to assess the application of sustainable approaches for the screening of invertebrate-associated microbial populations. In almost all cases, the development and production of reef invertebrate-derived drugs is seriously hampered by the environmental and technical problems associated with collecting or cultivating large amounts of animals (or organisms).

Because most of the macroorganisms contain a great variety and considerable amounts of associated microorganisms, the importance of studying the ability of these microorganisms to produce secondary metabolites is now recognized [7]. This phenomenon has raised the

importance of microbial symbionts of reef invertebrates as prolific sources of secondary metabolites with diverse biological activities applicable for health and industrial purposes. The existence of secondary metabolite-producing microbial symbionts is therefore especially intriguing, because a sustainable source of invertebrate-derived drug candidates can be generated by establishing symbionts in culture or by transferring symbiont biosynthetic genes into culturable bacteria.

The increasing need for new marine natural products for the treatment of clinical diseases coupled with the recognition of marine microbial symbionts of reef invertebrates as a rich source of suitable substances for these purposes provide a strong rationale for focusing marine organisms in the search for novel marine natural products. Efforts have been mounted to enforce research on marine natural products in particular to promote the use of microorganisms that enable large-scale production of marine natural products in laboratory cultures thereby avoiding any harm to coastal ecosystems.

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