Public Lecture

Sustainable Oceans – Our Treasure in the Past and in the Future: Power of Molecular Biology

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All welcome!

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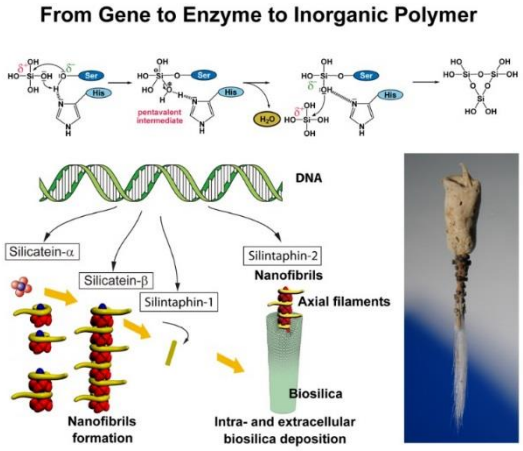
In the last decade the phylogenetically oldest metazoan phylum, the Porifera (sponges) gained special interest. Mainly due to the introduction of molecular biological techniques solid evidence was elaborated which indicated that this phylum provides a cornucopia of new information which allows a grasping for the understanding of the dynamics of evolutionary processes occurring during the Earth period of Ediacara until today. Furthermore, the species of this phylum are rich and valuable sources for bioprospecting, the translation of life-science discoveries into practical products or processes for the benefit of the society.

BIOPROSPECTING: The field of bioprospecting of Porifera may be of tremendous potential benefit for humans from the applied point of view. Taking into account that the chemical diversity of the natural bioactive compounds obtained from the marine biota is much higher than the one of those compounds, synthesized in standard combinatorial chemistry approaches, and also that natural compounds display an impressively high selectivity, the high value of the secondary metabolites from natural resources in general and from sponges in particular can only be roughly imagined. Until now only in one case a bioactive compound from sponges is applied in clinics, arabinofuranosyladenine (ara-A) as antiviral drug; ara-A is a derivative of a lead structure isolated from a sponge.

THE FUTURE – EVOCHEMISTRY: Thanks to the progress initiated by the pressure of the society for a sustainable use of natural resources for human benefit, the exploitation of natural biodiversity became possible through the application of the techniques of molecular biology and modern cell biology.

NOVEL DIRECTIONS: BIOMATERIALS. There is an increasing need for novel materials to be used as scaffolds in biomaterials in general and in tissue engineering (bone and cartilage) in particular. Siliceous sponges are unique in their ability to synthesize their silica skeleton enzymatically. The responsible enzymes, the silicateins which have been isolated from demosponges, polymerize alkoxide substrates to silica. Silica is an important component of materials such as bioactive glasses and composites based on glasses, ceramics and (organic) polymers. New strategies for the structure-directed synthesis of amorphous silica (biosilica) can now be envisaged.

CONCLUSION: It is fortunate that, according to the fossil records, the phylogenetic oldest metazoan phylum, the Porifera did not become extinct during the last 800 million years. Considerable impact in biotechnology can be expected from studies on the recombinant preparation of bioactive, low-molecular weight compounds and of the development of new biomaterials [biosilica] from marine sources.



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