The Colorful Chemistry of Mushrooms and Marine Animals

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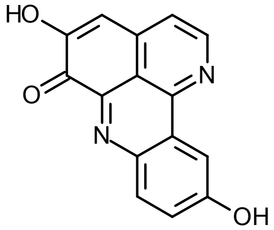
Mushrooms produce a great variety of metabolites, whose biosyntheses can serve as models for simple laboratory syntheses. Thus, necatorone (**1**) is formed biosynthetically from anthranilic acid and tyrosine, an unusual oxidative C-N bond formation being the key step. Mimicking this reaction in the laboratory allowed a simple synthesis of **1**, which could also be applied to bisdemethylaaptamine, an alkaloid from marine sponges. The latter is biosynthetically related to halitulin, a marine alkaloid exhibiting pronounced cytotoxic activities.

Structurally similar to halitulin are bisindolylmaleimides and indolocarbazoles from slime moulds (myxomycetes) as well as several 3,4-diarylpyrrole alkaloids from marine animals. Following biogenetic considerations, a general synthesis of these compounds via oxidative dimerization of aromatic α-keto acids could be developed. The value of this method will be demonstrated on the synthesis of lamellarin K.

A manifold of novel indole alkaloids is produced by the lipophilic yeast *Malassezia furfur* if tryptophan is added to the culture medium, an important discovery made by Dr. Peter Mayser, a dermatologist from the University of Giessen. It led to the discovery of pityriarubin A (**2**), malassezin (**3**) and a variety of other novel indole alkaloids. Interestingly, their biological activities might be related to some clinical symptoms of pityriasis versicolor, a common skin disease caused by *M. furfur*.

Finally, the fascinating ability of mushrooms to synthesize structurally unique molecules from simple precursors will be illustrated by some new pigments from fruit bodies of *Mycena* sp., *Boletus curtisii* and the "flower-pot" mushroom *Leucocoprinus birnbaumii*.



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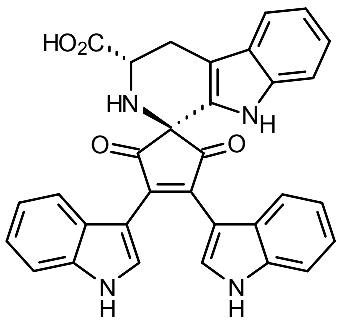

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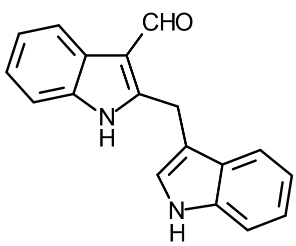

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