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Cultivating Bioactive Chemicals

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Abstract: Natural products chemistry in the 21st century has advanced beyond the extraction, isolation, identification of natural compounds in plants, animals and micro-organisms and their subsequent derivatization. Various points in a given biosynthetic pathway can be controlled simultaneously, either by over-expression and/or suppression of selected enzymes, or through the use of transcriptional regulators to control endogenous genes. It is therefore now possible to decide not only which biological entity should produce which compound of interest but in what quantity. Further, it is now also possible to quench biosynthetic reactions at stages of chemical intermediates and introduce new pathways leading to compounds of advantage to medicine or industry. Combination of cell suspension culture methods with synthetic organic chemistry offers interesting opportunities for the synthesis of complex natural products of medicinal significance especially with fore-knowledge of ethno-botany and ethno-medicine. While combinatorial chemistry has demonstrated that it is certainly of value in the process of lead optimization, nature itself presents the most diverse and complete source of leads. A relatively recent approach that unites the strengths of combinatorial chemistry and natural product identification is a process referred to as combinatorial biosynthesis. Combinatorial biosynthesis is a tool in the generation of novel natural products, as well as for the production of rare and expensive natural products. The basic concept of combinatorial biosynthesis is to combine metabolic pathways in different organisms at the genetic level. In this technique, the pathway leading to the production of a natural product is identified and the genetic basis of it elucidated. Genetic modifications of the organism are then made causing the production of different biologically active products. These products can then be evaluated for target therapeutic potency in various screens. Plant cell cultures provide specific enzyme systems that could be effectively utilized as reagents in the biotransformation of intermediate natural products to obtain desired end products. Such enzymatic conversions are more advantageous over bench synthetic routes since the overall synthetic route is more efficient. Also, the use of enzymatic conversion could be employed to evaluate and obtain important information about biosynthetic pathways leading to isolation of useful chemical intermediates for medicinal and industrial purposes. One may thus say that chemical synthesis has experienced a paradigm shift to the cultivating field as plants could be cultivated and manipulated for the sole purpose of producing chemical entities to feed specialized industries.

Key words: *Natural products Chemistry; Combinatorial Chemistry; Combinatorial biosynthesis; Enzyme based Chemosynthesis*

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