
Preface

Nonribosomal peptide synthetases (NRPSs) and polyketide synthases (PKSs) are fascinating families of enzymes from many standpoints. These biosynthetic enzymes share a common logic with fatty acid synthases (FASs), thiotemplate-guided assembly of metabolites. The NRPSs, PKSs, and FASs can be combined in pathways (and singular enzymes) to biosynthesize hybrid molecules. They are often very large, multienzyme polypeptides that form some of the largest protein structures in the cell. These molecular assembly lines utilize complicated substrate shuttling routines to form their products from an array of over 500 documented monomer subunits. NRPS and PKS biosynthetic pathways produce a wide range of bioactive compounds from the well-known medicines penicillin, tetracycline, erythromycin, lovastatin, cyclosporine, and vancomycin, to the widely used herbicide phosphinothricin tripeptide (Bialaphos, Basta, Glufosinate) to deadly toxins such as microcystin, aflatoxin, and gliotoxin. The variety and importance of the products of thiotemplate pathways has spurred investigation into NRPS and PKS biosynthesis. The modular nature of these pathways and the complex, high value and sometimes deadly nature of their pathways make them tantalizing targets for bioengineering. Research in NRPS and PKS biosynthesis has accelerated in recent years with the rapid rise in available genome sequence data. It is within this context that this volume is presented. We have assembled an overview of NRPS and PKS structure and function (Part I) followed by methods for analysis of these pathways including conventional enzymological assays, contemporary mass spectrometric analysis techniques, specialized molecular biological approaches applicable to NRPSs and PKSs, and small molecule analysis tools tailored to this very special class of natural products (Part II), and finally bioinformatics tools for the analysis of these enzymes, pathways, and molecules (Part III). We anticipate reaching researchers in the field whose backgrounds are in the disciplines of enzymology, microbiology, structural biology, genomics, proteomics, bioinformatics, and natural products chemistry. This compilation should serve as a reference for those experienced in studying NRPS and PKS enzymes, pathways, and natural products as well as a gateway for those just entering the field.

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