## The Complete Book on Biotechnology Based Bulk Drugs

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Biotechnology has played an essential role in the development of the healthcare chemical industries. The range of product includes diagnostic, prophylactic and therapeutic agents. The discovery of a potentially active compound starts a sequence of exhaustive chemical and biological testing that may culminate in manufacture of the agent or an improved analog. The role of biotechnology in this complex path to regulatory approval and marketing is diverse. Biotechnology is a field of applied biology that involves the use of living organisms and bioprocesses in engineering, technology, medicine and other fields requiring bio products. Biotechnology also utilizes these products for manufacturing purpose. Some of the examples of drugs produced through biotechnology are penicillin, lincomycin, streptomucin, tylosin, peptide antibiotics, cephalosporins, etc. Modern use of similar terms includes genetic engineering as well as cell and tissue culture technologies. Biotechnology draws on the pure biological sciences and in many instances is also dependent on knowledge and methods from outside the sphere of biology. Conversely, modern biological sciences are intimately entwined and dependent on the methods developed through biotechnology and what is commonly thought of as the life sciences industry. The development of biotechnology is taking place in almost all fields of human life. The recent advances in the field of basic genetics have opened up new vistas, potentials and possibilities.

Some of the fundamentals of the book are the pharmaceutical industries, marketing strategy, common features in the evolution of products and processes, process technology fermentation, product recovery, new trends in biotechnology, penicillins, biosynthesis and regulation of thienamycin, olivanic acids and epithienamycins, aminoglycoside antibiotics, streptidine and deoxystreptamine, streptomycin, neomycin, paromomycin, ribostamycin and, butirosin gentamicin, micronomicin and sisomicin, tylosin, peptide antibiotics, current applications of peptides, blasticidin S: an agricultural antibiotic bleomycin and bestatin: peptides used in anticancer therapy etc.

The present book contains process of biotechnology based bulk drugs like penicillin, B lactam antibiotics, aminoglycoside antibiotics, peptide antibiotics, anti cancer agents, lincomycin etc. This is very resourceful book for entrepreneurs, technocrats, research scholars, libraries etc.

CHAPTER 1 INTRODUCTION The Pharmaceutical Industries Marketing Strategy Common Features in the Evolution of Products and Processes Process Technology Fermentation Product Recovery New Trends in Biotechnology

CHAPTER 2 PENICILLINS **Historical Perspective History Biosynthetic Penicillins Process Overview** Fermentation Technology The Culture: Strain Development Mutation Selection Genetics Fermetation Process : Flow Sheet Facilities **Inoculum Development** Fermentation Stage: Medium **Process Control** Physiological Variables and Their Effect on Product Formation Duration of the Fermentation **Recovery of Penicillin** Carbon Process (Obsolete) Solvent Extraction Process (Industry Standard) **Process Overview** Filtration Solvent Extraction **Carbon Treatment Further Extraction** Crystallization Drying **Further Processing** Penicillin Acid Process (State of the Art) Semisynthetic Penicillins 6-Aminopenicillanic Acid Enzymic Cleavage of Penicillins to Yield 6-Aminopenicillanic Acid Chemical Preparation of 6-Aminopenicillinic Acid Synthesis of Clinically Useful Penicillins and Closely Related Congeners Automation **Process Economics** Costs

CHATPER 3 NOVEL ï•¢-LACTAM ANTIBIOTICS Thienamycin Discovery Chemistry Pharmacological Activity Chemical Synthesis Biosynthesis and Regulation of Thienamycin Biosynthesis

Regulation **Classical Fermentation Process** Introduction Seed Stages **Production Stage Fermentation Process Development** Strain Improvement **Fed-Batch Techniques** Synthetic Media **Novel Fermentation Processes Ultrafiltration Coupled Fermenter** Immobilized Cells Thienamycin Purification **Future Prospects Market Projections Clavulanic Acid** Introduction Production Market **Olivanic Acids and Epithienamycins** Nocardicins Introduction Production of Nocardicin A **Market Projections Monobactams CHAPTER 4** AMINOGLYCOSIDE ANTIBIOTICS Streptidine and Deoxystreptamine Streptomycin Neomycin, Paromomycin, Ribostamycin and Butirosin Gentamicin, Micronomicin and Sisomicin Fortamine and Fortimicins **Mutasynthesis** A-Factor Metabolic Grid Manufacture Fermentation Microorganisms Equipment **Inoculum Development** Media Procedures Isolation Strain Improvement **CHAPTER 5** 

TYLOSIN Production Technology Structure of Tylosin and Related Compounds Biosynthetic Pathway Growth of Producer Microorganisms Product Recovery and Purification Product Development Development in the Genetic Improvement of Producing Strains Developments in Fermentation Technology

CHAPTER 6 PEPTIDE ANTIBIOTICS **Current Applications of Peptides** Blasticidin S : an Agricultural Antibiotic Bleomycin and Bestatin: Peptides used in Anticancer Therapy Cyclosporin: an Immunosuppressor Structural Types of Peptides **Biosynthesis of Peptide Antibiotics Ribosomal and Nonribosomal Mechanisms** Reactions Involved in Enzymatic Peptide Formation **Carboxyl Activation** Peptide Bond Formation **Modification Reactions Production of Peptides Screening Methods Biotechnological Production Methods** Improvements and Modification Procedures **Compilation of Peptides** Abbreviations Used in the Table Alternative Names and Synonyms Compounds Listed in the Table Appendix **CHAPTER 7** STREPTOMYCIN AND COMMERCIALLY IMPORTANT AMINOGLYCOSIDE ANTIBIOTICS Generalities on Aminoglycoside Antibiotics Historical Background Structure of Different Classes of Aminoglycoside Antibiotics Microbiological Activity and Clinical use Mode of Action Problems with Toxicity and Bacterial Resistance Toxicity **Bacterial Resistance** Streptomycin Generalities **Physicochemical Properties** 

Assay and Identification Methods Assay Methods

Identification Methods

Biosynthesis

Production Technology

Fermentation

Product Recovery

Other Major Aminoglycoside Antibiotics

Screening and Genetic Engineering of Strains for New Aminosides

Screening of new strains

Use of Idiotrophic Mutants

Structural Modification of Known Aminosides

Hemisynthesis

Bioconversion

Chemical Synthesis of New Aminosides Streptothricins, Aminoglycoside-like Antibiotics Structure Physicochemical and Biological Properties Production by Fermentation and Isolation Uses Marketing Prospects **CHAPTER 8 CEPHALOSPORINS** Mode of Action of Cephalosporins Structure and Biosynthesis of Bacterial Cell Wall Sensitivity and Resistance Structure/Activity Relationships Cephalosporin Market **Biosynthesis of Cephalosporins Biosynthesis Pathway Regulation of Cephalosporin Biosynthesis** ï•¡-Aminoadipic Acid Valine Cysteine Effect of Oxygen Tension **Catabolite Repression** Specific Growth Rate **Fermentation Process** The Fermenter-Its Design and Instrumentation Fermentation Microbiology **Production Kinetics** Strain Development **Fermentation Development** Alternative Process-DAC Process **Recovery Process** Purification of Cephalosporin C Cleavage of Cephalosporin C to 7-ACA **CHAPTER 9** COMMERCIAL PRODUCTION OF CEPHAMYCIN ANTIBIOTICS **Cephamycin Product Description** Discovery Mode of Action Cefoxitin **Physicochemical Characteristics** Cephamycin C Assay Techniques Fermentation Microbiology Introduction

Discovery Mode of Action Cefoxitin Physicochemical Characteristics Cephamycin C Assay Techniques Fermentation Microbiology Introduction Metabolic Origins Carbon Metabolism Nitrogen Metabolism Sulfur Metabolism Phosphate Metabolism Cephamycin Production Technology Inoculum Development Stage Antibiotic Production Stage Isolation and Purification Stage Conclusions and Implications

CHAPTER - 10 LINCOMYCIN Discovery Chemistry Spectrum Mode of Action Lincomycin Assays for Fermentation Development and Production **Production Technology** Lincomycin Biosynthesis Fermentation Lincomycin Production by Other Actinomyces Species **Fermentation Power Requirements** Isolation Chemical Derivatives of Lincomycin **Commercial Markets** Current Manufacturers Product Outlook

CHAPTER 11 PHARMACOLOGICALLY ACTIVE AND RELATED MARINE MICROBIAL PRODUCTS Pharmocologically Active Compounds From Marine Microorganisms Products From the Culture of Microalgae in Coastal Ponds Agricultural Applications Conclusions

CHAPTER - 12 ANTICANCER-AGENTS The Drug Development Process Market Information Containment Technology for Cytotoxic Agents **Containment of Process Equipment Personnel Protection Decontamination of Waste Streams** Microbial Process Examples Fermentation Processes for Production of Anthracyclines Strain Improvement **Batch Fermentation Processes** Isolation and Purification Fermentation Processes for Production of Nucleosides Strain Improvement **Batch Production Process Therapeutic Enzymes** Batch and Continuous Fermentation Processes **Isolation and Purification** Examples of Products of Mammalian Cells in Culture Interferon Production Fibroblast Processes (HuIFN-ï•¢) Leukocyte Processes (HulFN-a) Lymphoblastoid Processes (Hu Ly, IFN) Immune Interferon Processes (HuIFN-Y)

Future Technologies: Lymphokines and Monoclonal Antibodies Summary Appendix

**CHAPTER 13 SIDEROPHORES** The Need for Iron-Solubilizing Agents The Role of Siderophores Uptake and Release of Iron from the Siderophore Complex **Production of Siderophores Conditions for Siderophore Production** Extraction Adsorption Ion-exchange Chromatography **Restricted Growth** Protein Binding of Contaminant Iron **Range of Molecular Structures Hydroxamates** Catecholates (sometimes referred to as phenolates) Siderophores with Antibiotic Activity Sideromycins Interference with Iron Uptake Siderophore Analogues Sideromycins Extraction and Purification of Siderophores Mycobactin Enterochelin Ferrichrome Commercial Production of Desferrioxamine B (Desferal) Uses of Siderophores Iron Metabolism in the Body Iron Poisoning and Chelation Therapy Haemochromatosis and Chelation Therapy Chelation Therapy Other Medical Application for Siderophores Applications for Siderophores Outside Medicine **Future Trends** CHAPTER 14 STEROID FERMENTATIONS **Bioconversions of Practical Importance Bioconversions of Limited or Potential Practical Importance** Progesterone Side Chain Cleavage **Ring A Aromatization** 17 and 21-Hydroxylations **Alternative Bioconversion Methods** Sterol Degradation Steroid Solubility Methods of Steroid Addition

Steroid Conversion in Organic Solvents Future Trends in Steroid Bioconversions Recovery of Steroids Split Process Whole-beer Process Cake-extraction Process Products of Commercial Importance Summary

CHAPTER 15 RODUCTS FROM RECOMBINANT DNA Production Technology Methods for Cloning and Expression Range and Relative Advantages of Host Microorganisms Stability of Strains and Plasmids Product Recovery and Purification Commercial Markets Markets for Recombinant Products

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