

scientific expertise – medics, physicists, engineers, chemists, biochemists and molecular biologists. It will be the multidisciplinary collaborations that arise as a consequence of such meetings that will provide the high-sensitivity microarray technologies of the future.

References

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Pharmaceutical Biotechnology (2nd Edition)

Edited by Daan J.A. Crommelin and Robert D. Sindelar,

Taylor and Francis, 2002, 425 pages in paperback, ISBN: 0-415-28501-1

In the past decade, pharmaceutical biotechnology has rapidly evolved at the interface of molecular biology, molecular genetics, bioengineering, (protein, sugar and nucleic acid) chemistry and pharmaceutical sciences to become a multidisciplinary field on its way to providing treatments for serious life-threatening diseases (e.g. cancer, viral infection, hereditary deficiencies). For such an ambitious goal, pharmaceutical biotechnology has to integrate solid pharmaceutical science and a strong industrial implementation, exemplified by an eightfold increase in worldwide total sales of the US pharmaceutical industry in the past twelve years. Conceiving an up-to-date pharmaceutical biotechnology textbook that trains next-generation pharmacy students, as well as updating pharmacists and pharmaceutical scientists on basic research and biopharmaceutical manufacturing topics is a formidable challenge, and one which the editors, together with their various academic and industrial experts, have accomplished to a high standard with the 2nd Edition of *Pharmaceutical Biotechnology*.

This textbook comprises 20 chapters, many of which contain industrial case-studies of blockbuster drugs, thus giving this textbook an industrial scope that is difficult to find elsewhere. All the chapters are easy to read and well illustrated to aid understanding of the interdisciplinary content. Key scientific information is referenced for the advanced reader. Each chapter is authored by experts in the field and contains a good introductory section and an in-depth discussion of each topic, as well as a well-designed Q&A section, which enables self-assessment or facilitates the integration of each chapter's essentials. Although the topics and scientific information flow well from chapter to chapter, each chapter is conceived in a stand-alone manner, allowing one to consult specific topics.

Chapter 1 contains a concise yet complete overview of molecular biotechnology essentials, including gene expression in pro- and eukaryotic cells, recombinant DNA technology and specific DNA techniques, as well as an introduction to the key systems that are used for biopharmaceutical manufacturing – microbial, animal and plant cell cultures.

Chapter 2 provides an insight into the biophysical, biochemical and structural analysis of recombinant proteins. The factors at work during protein folding are described, as are the standard technologies (immunoassays, electrophoresis, chromatography and mass spectrometry) that are essential for

the quality control of protein pharmaceuticals.

The production and downstream processing of biotech products is covered in chapter 3. This chapter touches upon production issues, including expression and cultivation systems and medium components, together with the problems associated with contaminants. Because of the argument that prokaryotes are unable to provide the desired glycosylation of protein pharmaceuticals, the authors focus on eukaryotic production systems, thereby neglecting certain advantages that microbial configurations have shown in the production of non-glycosylated protein therapeutics. Downstream processing is well covered, taking advantage of the introduction to basic purification technologies included in chapter 2.

Chapters 4 and 5 provide a detailed insight into the biopharmaceutical considerations of protein pharmaceuticals, as well as their pharmacokinetics and pharmacodynamics. Controlled and site-specific delivery technologies are well described.

Chapter 6, entitled 'Genomic, proteomics and additional biotechnology-related techniques' provides an extensive coverage of diagnostics, therapeutic molecular interventions and drug discovery. General topics, including transgenic animals, tissue engineering and glycobiology are smoothly integrated

with a more specific in-depth coverage of proteomics, protein engineering, nucleic acid-based transcript modulation and catalytic antibodies.

Gene therapy is a focus of chapter 7, which provides state-of-the-art information on non-viral, retroviral, adenoviral and adeno-associated virus-based transduction technologies. As an emerging technology, gene therapy remains insufficiently represented in the 2nd Edition of *Pharmaceutical Biotechnology*. More information on lentiviral gene transfer systems and a more extensive discussion of past and current clinical trials would have been useful.

Starting with chapter 8, *Pharmaceutical Biotechnology* refocuses from basic technological considerations to a detailed description of disease phenotypes, pharmaceutical issues and clinical aspects of different classes of

protein pharmaceuticals, including hematopoietic growth factors (chapter 8), interferons and interleukins (chapter 9), insulin (chapter 10), growth hormones (chapter 11), vaccines (chapter 12), monoclonal antibody-based pharmaceuticals (chapter 13; coverage of monoclonal antibody-based therapies is extended by industrial cases studies that focus on blockbuster therapies such as Herceptin®, ReoPro®, Zenapax® and Simulect®), recombinant thrombolytic agents (chapter 14), recombinant coagulation factors (chapter 15), recombinant human deoxyribonuclease (chapter 16) and follicle-stimulating hormones (chapter 17). *Pharmaceutical Biotechnology (2nd Edition)* concludes with three stand-alone chapters that describe the practical aspects associated with the dispensing of biotechnology products (chapter 18), economic considerations in

medical microbiology (chapter 19) and an outlook on different product types that are currently in the pipeline (chapter 20).

The editors and authors have succeeded in producing an interdisciplinary textbook that integrates basic and applied knowledge of the discovery, administration and manufacturing of pharmaceuticals. *Pharmaceutical Biotechnology (2nd Edition)* is focused on protein and gene-based therapies; small-molecule drugs, including antibiotics, immunosuppressives and anticancer drugs, remain to be considered in one of the future editions.

Martin Fussenegger
Institute of Biotechnology
ETH Zurich
Switzerland

e-mail: fussenegger@biotech.biol.ethz.ch

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