# Therapeutic Dressings and Wound Healing Applications

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# Therapeutic Dressings and Wound Healing Applications

**Edited by**

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# Series Preface

The series *Advances in Pharmaceutical Technology* covers the principles, methods and technologies that the pharmaceutical industry uses to turn a candidate molecule or new chemical entity into a final drug form and hence a new medicine. The series will explore means of optimizing the therapeutic performance of a drug molecule by designing and manufacturing the best and most innovative of new formulations. The processes associated with the testing of new drugs, the key steps involved in the clinical trials process and the most recent approaches utilized in the manufacture of new medicinal products will all be reported. The focus of the series will very much be on new and emerging technologies and the latest methods used in the drug development process.

The topics covered by the series include the following:

***Formulation*:** The manufacture of tablets in all forms (caplets, dispersible, fast-melting) will be described, as will capsules, suppositories, solutions, suspensions and emulsions, aerosols and sprays, injections, powders, ointments and creams, sustained release and the latest transdermal products. The developments in engineering associated with fluid, powder and solids handling, solubility enhancement, colloidal systems including the stability of emulsions and suspensions will also be reported within the series. The influence of formulation design on the bioavailability of a drug will be discussed and the importance of formulation with respect to the development of an optimal final new medicinal product will be clearly illustrated.

***Drug Delivery*:** The use of various excipients and their role in drug delivery will be reviewed. Among the topics to be reported and discussed will be a critical appraisal of the current range of modified-release dosage forms currently in use and also those under development.

The design and mechanism(s) of controlled release systems including macromolecular drug delivery, microparticulate controlled drug delivery, the delivery of biopharmaceuticals, delivery vehicles created for gastrointestinal tract targeted delivery, transdermal

delivery and systems designed specifically for drug delivery to the lung will all be reviewed and critically appraised. Further site-specific systems used for the delivery of drugs across the blood–brain barrier including dendrimers, hydrogels and new innovative biomaterials will be reported.

***Manufacturing*:** The key elements of the manufacturing steps involved in the production of new medicines will be explored in this series. The importance of crystallization; batch and continuous processing, seeding; and mixing including a description of the key engineering principles relevant to the manufacture of new medicines will all be reviewed and reported. The fundamental processes of quality control including good laboratory practice, good manufacturing practice, Quality by Design, the Deming Cycle, regulatory requirements and the design of appropriate robust statistical sampling procedures for the control of raw materials will all be an integral part of this book series.

An evaluation of the current analytical methods used to determine drug stability, the quantitative identification of impurities, contaminants and adulterants in pharmaceutical materials will be described, as will the production of therapeutic bio-macromolecules, bacteria, viruses, yeasts, molds, prions and toxins through chemical synthesis and emerging synthetic/molecular biology techniques. The importance of packaging including the compatibility of materials in contact with drug products and their barrier properties will also be explored.

*Advances in Pharmaceutical Technology* is intended as a comprehensive one-stop shop for those interested in the development and manufacture of new medicines. The series will appeal to those working in the pharmaceutical and related industries, both large and small, and will also be valuable to those who are studying and learning about the drug development process and the translation of those drugs into new life-saving and life-enriching medicines.

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# Preface

Wounds and their effective healing constitute a common and current global medical concern with several challenges, including the increasing incidence of obesity and type 2 diabetes, an ageing population that has increased the incidence of chronic (difficult to heal) wounds, and the requirement for more effective but also cost-effective dressings. Wounds can be chronic or acute and can result from burns, amputation, surgical procedures, or underlying medical conditions. Innovative dressings that take an active part in wound healing in a more rapid manner and at reasonable cost are currently an unmet public health need. Although there are several dressings on the market, not all of them take an active part in wound healing; instead, they depend on the body's natural physiological tissue processes, which are normally compromised in patients with underlying medical conditions and in those who are highly traumatized, such as combat personnel and mass casualties.

Therefore, interest has shifted in academic research laboratories, industry, and general clinical practice towards more advanced therapeutic dressings that are biologically active and usually involve multi-disciplinary approaches spanning molecular biology, biomaterial/polymer science, biochemistry, formulation science, and biopharmaceutics. These include medicated dressings, biomaterial-based biological dressings (biological and naturally derived), tissue-engineered scaffolds, as well as nanotechnology.

This book systematically covers various aspects of the above advanced wound healing therapies and is divided into three main themes. The book comprises 17 chapters written by various authors who are widely recognized in their fields of expertise. The first six chapters focus on the physiological and molecular basis of wounds and their healing, including the various types of chronic wounds as well as some of the complicating and risk factors, such as infections and dead tissues, and how to manage these from a clinical perspective. Chapters 7–9 focus on advanced moist modern dressings such as wafers and hydrogels as well as on nanotechnology-based silver dressings. Finally, Chapters 10–17 address more advanced and novel approaches to wound healing, including gene therapy-based dressings, tissue engineering, delivery of growth factors, electrospun dressings, biomaterial-based dressings,

and the use of three-dimensional (3D) printed scaffolds embedded with cells and other active entities that take part in tissue regeneration.

Most importantly, I would like to personally thank all of the authors for their willingness to contribute to this book in the first place, and for preparing their chapters with due diligence and a sense of purpose to meet the agreed deadlines.

Joshua Boateng