Nano Drug Delivery Strategies for the Treatment of Cancers

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Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, United Kingdom
525 B Street, Suite 1650, San Diego, CA 92101, United States
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom

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British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-819793-6

Publisher: Stacy Masucci
Senior Acquisitions Editor: Rafael E. Teixeira
Senior Editorial Project Manager: Pat Gonzalez
Production Project Manager: Niranjan Bhaskaran
Cover Designer: Mark Rogers

Typeset by MPS Limited, Chennai, India

Contents

CHAPTER

12

Nanomedicine-based multidrug resistance reversal strategies in cancer therapy

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12.1 Introduction

The clinical efficacy of chemotherapy of cancer cells is limited due to many factors, including the undesired distribution of cytotoxic drugs to healthy vital cells, low bioavailability in the tumor microenvironment, and the development of multidrug resistance (MDR). Biedler and Riehm (1970) reported the concept of MDR in chemotherapy way back in the 1970s. Briefly, MDR in cancer cells can be defined as the resistance of cells to any anticancer agent accompanied by other chemotherapeutic drugs, which possess different structures and functional moieties, or it can also be defined as a condition of resilience against structurally and functionally dissimilar drugs (Harris & Hochhauser, 1992).

The MDR phenomenon is a consequence of multiple factors, including p-glycoprotein pump mediation, the upregulation of adenosine triphosphate (ATP)-binding cassette (ABC) transporter proteins, hypoxia, xenobiotics factors, and p53 gene mutation, etc. MDR can be classified into various groups according to the associated mechanisms such as increased drug efflux by efflux pumps, decreased influx, and increased concentration of metabolizing enzymes such as cytochrome p450 that rapidly metabolize and inactivate internalized chemotherapeutic agents, increased DNA repair, and the termination of the

*Equal contributions to the chapter.

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DOI: https://doi.org/10.1016/B978-0-12-819793-6.00013-8