METHODS IN MOLECULAR BIOLOGY

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Virus-Derived Nanoparticles for Advanced Technologies

Methods and Protocols

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Humana Press

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ISSN 1064-3745 ISSN 1940-6029 (electronic)
Methods in Molecular Biology
ISBN 978-1-4939-7806-9 ISBN 978-1-4939-7808-3 (eBook)
https://doi.org/10.1007/978-1-4939-7808-3

Library of Congress Control Number: 2018940647

Printed on acid-free paper

This Humana Press imprint is published by the registered company Springer Science+Business Media, LLC part of Springer Nature.
The registered company address is: 233 Spring Street, New York, NY 10013, U.S.A.

Preface

Nanotechnology is a subject that continues to attract considerable public interest, not all of it favorable. Indeed, nanoparticles themselves can, in certain cases, such as those associated with diesel emissions, be considered harmful. However, there are an increasing number of examples of the beneficial deployment of nanoparticles for a variety of different applications ranging from their use in medicine to create novel diagnostics or therapies through to the design and fabrication of nano-scale electronic devices.

One prerequisite for any application involving nanoparticles is the availability of a source of the particles with consistent size and properties; it is also highly desirable that the properties should be modifiable in a controlled manner. Biologically produced nanoparticles, such as viruses and virus-like particles (VLPs), have these desirable features. In addition, virus particles and VLPs, often collectively known as viral nanoparticles (VNPs), are in many cases capable of self-assembly, are generally biocompatible, and may be modified genetically as well as chemically. Due to these features, it is therefore unsurprising that they have attracted considerable attention for use as nanoparticles for a number of applications and are now being introduced into "real-world" fabrication processes.

In this volume, we have assembled protocols for the use of VNPs for a number of different applications. The protocols have been divided into three parts: Part I concerns the production of a variety of VNPs derived from plant, animal, and bacterial viruses using both prokaryotic and eukaryotic expression systems; it also includes protocols for the incorporation of the VNPs into supramolecular structures. Part II includes protocols for the encapsulation of heterologous materials within VNPs, essentially using them as nano-containers. Part III describes the modification of the outer surface of VNPs, combined approaches, and how such modified VNPs can be developed into functional entities. Inevitably, there is a certain degree of arbitrariness in the assignment of a given chapter into a particular part of this volume but we feel that it is, nonetheless, useful. We anticipate that those interested in using VNPs will be able to "mix and match" the technologies described to achieve the particular result they require.

Finally, we would like to offer our sincerest thanks to all the authors of the various chapters that have made this volume possible. We commend you for your attention to detail in the preparation of the protocols and, particularly, for your forbearance regarding the length of time that it has taken to produce the final version of this volume. We also thank Anke Liedek and Kerstin Ruoff for their excellent help with the editing of the contributions, John M. Walker for his continuous supportive advice, and all those at Springer involved in the publication process.

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