

Cambridge University Press

978-0-521-85020-9 - The Biology of Schwann Cells: Development, Differentiation and Immunomodulation

Edited by Patricia Armati

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The Biology of Schwann Cells

Schwann cells are a diverse group of cells formed from neural crest cells. They are essential components of the peripheral nerves of both vertebrate and invertebrate nervous systems. The diversity of Schwann cell subsets and function is seen in those Schwann cells that form myelin – that uniquely specialised part of the plasma membrane that spirals around axonal lengths to myelinate the peripheral nerves.

The Biology of Schwann Cells concentrates on Schwann cells of mammals and in particular humans. It covers the distinction between compact and non-compact myelin in depth, along with the perisynaptic cells which form the partnership between nerve terminals and muscle fibre. Developmental aspects are discussed alongside differentiation, together with the genetics of Schwann cells in health and disease. With chapters from world-renowned experts, this book is aimed at postgraduates and researchers in neuroscience and neurology, and anyone involved in the study of peripheral nerves.

PATRICIA J. ARMATI is an Associate Professor and Co-Director of the Nerve Research Foundation, Department of Medicine at the University of Sydney, Australia, with a long-standing research interest in the biology of Schwann cells.

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CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo

Cambridge University Press

The Edinburgh Building, Cambridge CB2 2RU, UK

Published in the United States of America by

Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521850209

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First published 2007

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

Library of Congress Cataloging in Publication data

The biology of Schwann cells : development, differentiation, and immunomodulation / edited by Patricia Armati.

p. ; cm.

Includes bibliographical references.

ISBN-13: 978-0-521-85020-9 (hardback)

ISBN-10: 0-521-85050-7 (hardback)

1. Neuroglia. I. Armati Patricia J.

[DNLM: 1. Schwann Cells—physiology. WL 102 B6164 2007] II. Title.

QP363.2.B563 2007

611'.0188—dc22

2006037782

ISBN-13 978-0-521-85020-9 hardback

ISBN-10 0-521-85020-7 hardback

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Dedication

This book is dedicated to all the 'Friends of the Schwann cell': Theodore Schwann who first named the cell; Richard and Mary Bunge and the unsung Patrick Wood; and also John Pollard my husband, whose ever-enquiring mind, excellence in research and dedication to all those with peripheral nerve diseases inspired my interest in the extraordinary tale of the Schwann cell.

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Preface

It is now over 200 years since Theodore Schwann first described the cell which bears his name. Such early descriptions of nervous system components were done without the powerful microscopes we have today, yet Schwann and Ramon Y. Cajal made foundation observations which still stand. Cajal's papers, especially, show the power of careful observation, an essential element of good science.

The Schwann cell has been historically underrated and poorly understood. In particular, the myelin-forming Schwann cells or their myelin are still often referred to as a simple 'sheath' for the neuron. However, Schwann cells in all their complexity form essential partnerships with neurons, and muscles. This is of particular relevance in the case of the myelin-forming Schwann cell, an enormous cell that expresses unique molecules and complex relationships related to maintenance of the compact and non-compact myelin regions of its plasma membrane. Schwann cells have other complex interactions, not least of which are found where nerve terminals and muscle fibres form the tripartite synapse in association with the perisynaptic Schwann cells. There are also the poorly understood satellite cells that surround the dorsal root ganglion nerve cell bodies, and of course the complexity of non-myelinated Schwann cells and their axonal associations.

It may be that the histopathological prominence of abnormalities of compact myelin has focussed research on this region of the Schwann cell. This is shown by the historical concentration on disturbance of compact myelin in diseases of the peripheral nervous system such as Guillain–Barré syndrome, chronic inflammatory demyelinating polyneuropathy (CIDP) and Charcot–Marie–Tooth disease. The study of the basic biology of this cell is therefore increasingly recognised as

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an essential element in understanding the development, function and potential for repair of the nervous system, including the central nervous system.

With the development of electron microscopy, molecular biology and genetic techniques, proteomics and other technologies pushing the boundaries of our knowledge, the unravelling of the astounding complexity of all cells including the Schwann cell is well underway. It is therefore timely that the current understanding of this cell be gathered into a book such as *The Biology of Schwann Cells*.

I would like to thank Dr Ariel Arthur, University of Sydney, Dr Martin Griffiths, Cambridge University Press, and 'my son' Mr Damien Pembroke, for their editorial assistance, encouragement and expertise.

Patricia Armati

October 2006

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