Handbook of Meningococcal Disease

Infection Biology, Vaccination, Clinical Management

Edited by
Matthias Frosch and Martin C. J. Maiden

WILEY-VCH Verlag GmbH & Co. KGaA

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Cover
Neisseria meningitidis adherent to human brain derived endothelial cell (SEM 10.000 × magnification). Kindly provided by Alexandra Schubert-Unkmeir, Institute for Hygiene and Microbiology, Würzburg.

Library of Congress Card No.: applied for

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

Bibliographic information published by Die Deutsche Bibliothek
Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the Internet at <http://dnb.ddb.de>

Printed in the Federal Republic of Germany
Printed on acid-free paper

Typesetting K+V Fotosatz GmbH, Beerfelden
Printing Betz-Druck GmbH, Darmstadt
Bookbinding J. Schäffer GmbH, Grünstadt

ISBN-13: 978-3-527-31260-3
ISBN-10: 3-527-31260-9

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Preface

Meningococcal disease has apparently emerged relatively recently, with definitive descriptions dating only from 1805 in Europe and North America and 1905 in Africa. During the 20th century it attained a global distribution both as an endemic and epidemic disease, with a number of pandemics. At the beginning of the 21st century, the disease remains a major challenge globally with around 500,000 cases a year, 300,000 of which occur in sub-Saharan Africa: these numbers increase substantially in those years when major epidemics occur in Africa.

The basis for this *Handbook of Meningococcal Disease* was the classic book edited by Keith Cartwright entitled *Meningococcal Disease* and published by John Wiley & Sons in 1995. This book brought together up-to-date information on all aspects of meningococcal disease with value for paediatricians microbiologists, infectious disease specialists and professionals in public health medicine. However, since 1995 substantial progress has been made and we look back to a decade with changes in the epidemiology of meningococcal disease, improved understanding of the meningococcal population biology, new options to combat the disease by vaccination and exciting new insights into the basic biology of the meningococcus, which was stimulated by the availability of whole genome sequence data and the novel insights into cell biology. The *Handbook of Meningococcal Disease* covers all these aspects on the recent research on meningococci and meningococcal disease.

This book would not have been possible without the outstanding contributions of a group of internationally respected authors. We would like to thank our colleagues for giving their valuable time and effort toward compilation of this book, but we are also grateful to all those who are engaged in the intensive, and increasingly successful, efforts to eliminate this disease. We are also indebted to Andreas Sendtko at Wiley-VCH for the initial suggestion to put this book together and for the committed and stimulating support and promotion of the project.

Würzburg and Oxford, February 2006 Matthias Frosch and Martin Maiden

Foreword

This book is welcome, summarizing as it does our current understanding of the microbiology, pathology and epidemiology of meningococcal disease, as well as updating readers on clinical developments. For me, it has been a pleasure and a privilege to work closely with one of the editors over a period of many years, and equally so to be invited to write this Foreword. I hope that readers will both enjoy and learn from the experience of the many contributors to this timely addition to the meningococcal literature.

Meningococcal disease remains perhaps the most fascinating of human bacterial infections. The microbe colonizes only Man, is ubiquitously and commonly distributed and lives harmlessly in the main at the back of the human throat. Yet when it invades, it can cause disease of almost unparalleled ferocity, manifesting mainly as meningitis, but in a substantial minority of patients as septicemia (blood poisoning) without involvement of the meninges.

The meningococcus can cause sporadic, endemic or epidemic disease. In developed countries, there are two quite distinct age peaks (infancy, early adulthood), each with entirely different underlying pathological mechanisms. Different serogroups affect different continents and countries at different times, yet despite burgeoning international travel and the inevitability of incessant introductions of new meningococcal strains into all countries across the globe, the African epidemiology remains persistently dominated by serogroup A disease, whereas in Europe, the Americas and Australasia, serogroups B and C are most common and have been so for years.

Unlike the great majority of other bacterial species that cause human disease, meningococci have remained (with one or two anecdotal exceptions), persistently and thankfully sensitive to antibiotics, in the face of gross exposure, indeed, over-exposure, over the past 60 years. This is despite their highly developed ability to acquire useful genes from other nasopharyngeal bacteria.

Clearly, the disease and its causative microbe present us with problems, conundrums and questions to which we cannot as yet find answers. What is equally clear is that the pace of investigation is quickening. Meningococcal disease is now accorded a high public health priority in most developed countries, perhaps in part because of the fear it evokes in both parents of young children and also in health care professionals, who dread missing a case of this largely treatable condition, thus causing death or avoidable morbidity.

At governmental level, the disease is important not only for economic reasons but also because the prospects for reduction in morbidity and mortality are excellent, and because there are also good prospects for global disease control through the deployment of effective vaccines for all serotypes within the next few years. The problems in realizing this exciting vision are not just technological, but financial, political and organizational.

Bill Gates, the founder of the Microsoft Corporation, made a striking contribution to the battle against meningococcal disease by promising generous funding for a program to control a range of (mainly vaccine-preventable) infections in the world's poorer countries. Many developed country governments have now followed his example. The support of the Bill and Melinda Gates Foundation includes funding earmarked specifically for the manufacture and deployment of conjugated meningococcal vaccines in the African "meningitis belt".

The manufacture of conjugated vaccines for serogroup A and C meningococci is technically straightforward; and the constraints in controlling meningococcal disease in Africa are now largely financial and organizational. Given goodwill, the Gates' initiative should overcome these problems, thereby addressing by far the most important global public health issue in meningococcal disease control.

The developed world, where thankfully meningococcal disease attack rates are only a fraction of those seen in African epidemics, needs a serogroup B vaccine. Here, the hurdles are still technological. It is immensely frustrating to observe the plain epidemiological fact that meningococcal disease is rare after the age of 25–30 years, indicating that a natural protective process operates, yet to date we have been unable to characterize it and mimic it with a vaccine.

Though the past few years have seen less progress in the development of serogroup B vaccines than one might have hoped for, it seems likely that, with the diverse range of innovative technological approaches now being explored, we may at last be on the brink of identifying and developing a successful men B vaccine candidate. I look forward with some optimism to the global control of meningococcal disease within the next decade, an achievable public health goal.

Brobury, February 2006 Keith Cartwright

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