

# Handbook of Meningococcal Disease

*Infection Biology, Vaccination, Clinical Management*

*Edited by  
Matthias Frosch and Martin C. J. Maiden*



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## The Editors

### **Prof. Dr. Matthias Frosch**

Institute of Hygiene and Microbiology  
University of Würzburg  
Josef-Schneider-Straße 2  
97080 Würzburg  
Germany

### **Prof. Dr. Martin C. J. Maiden**

Peter Medawar Building for Pathogen Research  
Department of Zoology  
University of Oxford  
South Parks Road  
Oxford OX1 3SY  
Great Britain

## 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.

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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 20<sup>th</sup> 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

## List of Contributors

**Ole Herman Ambur**

Centre for Molecular Biology  
and Neuroscience and Institute  
of Microbiology  
University of Oslo  
Rikshospitalet Radiumhospitalet Trust  
0027 Oslo  
Norway

**Colin Block**

Clinical Microbiology Unit  
Infectious Diseases  
Hadassah–Hebrew University Medical  
Centres  
IL 91120 Jerusalem  
Israel

**Ray Borrow**

Vaccine Evaluation Department  
Manchester Medical Microbiology  
Partnership  
PO Box 209  
Clinical Sciences Building  
Manchester Royal Infirmary  
Manchester, M13 9WZ  
Great Britain

**Sandrine Bourdoulous**

Institut Cochin  
Département de Biologie Cellulaire  
Université René Descartes Paris V  
22 rue Méchain  
75014 Paris  
France

**Petter Brandtzaeg**

Department of Pediatrics  
Ullevål University Hospital  
University of Oslo  
0407 Oslo  
Norway

**Helen Campbell**

Immunisation Division  
PHLS Communicable Disease  
Surveillance Centre  
61 Colindale Avenue  
London, NW9 5EQ  
Great Britain

**Keith Cartwright**

Brobury House  
Brobury  
Herefordshire, HR3 6BS  
Great Britain

**Dominique A. Caugant**

WHO Collaborating  
Centre for Reference and Research  
on Meningococci  
Division of Infectious Disease Control  
Norwegian Institute of Public Health  
PO Box 4404 Nydalen  
0403 Oslo  
Norway

**Heike Claus**

Institute of Hygiene  
and Microbiology  
University of Würzburg  
Josef-Schneider-Straße 2  
97080 Würzburg  
Germany

**Tonje Davidsen**

Centre for Molecular Biology  
and Neuroscience  
and Institute of Microbiology  
University of Oslo  
Rikshospitalet Radiumhospitalet Trust  
0027 Oslo  
Norway

**Philippe Denoël**

GlaxoSmithKline Biologicals  
Rue de l'Institut 89  
1330 Rixensart  
Belgium

**Jeremy Derrick**

Department of Biomolecular Sciences  
Faculty of Life Sciences  
UMIST  
PO Box 88  
Manchester, M60 1QD  
Great Britain

**Andrew Ekins**

Department of Microbiology  
and Infectious Diseases  
University of Calgary  
Calgary  
Alberta, T2N 4N1  
Canada

**Ian M. Feavers**

Division of Bacteriology  
NIBSC  
Blanche Lane  
South Mimms  
Potters Bar  
Hertfordshire, EN6 3QG  
Great Britain

**Christiane Feron**

GlaxoSmithKline Biologicals  
Rue de l'Institut 89  
1330 Rixensart  
Belgium

**Matthias Frosch**

Institute of Hygiene  
and Microbiology  
University of Würzburg  
Josef-Schneider-Straße 2  
97080 Würzburg  
Germany

**Karine Goraj**

GlaxoSmithKline Biologicals  
Rue de l'Institut 89  
1330 Rixensart  
Belgium

**Steve J. Gray**

Meningococcal Reference Unit  
Health Protection Agency  
Clinical Science Building  
Manchester Royal Infirmary  
PO Box 209 Oxford Road  
Manchester, M13 9WL  
Great Britain

**John E. Heckels**

Molecular Microbiology Group  
 Division of Infection, Inflammation  
 and Repair  
 University of Southampton  
 Medical School  
 Southampton General Hospital  
 Southampton, SO16 6YD  
 Great Britain

**Keith A. Jolley**

Peter Medawar Building for  
 Pathogen Research  
 Department of Zoology  
 University of Oxford  
 South Parks Road  
 Oxford, OX1 3SY  
 Great Britain

**Oliver Kurzai**

Institute of Hygiene  
 and Microbiology  
 University of Würzburg  
 Josef-Schneider-Straße 2  
 97080 Würzburg  
 Germany

**Rosanna Leuzzi**

Chiron Vaccines  
 Via Fiorentina 1  
 53100 Siena  
 Italy

**Martin C. J. Maiden**

Peter Medawar Building for  
 Pathogen Research  
 Department of Zoology  
 University of Oxford  
 South Parks Road  
 Oxford, OX1 3SY  
 Great Britain

**Elizabeth Miller**

Immunisation Division  
 PHLS Communicable Disease  
 Surveillance Centre  
 61 Colindale Avenue  
 London, NW9 5EQ  
 Great Britain

**Philippe C. Morand**

Department of Molecular Biology  
 Max Planck Institute  
 for Infection Biology  
 Schumannstr. 21/22  
 10117 Berlin  
 Germany

**E. Richard Moxon**

Weatherall Institute of  
 Molecular Medicine  
 Department of Paediatrics  
 Room 4252 ~ Level 4  
 John Radcliffe Hospital  
 University of Oxford  
 Headley Way  
 Headington  
 Oxford, OX3 1DU  
 Great Britain

**Simon Nadel**

Paediatric Intensive Care Unit  
 St. Mary's Hospital  
 Praed Street  
 London, W2 1NY  
 Great Britain

**Xavier Nassif**

Laboratoire de Microbiologie  
 Faculté de Médecine  
 Necker-Enfants Malades  
 156 Rue de Vaugirard  
 75015 Paris  
 France

***Mariagrazia Pizza***

Chiron Vaccines  
Via Fiorentina 1  
53100 Siena  
Italy

***Joyce S. Plested***

Weatherall Institute of  
Molecular Medicine  
Department of Paediatrics  
Room 4252 ~ Level 4  
John Radcliffe Hospital  
University of Oxford  
Headley Way  
Headington  
Oxford, OX3 1DU  
Great Britain

***Andrew J. Pollard***

Weatherall Institute of  
Molecular Medicine  
Department of Paediatrics  
Room 4252 ~ Level 4  
John Radcliffe Hospital  
University of Oxford  
Headley Way  
Headington  
Oxford, OX3 1DU  
Great Britain

***Jan T. Poolman***

GlaxoSmithKline Biologicals  
Rue de l'Institut 89  
1330 Rixensart  
Belgium

***Peter M. Power***

Weatherall Institute of  
Molecular Medicine  
Department of Paediatrics  
Room 4252 ~ Level 4  
John Radcliffe Hospital  
University of Oxford  
Headley Way  
Headington  
Oxford, OX3 1DU  
Great Britain

***Sanjay Ram***

Section of Infectious Diseases  
Evans Biomedical Research Center  
Boston University Medical Center  
650 Albany St.  
Boston  
Massachusetts, 02118  
USA

***Mary Ramsay***

Immunisation Division  
PHLS Communicable Disease  
Surveillance Centre  
61 Colindale Avenue  
London, NW9 5EQ  
Great Britain

***Rino Rappuoli***

Chiron Vaccines  
Via Fiorentina 1  
53100 Siena  
Italy

***Neil Ravenscoft***

Department of Chemistry  
University of Cape Town  
Rondebosch 7701  
Cape Town  
South Africa