An Introduction to Vascular Biology

Second edition

Vascular biology is an exciting and rapidly advancing area of medical research, with many new and emerging pathophysiological links to an increasing number of diseases. This updated and expanded new edition takes full account of these developments and conveys the basic science underlying a wide range of clinical conditions, including atherosclerosis, hypertension, diabetes and pregnancy. As with the first edition, the publication provides an introductory account of vascular biology before leading on to explain mechanisms involved in disease processes. Other emerging topics include the role of nitric oxide and apoptosis in vascular biology. The breadth and range of subjects covered in this new edition do full justice to this increasingly important area of clinical research and medicine. This multidisciplinary approach will suit the needs of all those who are new to the field or working in one small area, with a need to get the wider picture, and also for those seeking to refresh their knowledge with the very latest advances from basic science through to clinical practice.

Features of the new edition

- All chapters fully updated and expanded, including up-to-date references
- Includes several new clinical chapters
- Covers new and emerging areas of research
- Integrates basic science and clinical practice

Reviews of the first edition

'I recommend this book to those seeking an introductory overview into this exciting and rapidly burgeoning area. The authors provide an up-to-date interpretation of vascular biology and how this might relate to disease; the figures are excellent; and the references offer access to further sources of information.' JOURNAL OF THE ROYAL SOCIETY OF MEDICINE

'... it makes excellent reading ... for readers who are interested in gaining fundamental understanding of this critical area. I believe the book offers an excellent pathway towards this goal.' BRITISH JOURNAL OF SURGERY

'It is well written, with the correct balance of figures, tables and text, and also well referenced ... I warmly recommend it.' BIOMEDICAL SCIENCES

An Introduction to Vascular Biology

From basic science to clinical practice

SECOND EDITION

Edited by

Beverley J. Hunt
Departments of Haematology and Rheumatology, Guy's and St Thomas' Trust, London

Lucilla Poston
Department of Obstetrics and Gynaecology, St Thomas' Hospital, London

Michael Schachter
Department of Clinical Pharmacology, Imperial College School of Medicine, London

and

Alison W. Halliday
Department of Vascular Surgery, St George's Hospital, London

CAMBRIDGE UNIVERSITY PRESS

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, UK
40 West 20th Street, New York NY 10011–4211, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
Ruiz de Alarcón 13, 28014 Madrid, Spain
Dock House, The Waterfront, Cape Town 8001, South Africa

http://www.cambridge.org

First published 2002

Printed in the United Kingdom at the University Press, Cambridge

Typeface Minion 10.5/14pt *System* Poltype® [VN]

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

Library of Congress Cataloguing in Publication data

An introduction to vascular biology : from basic science to clinical practice / edited by
Beverley J. Hunt . . . [et al.]. – 2nd ed.
p. cm.
Includes bibliographical references and index.
ISBN 0-521-79652-0 (pbk)
1. Blood-vessels–Diseases. 2. Blood-vessels–Physiology. I. Hunt, Beverley J.
[DNLM: 1. Blood Vessels–physiology. 2. Blood Vessels–physiology. 3. Vascular
Diseases–physiopathology. WG 500 I635 2001]
RC691.I595 2001
616.1'3–dc21 2001035627

ISBN 0 521 79652 0 paperback

Contents

Contributors

Martin R. Bennett
Unit of Cardiovascular Medicine
Addenbrooke's Centre for Clinical Investigation
Level 6, Box 110
Addenbrooke's Hospital
Hills Road, Cambridge CB2 2QQ
mrb@mole.bio.cam.ac.uk

Mark Caulfield MD FRCP
The Cardiovascular Genetics Group
Department of Clinical Pharmacology
St Bartholomew's and The Royal London School of Medicine and Dentistry
Charterhouse Square
London EC1M 6BQ
m.j.caulfield@mds.qmw.ac.uk

Norman Chan MB ChB MRCP DCH
Centre for Clinical Pharmacology
The Rayne Institute
University College London
5 University Street
London
WC1E 6JJ
NNKAChan@aol.com

Philip Chowienczyk
Department of Clinical Pharmacology
Ground Floor
St Thomas' Hospital
London SE1 7EH
Phillip.chowienczyk@gstt.sthames.nhs.uk

Julie T. Daniels
Wound Healing Research Unit
Department of Pathology
Institute of Ophthalmology and
Glaucoma Unit
Moorfields Eye Hospital
London
j.daniels@ucl.ac.uk

Gerard Gardner PhD
The Cardiovascular Genetics Group
Department of Clinical Pharmacology
St Bartholomew's and The Royal London School of Medicine and Dentistry
Charterhouse Square
London EC1M 6BQ

Kay Lay Goh MRCP
Department of Diabetes and Vascular Medicine Research Centre
School of Postgraduate Medicine and Health Sciences
Royal Devon & Exeter Hospital (Wonford)
Barrack Road
Exeter EX2 5AX

Alison W. Halliday
Department of Vascular Surgery
St George's Hospital
Blackshaw Road
London SW17 0RE

Peter Hewins BSc MRCP
Renal Immunology Group
Birmingham Centre for Immune Regulation
The Medical School
University of Birmingham
Birmingham B15 2TT
P.Hewins@bham.ac.uk

Tim Higenbottam MA MD DSc FRCP
Clinical Sciences
AstraZeneca R&D Charnwood
Bakewell Road
Loughborough
Leicestershire LE11 5RH
tim.higenbottam@astrazeneca.com

Alun D. Hughes
Clinical Pharmacology
NHLI, Imperial College
St Mary's Hospital
London W2 1NY
a.hughes@ic.ac.uk

Beverley J. Hunt MD FRCP FRCPath
Departments of Haematology and Rheumatology
Guy's and St Thomas' Trust
Lambeth Palace Road
London SE1 7EH
Berverley.Hunt@gstt.sthames.nhs.uk

Karen M. Jurd BSc (Hons) PhD
Principal Scientist, Protection and Performance Department Centre for Human Sciences
DERA Alverstoke
Gosport

Brenda A. Kelly
Maternal and Fetal Research Unit/
Centre for Cardiovascular and Vascular Biology
King's College London
c/o Department of Obstetrics and Gynaecology
10th Floor North Wing
St Thomas' Hospital
Lambeth Palace Road
London SE1 7EH

Peng T. Khaw
Wound Healing Research Unit
Department of Pathology
Institute of Ophthalmology and Glaucoma Unit
Moorfields Eye Hospital
London
p.khaw@ucl.ac.uk

Joanne Knight BSc
The Cardiovascular Genetics Group
Department of Clinical Pharmacology
St Bartholomew's and The Royal London School of Medicine and Dentistry
Charterhouse Square
London EC1M 6BQ

Helen Marriott BSc MSc
Section of Medicine and Pharmacology
Division of Clinical Sciences (South)
Floor F, Medical School
University of Sheffield
Beech Hill Road
Sheffield S10 2RX
h.m.Marriott@sheffield.ac.uk

Nicola J. McCarthy
Unit of Cardiovascular Medicine
Addenbrooke's Centre for Clinical Investigation
Level 6, Box 110
Addenbrooke's Hospital
Hills Road, Cambridge CB2 2QQ
njm34@mole.bio.cam.ac.uk

Kirsty M. McCulloch
Department of Pharmacology
Quintiles Ltd
Research Avenue South
Heriot-Watt University Research Park
Riccarton, Edinburgh
EH14 4AP
kirsty.mcculloch@quintiles.com

John C. McGrath
Head of Division of Neurosciences and Biomedical Systems
Institute of Biomedical and Life Sciences
University of Glasgow
West Medical Building
Glasgow G12 8QQ
Jcmcgrath@bio.gla.ac.uk

Alan R. Moody MRCP FRCP
Department of Academic Radiology
Queens Medical Centre
Nottingham NG7 2UH
Alan.Moody@nottingham.ac.uk

Patricia Munroe PhD
The Cardiovascular Genetics Group
Department of Clinical Pharmacology
St Bartholomew's and The Royal London School of Medicine and Dentistry
Charterhouse Square
London EC1M 6BQ

Nick L. Occleston PhD
Renovo Ltd
Manchester Incubator Building
48 Grafton Street
Manchester M13 9XX
n.occleston@renovo-Ltd.com

Suzanne O'Shea
The Cardiovascular Genetics Group
Department of Clinical Pharmacology
St Bartholomew's and The Royal London School of Medicine and Dentistry
Charterhouse Square
London EC1M 6BQ

Lucilla Poston PhD
Maternal and Fetal Health Research Unit
Department of Obstetrics and Gynaecology
Guy's, King's and St Thomas' School of Medicine, and Centre for Cardiovascular Biology and Medicine
St Thomas' Hospital
London SE1 7EH
Lucilla.poston@kcl.ac.uk

Janet T. Powell PhD MD
Professor of Vascular Biology
Department of Vascular Surgery
Imperial College School of Medicine
Charing Cross Hospital
Fulham Palace Road
London W6 8RF
Janet.Powell@wh-tr.wmids.nhs.uk

John W. Quarmby
Department of Vascular Surgery
St George's Hospital
Blackshaw Road
London SW17 0RE

Marlene L. Rose
Professor of Transplant Immunology
National Heart and Lung Institute
Imperial College School of Medicine
Heart Science Centre
Harefield Hospital
Harefield, Middlesex UB9 6JH
Marlene.rose@ic.ac.uk

James H.F. Rudd MRCP
Division of Cardiovascular Medicine
Addenbrooke's Centre for Clinical Investigation
Addenbrooke's NHS Trust
Hills Road
Cambridge CB2 2QQ
jhfr2@cam.ac.uk

Caroline O.S. Savage MD PhD FRCP
Renal Immunology Group
Birmingham Centre for Immune Regulation
The Medical School
University of Birmingham
Birmingham B15 2TT
C.O.S.Savage@bham.ac.uk

Michael Schachter BSc MB BS MRCP
Department of Clinical Pharmacology
National Health and Lung Institute
Imperial College School of Medicine
St Mary's Hospital
London W2 1NY
m.schachter@ic.ac.uk

Angela C. Shore PhD
Department of Diabetes and Vascular Medicine Research Centre
School of Postgraduate Medicine and Health Sciences
Royal Devon & Exeter Hospital (Wonford)
Barrack Road
Exeter EX2 5AX
A.C.Shore@exeter.ac.uk

John E. Tooke
Department of Vascular Medicine
Postgraduate Medical School
Barrack Road
Exeter EX2 5AW
J.E.Tooke@exeter.ac.uk

Patrick Vallance MRCP MD FRCP FmedSci
Centre for Clinical Pharmacology
The Rayne Institute
University College London
5 University Street
London WC1E 6JJ
patrick.vallance@ucl.ac.uk

Peter L. Weissberg MD FRCP FMedSci FESC
Division of Cardiovascular Medicine
Addenbrooke's Centre for Clinical Investigation
Addenbrooke's NHS Trust
Hills Road
Cambridge CB2 2QQ
plw@mole.bio.cam.ac.uk

David Williams MRCP
Department of Obstetrics and
Gynaecology
Imperial College School of Medicine
Chelsea and Westminster Hospital
Fulham Road
London SW10 9NH
david.williams@ic.ac.uk

Preface to Second Edition

The science of vascular biology has emerged and expanded rapidly over the past 25 years. Research in this area has increased understanding of a wide range of clinical conditions. This book provides a broad overview of the field for both specialist and newcomer to the field, and concise resource for the non-specialist. The multidisciplinary team of contributors covers topics ranging from normal and pathological aspects of endothelial cell function to the role of the vasculature in pregnancy, hypertension and atherosclerosis.

The authors have been selected for their ability to provide clear explanations of their area, resulting in an easily readable text with carefully produced illustrations. This second edition has allowed for increased clarity in presentation: the book has been divided into three sections, basic science, pathogenic mechanisms, and clinical practice. There is also inclusion of information on new and advancing areas in vascular biology including chapters on nitric oxide, apoptosis, imaging and pregnancy.

Beverley Hunt