

OXFORD
TEXTBOOK OF
CLINICAL
NEPHROLOGY

VOLUME 3

OXFORD TEXTBOOK OF CLINICAL NEPHROLOGY

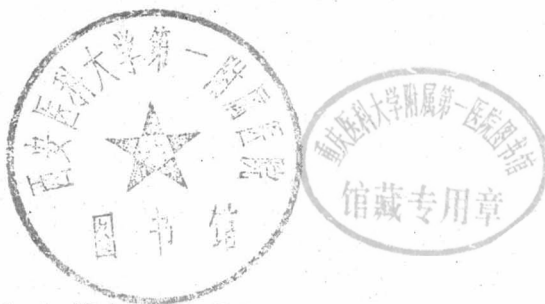
Edited by

**STEWART CAMERON, ALEX M. DAVISON,
JEAN-PIERRE GRÜNFELD, DAVID KERR,
and EBERHARD RITZ**

with the assistance of

**A. J. REES, C. G. WINEARLS,
LUIS HERNANDO, CHARLES VAN YPERSELE DE STRIHOU,
and CLAUDIO PONTICELLI**

VOLUME 3



Oxford New York Tokyo

OXFORD UNIVERSITY PRESS

1992

Oxford University Press, Walton Street, Oxford OX2 6DP

*Oxford New York Toronto
Delhi Bombay Calcutta Madras Karachi
Petaling Jaya Singapore Hong Kong Tokyo
Nairobi Dar es Salaam Cape Town
Melbourne Auckland
and associated companies in
Berlin Ibadan*

Oxford is a trade mark of Oxford University Press

*Published in the United States
by Oxford University Press, New York*

© The editors listed on p. ii, 1992

*All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise, without
the prior permission of Oxford University Press*

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

*Library of Congress Cataloging in Publication Data
(Cataloging data available)*

*ISBN 0-19-262154-8 (vol 3)
ISBN 0-19-262093-2 (3 vol set)
(Available only as a three volume set)*

*Typeset by Promenade Graphics, Cheltenham
Printed in Great Britain by
William Clowes Ltd, Beccles, Suffolk*

OXFORD MEDICAL PUBLICATIONS

OXFORD TEXTBOOK OF CLINICAL NEPHROLOGY

EDITORS

STEWART CAMERON

Professor of Renal Medicine,
Guy's Hospital, London, UK

ALEX M. DAVISON

Consultant Renal Physician,
St James's University Hospital, Leeds, UK

JEAN-PIERRE GRÜNFELD

Professor of Nephrology,
Hôpital Necker, Paris, France

DAVID KERR

Professor of Renal Medicine,
Royal Postgraduate Medical School, London, UK

EBERHARD RITZ

Head of Division of Nephrology,
University of Heidelberg, Germany

ASSOCIATE EDITORS

A. J. REES

Professor of Nephrology,
Royal Postgraduate Medical School, London, UK

C. G. WINEARLS

Consultant Nephrologist,
Churchill Hospital, Oxford, UK

L. HERNANDO

Professor, Servicio de Nefrología,
University of Madrid, Spain

C. VAN YPERSELE DE STRIHOU

Professor of Medicine,
University of Louvain Medical School, Belgium

CLAUDIO PONTICELLI

Director, Division of Nephrology and Dialysis,
Ospedale Maggiore, Milan, Italy

Preface

Why another large text on nephrology? Because this one is *different*. It begins not with the anatomy of the nephron, but with the approach to the renal patient. It is intended as a text on *clinical nephrology*, of primary use to those caring for patients with renal disease. Not that we do not value the science that underlies our clinical practice—far from it. In each section the basic science relevant to the problem under discussion will be found incorporated at the appropriate point in the text for the clinician. In this area we have had the assistance of one of the foremost renal physiologists.

We deal in this book with many of the rarer renal problems and renal manifestations of systemic disease that are not dealt with in other texts—as a glance at the index and that of other similar volumes will show. A unique feature of the book is that at the end we have provided a guide to the book from the point of view of other specialist physicians—gastroenterologists, rheumatologists, neurologists, and so on—so that both they and generalists can enter the complex world of nephrology more easily. We have paid special attention to the handling of drugs by the kidney, and to the effects of drugs upon the kidney and renal tract. In this we have been assisted by our distinguished editor in clinical pharmacology.

We have tried to look at nephrology in a global context,

remembering that the great majority of patients with renal diseases live in the developing world. Several chapters deal specifically with nephrology as it is seen in the tropics. We have also included chapters which deal with renal disease at the extremes of life. Paediatric nephrology has been blended into the text throughout with the assistance of our able paediatric editor, and several chapters deal with the special problems of the growing number of elderly patients with renal disease.

Finally, we hope that these volumes will be, as well as for day-to-day use when needed, a useful and pleasurable source for browsing when the pressure is off. Above all we hope that these volumes will be a literate as well as a comprehensive guide to diseases of the kidney, and diseases affecting the kidney. We thank our Associate Editors Luis Hernando, Claudio Ponticelli, Andy Rees, Charles van Ypersele de Strihou, and C. J. Winearls without whom these volumes could never have been completed.

Stewart Cameron
Alex M. Davison
Jean-Pierre Grünfeld
David Kerr
Eberhard Ritz

Contributors

DAVID H. ADAMS

Liver Unit, Queen Elizabeth Hospital, Birmingham, UK.

D. ADU

Consultant Physician, Queen Elizabeth Hospital, Birmingham, UK.

J.-R. ALLENBERG

Professor, Department of Surgery, Section of Vascular Surgery, University of Heidelberg, Germany.

CLAUDE AMIEL

Professor of Physiology, INSERM Unit 251 and Department of Physiology, Faculté Xavier Bichat, Université Paris 7, France.

ANITA APERIA

Professor of Pediatrics and Chairman of Department, Department of Pediatrics, St Goran's Children's Hospital, Karolinska Institute, Stockholm, Sweden.

JEAN-FRANÇOIS BACH

Professor of Immunology, INSERM U25, Hôpital Necker, Paris, France.

ROSS R. BAILEY

Head of Department of Nephrology, Christchurch Hospital, New Zealand.

CLAIRE BAILLY

INSERM U251 and Department of Physiology, Faculté Xavier Bichat, Université Paris 7, France.

L. R. I. BAKER

Consultant Physician and Nephrologist, St Bartholomew's Hospital, London, UK.

GIOVANNI BANFI

Senior Assistant, Division of Nephrology and Dialysis, Istituto Scientifico Ospedale Maggiore, Milan, Italy.

T. MARTIN BARRATT

Professor of Paediatric Nephrology, Medical Unit, Institute of Child Health, London, UK.

RASHAD S. BARSOUM

Professor of Medicine and Chief of Nephrology, Kasr-El-Aini Medical School, Cairo University; Chairman, Cairo Kidney Center, Egypt.

CHRIS BAYLIS

Associate Professor of Physiology, West Virginia University, Morgantown, USA.

PIER LUCA BENCINI

Consultant Dermatologist, Istituto Scientifico San Raffaele, Department of Dermatology, University of Milan, Italy.

JERRY M. BERGSTEIN

Professor and Head, Section of Nephrology, Department of Pediatrics, Indiana University School of Medicine, Indianapolis, USA.

DANIEL G. BICHET

Associate Professor, Université de Montreal; Director, Clinical Research Unit, Research Center and Nephrology Division, Hôpital du Sacré-Coeur de Montreal, Canada.

CAROL M. BLACK

Rheumatology Unit and School of Medicine, Royal Free Hospital, London, UK.

GUILLAUME BOBRIE

Department of Nephrology, Hôpital Necker, Paris, France.

JURGEN BOMMER

Professor of Medicine, I. Medizinische Universitätsklinik Heidelberg, Germany.

JULIA A. BREYER

Assistant Professor of Medicine; Director, Outpatient Renal Clinic, Vanderbilt University Medical Center, Nashville, Tennessee, USA.

J. DOUGLAS BRIGGS

Consultant Nephrologist, Western Infirmary, Glasgow, UK.

K. E. BRITTON

Guy's Hospital, London, UK.

J. BRODEHL

Professor, Department of Paediatric Nephrology and Metabolic Diseases, Medical School Hannover, Germany.

MICHEL BROYER

Professor of Paediatrics; Head of Paediatric Nephrology Department, Hôpital Necker Enfants Malades, Paris, France.

HUGH S. CAIRNS

Lecturer and Honorary Senior Registrar, Department of Nephrology and Institute of Urology, University College and Middlesex School of Medicine, University College London, UK.

J. STEWART CAMERON

Professor of Renal Medicine, Guy's Hospital, London, UK.

D. J. S. CARMICHAEL

Consultant Renal Physician, Southend General Hospital, UK.

MICHAEL J. D. CASSIDY

Consultant Physician, Groote Schuur Hospital; Senior Lecturer in Medicine, Department of Medicine, University of Cape Town, South Africa.

W. R. CATTELL

Physician and Senior Consultant Nephrologist, St Bartholomew's Hospital, London, UK.

JOËL CHABRIAIS

Consultant Radiologist, Hôpital Necker, Paris, France.

CYRIL CHANTLER

Nationwide Professor of Paediatric Nephrology, United Medical and Dental Schools of Guy's and St Thomas's Hospitals, London, UK.

LUCIENNE CHATENAUD

INSERM U25—CNRS UA 122, Hôpital Necker, Paris, France.

ANTHONY C. CHU

Senior Lecturer and Consultant Dermatologist, Royal Postgraduate Medical School, Hammersmith Hospital, London, UK.

K. S. CHUGH

Professor, Department of Nephrology, Postgraduate Institute of Medical Education and Research, Chandigarh, India.

PIERRE CORVOL

Professor of Experimental Medicine, INSERM U36, Collège de France, Paris, France.

GIUSEPPE D'AMICO

Professor of Medicine, Division of Nephrology, San Carlo Hospital, Milan, Italy.

A. N. DARDENNE

Associate Professor of Radiology, Université Catholique de Louvain; Chief, Genitourinary and Ultrasound Section, Department of Radiology and Diagnostic Imaging, St Luc University Hospital, Brussels, Belgium.

A. M. DAVISON

Consultant Renal Physician, St James's University Hospital, Leeds, UK.

JOHN M. DAVISON

Scientific Staff and Consultant Obstetrician and Gynaecologist, Medical Research Council Human Reproduction Group, Princess Mary Maternity Hospital, Newcastle upon Tyne, UK.

FRANÇOISE DEGOS

Service d'Hépatologie and INSERM U24, Hôpital Beaujon, Clichy, France.

R. DIETZ

Professor, Department of Cardiology, University of Heidelberg, Germany.

JAVIER DIEZ

Professor of Medicine, University of Zaragoza; Associate Professor of Medicine, Center for Biomedical Research, University of Navarra, Spain.

JOHN H. DIRKS

Dean of the Faculty of Medicine, University of Toronto, Canada.

CIARAN C. DOHERTY

Consultant Nephrologist, Regional Nephrology Unit, Belfast City Hospital, Northern Ireland.

G. C. DOOMS

Department of Radiology, University Hospital St-Luc, Brussels, Belgium.

E. J. DORHOUT MEES

Professor, Department of Nephrology, Ege University, Izmir, Turkey.

DOMINIQUE DROZ

Laboratoire d'Anatomie Pathologique et Clinique Néphrologique, Hôpital Necker, Paris, France.

T. DRUEKE

Associate Professor, Department of Nephrology, Hôpital Necker, Paris, France.

PHILIPPE DRUET

Professor, INSERM U28, Hôpital Broussais, Paris, France.

PAUL A. DUBBINS

Consultant Radiologist, Ultrasound Department, Plymouth General Hospital, Plymouth, UK.

KAI-UWE ECKARDT

Physiologisches Institut, Universität Zurich, Switzerland.

HENRIK EKBLAD

Department of Paediatrics, Children's Hospital, University of Turku, Finland.

A. M. EL NAHAS

Sheffield Kidney Institute, Northern General Hospital, Sheffield, UK.

MARLIES ELGER

Institut für Anatomie und Zellbiologie, Universität Heidelberg, Germany.

PAUL EMERY

Department of Rheumatology, University of Birmingham, UK.

BRIGITTE ESCOUBET

Department of Physiology, Faculté de Médecine Xavier Bichat, Paris, France.

J. P. FILLASTRE

Professor, CHU de Rouen, France.

RICHARD N. FINE

Professor and Chairman, Department of Pediatrics, Children's Medical Center at Stony Brook, State University of New York at Stony Brook, USA.

GIOVANNI BATTISTA FOGAZZI

Division of Nephrology and Dialysis, Ospedale Maggiore, Milan, Italy.

U. FREI

Medizinische Hochschule Hannover, Germany.

GERARD FRIEDLANDER

Department of Physiology and INSERM U251, Faculté Xavier Bichat, Université Paris 7, Paris, France.

PATRICIA A. GABOW

Denver General Hospital and University of Colorado Health Sciences Center, USA.

MARIE-FRANCE GAGNADOUX

Pediatric Nephrology Department, Hôpital Necker Enfants Malades, Paris, France.

R.O.B. GANS

Department of Medicine, Free University Hospital, Amsterdam, The Netherlands.

SERAFINO GARELLA

Chairman, Department of Medicine, St Joseph Hospital; Professor of Clinical Medicine, Northwestern University Medical School, Chicago, USA.

GILLIAN GASKIN

MRC Training Fellow and Honorary Senior Registrar, Renal Unit, Department of Medicine, Royal Postgraduate Medical School, Hammersmith Hospital, London, UK.

DENIS GLOTZ

Service du Professeur Bariety, Hôpital Broussais, Paris, France.

M. GODIN

Professor, CHU de Rouen, France.

RAM GOKAL

Royal Infirmary, Manchester, UK.

IAN A. GREER

Clinical Consultant, MRC Reproductive Biology Unit; Honorary Senior Lecturer, Department of Obstetrics and Gynaecology, University of Edinburgh; Honorary Consultant Obstetrician and Gynaecologist, Simpson Memorial Maternity Pavilion and Royal Infirmary, Edinburgh, UK.

R. GREGER

Professor, Physiologisches Institut der Universität, Freiburg, Germany.

JEAN-PIERRE GRÜNFELD

Professor of Nephrology, Hôpital Necker, Paris, France.

T. T. GUYENE

INSERM U36, Collège de France, Paris, France.

RENÉE HABIB

Director of Research (INSERM); Director of the Unit of Paediatric Nephrology, Hôpital Necker Enfants Malades, Paris, France.

NEVEEN A. T. HAMDY

Chef de Clinique, Metabolic Unit, Department of Endocrinology and Metabolic Diseases, University Hospital Leiden, The Netherlands.

GEORGE B. HAYCOCK

Ferdinand James De Rothschild Professor of Paediatrics, United Medical and Dental Schools of Guy's and St Thomas's Hospitals, University of London, UK.

A. HEIDLAND

Professor of Nephrology, Department of Nephrology, Medical University, Würzburg, Germany.

OLIVIER HELENON

Assistant Professor of Radiology, Hôpital Necker, Paris, France.

UDO HELMCHEN

Institute of Pathology, University Hospital Eppendorf, Hamburg, Germany.

R. J. HENE

Department of Nephrology, University Hospital Utrecht, The Netherlands.

L. HERNANDO

Professor of Medicine, Fundación Jimenez Diaz, Universidad Autónoma, Madrid, Spain.

S. J. HOORNTJE

Department of Medicine, Catharina Hospital, Eindhoven, The Netherlands.

ROSALINDE HURLEY

Professor of Microbiology, the Royal Postgraduate Medical School's Institute of Obstetrics and Gynaecology, Queen Charlotte's and Chelsea Hospital, London, UK.

ENRICO IMBASCIATI

Director, Servizio Nefrologia e Dialisi, Ospedale Civile Sondrio, Italy.

LAURENT JACOB

INSERM U25, Hôpital Necker, Paris, France.

HARRY R. JACOBSON

Harry R. Johnson Professor of Medicine; Director, Division of Nephrology, Vanderbilt University Medical Center, Nashville, Tennessee, USA.

M. JADOUL

Renal Unit, University of Louvain Medical School, Clinique Universitaires St-Luc, Brussels, Belgium.

F. JOFFRE

Professor of Radiology, University Paul Sabatier; Head, Service Central de Radiologie au Centre Hospitalier et Universitaire de Toulouse-Rangueil, Toulouse, France.

MICHAEL JOHNSON

Consultant Neurologist, St James's University Hospital, Leeds, UK.

BRIAN J. R. JUNOR

Consultant Nephrologist, Western Infirmary, Glasgow, UK.

JOHN A. KANIS

Professor in Human Metabolism and Clinical Biochemistry, WHO Collaborating Centre for Metabolic Bone Disease, University of Sheffield Medical School, UK.

SABINE KENOUGH

Senior Staff Nephrologist, Department of Nephrology, Université Xavier Bichat, Paris, France.

DAVID N. S. KERR

Professor of Renal Medicine, Royal Postgraduate Medical School, Hammersmith Hospital, London, UK.

PRISCILLA KINCAID-SMITH

Director of Nephrology, Royal Melbourne Hospital, Victoria, Australia.

C. KLEINKNECHT

INSERM U192, Hôpital Necker Enfants Malades, Paris, France.

DIETER KLEINKNECHT

Head of Department of Nephrology, Centre Hospitalier, Montreuil, France.

MICHAEL KOCH

Medizinische Einrichtungen der Heinrich Heine Universität, Düsseldorf, Germany.

K. M. KOCH

Department of Nephrology, Centre of Internal Medicine, Medizinisch Hochschule Hannover, Germany.

ROBERT A. P. KOENE

Department of Medicine, Division of Nephrology, University Hospital, Nijmegen, The Netherlands.

H. A. KOOMANS

Professor of Nephrology and Hypertension, University Hospital, Utrecht, The Netherlands.

W. KRAMER

University of Heidelberg, Germany.

HENRI KREIS

Service de Transplantation, Hôpital Necker, Paris, France.

WILHELM KRIZ

Professor, Institut für Anatomie und Zellbiologie, Universität Heidelberg, Germany.

ARMIN KURTZ

Physiologisches Institut, Universität Zurich, Switzerland.

CHRISTOPHE LEGENDRE

Service de Transplantation, Hôpital Necker, Paris, France.

JOSE M. LOPEZ-NOVOA

Professor of Medicine, University of Salamanca, Spain.

F. C. LUFT

Professor of Medicine, University of Erlanger-Nurnberg; Adjunct Professor of Medicine and Pharmacology, Indiana University, Indianapolis, USA.

A. PETER LUNDIN

Associate Professor of Medicine, SUNY Health Science Center at Brooklyn, New York, USA.

EUGENE V. McCLOSKEY

University of Sheffield Medical School, UK.

JUAN F. MACIAS-NÚÑEZ

Titular Professor of Medicine, University of Salamanca, Spain.

MICHAEL MAISEY

Professor, Division of Radiological Sciences, United Medical and Dental Schools of Guy's and St Thomas's Hospitals, London, UK.

N. P. MALLICK

Department of Renal Medicine, Royal Infirmary, Manchester, UK.

ALEXANDER P. MANDELBAUM

Department of Internal Medicine, Ruperto Carola University, Heidelberg, Germany.

J. MANN

Professor, Universität Erlanger-Nurnberg, 4 Medizinische Klinik, Nurnberg, Germany.

GIUSEPPE MASCHIO

Professor of Nephrology and Chief of Division of Nephrology, University Hospital, Verona, Italy.

OTTO MEHLS

Professor of Paediatrics, University Children's Hospital, Heidelberg, Germany.

J. MENARD

INSERM U36, Paris, France.

JEAN-PHILIPPE MERY

Professor of Nephrology, Department of Nephrology, Université Xavier Bichat, Paris, France.

MARTIN MEYER-SCHWICKERATH

Associate Professor of Urology, Department of Urology, University of Essen, Germany.

ALAIN MEYRIER

Professor of Nephrology, Bobigny Medical School, Paris-North University, Bobigny, France.

M. J. MIHATSCH

Institut für Pathologie de Universität Basel, Switzerland.

LUIGI MINETTI

Head of Division of Nephrology and Dialysis, Ospedale Ca' Granda Niguarda, Milan, Italy.

CHRISTOPHER D. MITCHELL

Lecturer, Department of Haematology and Oncology, Institute of Child Health, London, UK.

M. MOLZAHN

Professor, Department of Internal Medicine III (Nephrology/Hypertension), Humboldt-Krankenhaus Berlin, Germany.

JEAN-FRANÇOIS MOREAU

Professor of Radiology and Chairman, Department of Radiology, Hôpital Necker, Paris, France.

STEPHEN H. MORGAN

Senior Registrar in Renal Medicine, South West Thames Regional Health Authority, St Helier Hospital, Carshalton and St George's Hospitals, London, UK.

PETER J. MORRIS

Professor of Surgery, Nuffield Department of Surgery, University of Oxford, John Radcliffe Hospital, Oxford, UK.

GUY NEILD

Professor, Department of Nephrology and Institute of Urology, University College and Middlesex School of Medicine, London, UK.

PATRICK NIAUDET

Assistant Professor, Pediatric Nephrology Department and INSERM U192, Hôpital Necker Enfants Malades, Paris, France.

H. OLBBING

Direktor der Abteilung für Kindernephrologie, Universitäts-Kinderklinik, Essen, Germany.

CHRISTOPH J. OLBRICHT

Professor of Medicine, Medizinische Hochschule Hannover, Germany.

LAMBERTO OLDRIZZI

Assistant Professor of Nephrology, University Hospital, Verona, Italy.

KAZUO OTA

Professor of Surgery, Kidney Center, Tokyo Women's Medical College, Tokyo, Japan.

SONIA PASQUALI

Department of Nephrology and Dialysis-Malpighi, Policlinico S. Orsola Malpighi, Bologna, Italy.

JOSÉ REIMÃO PINTO

Clinical Assistant, Nephrology Department, Santa Maria University Hospital, Lisbon, Portugal.

YVES PIRSON

Charge de Cours; Associate Chief of Renal Unit, University of Louvain Medical School, Cliniques Universitaires St-Luc, Brussels, Belgium.

P. F. PLOUIN

Service d'Hypertension Arterielle, Hôpital Broussais, Paris, France.

J. M. POCHET

Cliniques Universitaires St-Luc, Brussels and Cliniques Universitaires U.C.L. de Mont-Godinne, Yvoir, Belgium.

MOMIR H. POLENAKOVIC

Professor of Medicine, Department of Nephrology, Faculty of Medicine, University 'Cyril and Methodius', Skopje, Yugoslavia.

WOLFGANG POMMER

Department of Internal Medicine III (Nephrology/Hypertension), Humboldt-Krankenhaus Berlin, Germany.

CLAUDIO PONTICELLI

Director, Division of Nephrology and Dialysis, Istituto Scientifico Ospedale Maggiore, Milan, Italy.

CHARLES D. PUSEY

Wellcome Senior Research Fellow in Clinical Science; Senior Lecturer and Honorary Consultant Physician, Renal Unit, Department of Medicine, Royal Postgraduate Medical School, Hammersmith Hospital, London, UK.

ANTHONY E. G. RAINE

Department of Nephrology, St Bartholomew's Hospital, London, UK.

DAVID J. RAINFORD

Consultant in Renal Medicine, Princess Mary's Royal Air Force Hospital, Halton, Aylesbury, UK.

A. RAMMING

Department of Nephrology, Medical University, Wurzburg, Germany.

W. RASCHER

Professor, Universitäts-Kinderklinik, Essen, Germany.

PETER J. RATCLIFFE

Clinical Lecturer in Medicine, Nuffield Department of Medicine, John Radcliffe Hospital, Oxford, UK.

STEPHEN REEDERS

Assistant Professor of Internal Medicine and Human Genetics, Yale University School of Medicine, USA.

A. J. REES

Professor of Nephrology, Hammersmith Hospital, London, UK.

HELMUT REICHEL

Department of Internal Medicine, Division of Nephrology, University of Heidelberg, Germany.

CHRISTINE REISCH

Medizinische Klinik, Universität Erlangen-Nürnberg, Nürnberg, Germany.

GIUSEPPE REMUZZI

Mario Negri Institute for Pharmacological Research, and Division of Nephrology, Ospedali Riuniti di Bergamo, Italy.

SEVERIN M. G. RINGOIR

Professor of Medicine, University Hospital, Ghent, Belgium.

EBERHARD RITZ

Professor of Medicine, Ruperto Carola University, Heidelberg, Germany.

WILLIAM G. ROBERTSON

Chairman of Biological and Medical Research, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia.

ALAN M. ROBSON

Medical Director, Children's Hospital, New Orleans, Louisiana, USA.

BERNARDO RODRIGUEZ-ITURBE

Professor of Medicine, Renal Service and Laboratory, Hospital Universitario and Instituto de Investigaciones Biomedicas (INBIOMED), Maracaibo, Venezuela.

J. RODRIGUEZ-SORIANO

Professor of Paediatrics, Basque University School of Medicine; Head, Department of Paediatrics, Hospital Infantil de Cruces, Bilbao, Spain.

G. ALAN ROSE

Consultant Clinical Pathologist, St Peter's Hospitals, London, and Royal National Orthopaedic Hospital, Stanmore, UK.

CARLO RUGIU

Assistant Professor of Nephrology, University Hospital, Verona, Italy.

VINAY SAKHUJA

Additional Professor, Department of Nephrology, Postgraduate Institute of Medical Education and Research, Chandigarh, India.

FRANZ SCHAEFER

Division of Paediatric Nephrology, University Children's Hospital, Heidelberg, Germany.

F. PAOLO SCHENA

Professor, Department of Nephrology, University of Bari, Italy.

I. M. SHAFIK

Lecturer, Department of Medicine, University of Toronto, Canada.

THOMAS SHERWOOD

Professor of Radiology, University of Cambridge, UK.

COLIN D. SHORT

Department of Renal Medicine, Royal Infirmary, Manchester, UK.

HEINZ-GUNTER SIEBERTH

Director, Medizinische Klinik II, Medical Faculty, Technical University of Northrhine Westphalia (RWTH), Aachen, Germany.

VISITH SITPRIJA

Professor of Medicine and Chief of Division of Nephrology and Co-ordinating Kidney Center, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

MOURAD SOUSSI

Consultant Radiologist, Hôpital Necker, Paris, France.

L. W. STATIUS VAN EPS

Head, Department of Internal Medicine, Slotervaart Hospital, Amsterdam, The Netherlands.

VLADISAV STEFANOVIC

Professor of Medicine, Institute of Nephrology and Haemodialysis, University School of Medicine, Nis, Yugoslavia.

PAUL E. STEVENS

Department of Renal Medicine, Royal Air Force Hospital, Halton, Aylesbury, Buckinghamshire, UK.

JUDITH M. STEVENS

Research Fellow, Royal Postgraduate Medical School, London, UK.

TERRY B. STROM

Professor of Medicine, Harvard Medical School and Beth Israel Hospital, Boston, Massachusetts, USA.

MAX SUSSMAN

Professor, Department of Microbiology, Medical School, University of Newcastle upon Tyne, UK.

R. SUVANAPHA

Associate Professor of Medicine, Division of Nephrology, Department of Medicine, Chulalongkorn University, Bangkok, Thailand.

J. D. SWALES

Professor of Medicine, University of Leicester, UK.

RICHARD L. TANNEN

Professor and Chairman, Department of Medicine, University of Southern California, USA.

P. M. TER WEE

Department of Internal Medicine, Free University Hospital, Amsterdam, The Netherlands.

D. THOMSON

Senior Lecturer, Department of Pathology, University of Edinburgh, UK.

NEIL TURNER

Renal Unit, Department of Medicine, Royal Postgraduate Medical School, Hammersmith Hospital, London, UK.

MANUEL URRUTIA AVISRROR

Department of Urology, University of Salamanca, Spain.

G. K. VAN DER HEM

Professor of Nephrology, Division of Nephrology, Department of Internal Medicine, University Hospital, Groningen, The Netherlands.

F. J. VAN DER WOUDE

Department of Nephrology, University Hospital of Leiden, The Netherlands.

L. A. VAN ES

Professor, Department of Nephrology, University Hospital, Leiden, The Netherlands.

M. H. VAN RIJSWIJK

Professor, Division of Rheumatology, Department of Internal Medicine, University Hospital, Groningen, The Netherlands.

C. VAN YPERSELE DE STRIHOU

Professor of Medicine, Clinic Universitaires St-Luc, Brussels, Belgium.

RAYMOND C. VANHOLDER

Department of Nephrology, University Hospital, Ghent, Belgium.

R. VELA-NAVARRETE

Professor and Chairman, Fundación Jimenez Diaz, Universidad Autonoma, Madrid, Spain.

PATRICK J. W. VENABLES

Senior Lecturer and Consultant in Rheumatology, Kennedy Institute and Charing Cross Hospital, London, UK.

R. VERBERCKMOES

Professor, Renal Unit, Department of Internal Medicine, Universitair Ziekenhuis Gasthuisberg, Belgium.

KATE VERRIER JONES

Laura Ashley Senior Lecturer in Paediatric Nephrology, Department of Child Health, Royal Infirmary, Cardiff, UK.

JEAN-PAUL VIARD

Service d'Immunologie Clinique, INSERM U25, Hôpital Necker, Paris, France.

GIANCARLO VIBERTI

Professor of Diabetic Medicine; Director, Unit for Metabolic Medicine, Division of Medicine, United Medical and Dental Schools, Guy's Hospital, London, UK.

GIANLUIGI VIGANO'

Mario Negri Institute for Pharmacological Research, Bergamo, Italy.

ROWAN G. WALKER

Department of Nephrology, Royal Melbourne Hospital, Victoria, Australia.

M. WEBER

Professor, Medizinische Klinik IV, University Erlangen-Nürnberg, Erlangen, Germany.

RICHARD P. WEDEEN

VA Medical Center, East Orange, and UMDNJ, New Jersey Medical School, Newark, USA.

RICHARD B. WEINER

Clinical Assistant Professor of Psychiatry S.U.N.Y., Health Science Center at Brooklyn and Unit Chief, Children's Inpatient Psychiatric Unit, Brooklyn, New York, USA.

PETER WHELAN

Consultant Urologist, Department of Urology, St James' University Hospital, Leeds, UK.

HUGH N. WHITFIELD

St Bartholomew's Hospital, London, UK.

ROBERT WILKINSON

Reader in Medicine, Freeman Hospital, University of Newcastle upon Tyne, UK.

D. GWYN WILLIAMS

Senior Lecturer in Medicine and Consultant Nephrologist, United Medical and Dental Schools of Guy's and St Thomas's Hospitals, Guy's Hospital, London, UK.

C. G. WINEARLS

Consultant Nephrologist, Renal Unit, Churchill Hospital,
Oxford, UK.

ANTONY J. WING

United Medical and Dental Schools of Guy's and St Thomas's
Hospitals, St Thomas's Hospital, London, UK.

V. WIZEMANN

Georg Haas Dialysezentrum, Giessen, Germany.

OLIVER WRONG

Emeritus Professor of Medicine, University College, London,
UK.

ALESSANDRO ZUCCALA

Divisione di Nefrologia e Dialisi, Malpighi, Policlinico S.
Orsola-Malpighi, Bologna, Italy.

PIETRO ZUCHELLI

Professor, Department of Nephrology and Dialysis-Malpighi,
Policlinico S. Orsola-Malpighi, Bologna, Italy.

SECTION 12

Specific problems in chronic renal failure

- 12.1 Chronic renal failure in children**
- 12.2 Treatment of end-stage renal disease in the elderly**
- 12.3 Renal failure in diabetic nephropathy**

Contents

Volume 3

Contributors

xiii

SECTION 12 Specific problems in chronic renal failure

1603

- 12.1 Chronic renal failure in children
Otto Mehls and Richard N. Fine 1605

- 12.2 Treatment of end-stage renal disease in the elderly
Juan F. Macias-Núñez and J. Stewart Cameron 1621

- 12.3 Renal failure in diabetic nephropathy
Eberhard Ritz and Michael Koch 1635

SECTION 13 Urinary tract infection

1657

- 13.1 Microbiology and defences of the urinary tract
Max Sussman 1659

- 13.2 Lower and upper urinary tract infection in the adult
W. R. Cattell 1676

- 13.3 Lower and upper urinary tract infection in the child
Kate Verrier Jones 1699

- 13.4 Renal tuberculosis
L. Hernando and R. Vela-Navarrete 1719

- 13.5 Schistosomiasis
Rashad S. Barsoum 1729

- 13.6 Fungal infections and the kidney
Rosalinde Hurley 1742

SECTION 14 Disorders of mineral metabolism and renal stone disease

1751

- 14.1 Hypercalcaemia and hypocalcaemia
John A. Kanis, Neveen A. T. Hamdy, and Eugene V. McCloskey 1753

- 14.2 Hypo- and hyperphosphataemia
Claude Amiel, Claire Bailly, Brigitte Escoubet, and Gerard Friedlander 1782

- 14.3 Hypo- and hypermagnesaemia
I. M. Shafik and John H. Dirks 1802

- 14.4 Aetiological factors in stone formation
William G. Robertson 1822

- 14.5 The medical management of stone disease
G. Alan Rose 1847

- 14.6 The surgical management of renal stones
Hugh N. Whitfield 1869

- 14.7 Nephrocalcinosis
Oliver Wrong 1882

SECTION 15 The pregnant patient

1907

- 15.1 The normal physiological changes which occur during pregnancy
Chris Baylis and John M. Davison 1909

- 15.2 Renal complications which can occur in pregnancy
John M. Davison 1928

- 15.3 Pregnancy in patients with underlying renal disease
John M. Davison and Chris Baylis 1936

- 15.4 Pregnancy-induced hypertension
Ian A. Greer 1956

SECTION 16 Structural abnormalities

1981

- 16.1 Vesicoureteric reflux and reflux nephropathy
Ross R. Bailey 1983

- 16.2 The patient with urinary tract obstruction
L. R. I. Baker and Hugh N. Whitfield 2002

- 16.3 Congenital anomalies of the urinary tract
W. Rascher, Martin Meyer-Schwickerath, and H. Olbing 2023

SECTION 17 The patient with renal hypertension

2045

- 17.1 Clinical approach to hypertension
Robert Wilkinson 2047

- 17.2 The kidney and the control of blood pressure
J. D. Swales 2058

- 17.3 Clinical investigation of the renin-angiotensin-aldosterone system
Pierre Corvol, T. T. Guyene, J. Menard, and P. F. Plouin 2069

- 17.4 Effects of hypertension on renal vasculature and structure
Udo Helmchen 2075

- 17.5 Hypertension and progression of renal disease
Giuseppe Maschio, Lamberto Oldrizzi, and Carlo Rugiu 2083

- 17.6 Hypertension and unilateral renal parenchymal disease
A. Ramming and A. Heidland 2088

- 17.7 Renovascular hypertension
J. Mann, J.-R. Allenberg, Christine Reisch, R. Dietz, M. Weber, and F. C. Luft 2096

- 17.8 Hypertension in advanced renal failure
Pietro Zucchelli and Alessandro Zuccala 2117

- 17.9 Accelerated hypertension
Anthony E. G. Raine 2124

- 17.10 The hypertensive child
W. Rascher 2139

SECTION 18 The patient with inherited disease

2153

- 18.1 Molecular genetics of renal disorders
Stephen T. Reeders 2155

- 18.2 Cystic diseases
18.2.1 Polycystic kidney disease in children
Michel Broyer and Marie-France Gagnadoux 2163