

Cambridge University Press

978-0-521-88709-0 - Maternal-Fetal Nutrition During Pregnancy and Lactation

Edited by Michael E. Symonds and Margaret M. Ramsay

Frontmatter

[More information](#)

---

# Maternal-Fetal Nutrition during Pregnancy and Lactation

---

Cambridge University Press

978-0-521-88709-0 - Maternal-Fetal Nutrition During Pregnancy and Lactation

Edited by Michael E. Symonds and Margaret M. Ramsay

Frontmatter

[More information](#)

# Maternal-Fetal Nutrition during Pregnancy and Lactation

---

Editors

**Michael E. Symonds and Margaret M. Ramsay**

University of Nottingham and Nottingham University Hospitals, Nottingham, UK



**CAMBRIDGE**  
UNIVERSITY PRESS

Cambridge University Press  
978-0-521-88709-0 - Maternal-Fetal Nutrition During Pregnancy and Lactation  
Edited by Michael E. Symonds and Margaret M. Ramsay  
Frontmatter  
[More information](#)

CAMBRIDGE UNIVERSITY PRESS  
Cambridge, New York, Melbourne, Madrid, Cape Town,  
Singapore, São Paulo, Delhi

Cambridge University Press  
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by  
Cambridge University Press, New York

[www.cambridge.org](http://www.cambridge.org)  
Information on this title: [www.cambridge.org/9780521887090](http://www.cambridge.org/9780521887090)

© Cambridge University Press 2010

This publication is in copyright. Subject to statutory exception  
and to the provisions of relevant collective licensing agreements,  
no reproduction of any part may take place without  
the written permission of Cambridge University Press.

First published 2010

Printed in the United Kingdom at the University Press, Cambridge

*A catalog record for this publication is available from the  
British Library*

*Library of Congress Cataloging in Publication data*  
Maternal-fetal nutrition during pregnancy and lactation / editors, Michael  
E. Symonds and Margaret M. Ramsay.  
p. ; cm.

Includes bibliographical references and index.  
ISBN 978-0-521-88709-0 (hardback)

I. Pregnancy – Nutritional aspects. I. Symonds, Michael E., 1960–  
II. Ramsay, M. M., M.D. III. Title.

[DNLN: 1. Maternal Nutritional Physiological Phenomena. 2. Child  
Development. 3. Fetal Development. 4. Infant Nutritional Physiological  
Phenomena. 5. Infant. 6. Nutritional Requirements. 7. Pregnancy.  
WQ 175 M4225 2010]  
RG559.M365 2010  
618.2'42 – dc22 2009043217

ISBN 978-0-521-88709-0 hardback

Additional resources for this publication at  
[www.cambridge.org/9780521887090](http://www.cambridge.org/9780521887090)

Cambridge University Press has no responsibility for the  
persistence or accuracy of URLs for external or third-party  
internet websites referred to in this publication, and does  
not guarantee that any content on such websites is, or will  
remain, accurate or appropriate.

To the extent permitted by applicable law, Cambridge University Press is not  
liable for direct damages or loss of any kind resulting from the use of this  
product or from errors or faults contained in it, and in every case Cambridge  
University Press's liability shall be limited to the amount actually paid by the  
customer for the product.

Every effort has been made in preparing this publication to  
provide accurate and up-to-date information which is in accord with  
accepted standards and practice at the time of publication. Although case  
histories are drawn from actual cases, every effort has been made to disguise  
the identities of the individuals involved. Nevertheless, the authors, editors  
and publishers can make no warranties that the information contained  
herein is totally free from error, not least because clinical standards are  
constantly changing through research and regulation. The authors, editors  
and publishers therefore disclaim all liability for direct or consequential  
damages resulting from the use of material contained in this publication.  
Readers are strongly advised to pay careful attention to information provided  
by the manufacturer of any drugs or equipment that they plan to use.

# Contents

*Contributors* page vi

---

## Section 1 – Nutritional regulation and requirements for pregnancy and fetal growth

- 1 **Maternal adaptations to pregnancy and the role of the placenta** 1  
Leslie Myatt and Theresa Powell
- 2 **Pregnancy and feto-placental growth: macronutrients** 12  
Laura Brown, Tim Regnault, Paul Rozance, James Barry, and William W. Hay Jr.
- 3 **Mineral requirements of the mother and conceptus** 24  
Lorraine Gambling and Harry J. McArdle
- 4 **Individualized growth curves and size at birth** 34  
Eve Blair
- 5 **Maternal diets in the developing world** 44  
Shobha Rao and Chittaranjan Yajnik
- 6 **Preeclampsia** 53  
Fergus McCarthy and Louise Kenny

## Section 2 – Nutritional regulation and requirements for lactation and infant growth

- 7 **Macronutrients for lactation and infant growth** 63  
Thibault Senterre and Jacques Rigo
- 8 **Changes in nutrient requirements with age after birth** 72  
Christopher H. Knight
- 9 **Comparison between preterm and term infants** 82  
Mary Fewtrell and Sirinuch Chomtho

- 10 **Influences of timing and duration of formula feeding on infant growth** 92  
William C. Heird
- 11 **Maternal and offspring benefits of breast-feeding** 106  
Alison C. Tse and Karin B. Michels

---

## Section 3 – Specialized requirements

- 12 **Teenage pregnancies** 119  
Annie S. Anderson and Wendy L. Wrieden
- 13 **Vegetarians and vegans during pregnancy and lactation** 129  
Rana Conway and Adrienne Cullum
- 14 **Hyperemesis in pregnancy** 138  
James D. Paauw and Alan T. Davis
- 15 **Multiple pregnancy** 147  
Barbara Luke
- 16 **Mineral and vitamin supplementation before, during, and after conception** 155  
Y. Ingrid Goh
- 17 **Determinants of egg and embryo quality: long-term effects of maternal diet and assisted reproduction** 167  
Kevin D. Sinclair and Wing Yee Kwong
- 18 **Nutrition, environment, and epigenetics** 180  
Ian M. Morison and Wolf Reik

---

*Index* 196

Cambridge University Press

978-0-521-88709-0 - Maternal-Fetal Nutrition During Pregnancy and Lactation

Edited by Michael E. Symonds and Margaret M. Ramsay

Frontmatter

[More information](#)

## Contributors

---

### **Annie S. Anderson BSc PhD**

Centre for Public Health Nutrition Research,  
Department of Medicine, University of Dundee,  
Ninewells Hospital and Medical School, Dundee, UK

### **James Barry MD**

Perinatal Research Center, Department of Pediatrics,  
University of Colorado Denver, Aurora, Colorado,  
USA

### **Eve Blair PhD**

Centre for Child Health Research, University of  
Western Australia, West Perth, WA, Australia

### **Laura Brown MD**

Perinatal Research Center, Department of Pediatrics,  
University of Colorado Denver, Aurora, Colorado,  
USA

### **Sirinuch Chomtho MD PhD**

Childhood Nutrition Research Centre, University  
College London Institute of Child Health, London,  
UK

### **Rana Conway PhD BSc RPHNutr**

Freelance Public Health Nutritionist, London, UK

### **Adrienne Cullum BSc PhD RPHNutr**

Centre for Public Health Excellence, National  
Institute for Health and Clinical Excellence, London,  
UK

### **Alan T. Davis PhD**

Department of Surgery, Michigan State University,  
and GRMERC Department of Research, Grand  
Rapids, Michigan, USA

### **Mary Fewtrell MD MA FRCPC**

Childhood Nutrition Research Centre, University  
College London Institute of Child Health, London,  
UK

### **Lorraine Gambling BSc PhD**

Rowett Institute of Nutrition and Health, University  
of Aberdeen, Aberdeen, UK

### **Y. Ingrid Goh HBSc PhD**

Division of Clinical Pharmacology and Toxicology,  
The Hospital for Sick Children, Toronto, Ontario,  
Canada

### **William W. Hay Jr. MD**

Perinatal Research Center, Department of Pediatrics,  
University of Colorado Denver, Aurora, Colorado,  
USA

### **William C. Heird MD**

Children's Nutrition Research Center, Baylor College  
of Medicine, Houston, Texas, USA

### **Louise Kenny PhD MRCOG**

Anu Research Centre, Department of Obstetrics and  
Gynaecology, Cork University Maternity Hospital,  
University College Cork, Wilton, Cork, Ireland

### **Christopher H. Knight PhD**

University of Copenhagen Faculty of Life Sciences,  
Frederiksberg, Denmark

### **Wing Yee Kwong**

School of Biosciences, University of Nottingham,  
Sutton Bonington, Leicestershire, UK

### **Barbara Luke ScD MPH**

Department of Obstetrics, Gynecology, and  
Reproductive Biology, and Department of  
Epidemiology, Michigan State University, East  
Lansing, Michigan, USA

### **Harry J. McArdle BSc PhD**

Rowett Institute of Nutrition and Health, University  
of Aberdeen, Aberdeen, UK

Cambridge University Press

978-0-521-88709-0 - Maternal-Fetal Nutrition During Pregnancy and Lactation

Edited by Michael E. Symonds and Margaret M. Ramsay

Frontmatter

[More information](#)

## Contributors

**Fergus McCarthy MRCPI**

Anu Research Centre, Department of Obstetrics and Gynaecology, Cork University Maternity Hospital, University College Cork, Wilton, Cork, Ireland

**Karin B. Michels ScD PhD**

Obstetrics and Gynecology Epidemiology Center, Department of Obstetrics, Gynecology and Reproductive Biology, Brigham and Women's Hospital, Harvard Medical School; and Department of Epidemiology, Harvard School of Public Health; Boston, MA, USA

**Ian M. Morison MBChB PhD FRCPA**

Department of Pathology, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand

**Leslie Myatt PhD**

University of Texas Health Science Center, San Antonio, Texas, USA

**James D. Paauw MD PhD**

Spectrum Health Metabolic Nutrition Support Service and Department of Surgery, Michigan State University, Grand Rapids, Michigan, USA

**Theresa Powell PhD**

Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine, Cincinnati, Ohio, USA

**Shobha Rao, PhD**

Biometry and Nutrition Unit, Agharkar Research Institute, Pune, India

**Tim Regnault PhD**

Departments of Physiology and Pharmacology and Obstetrics and Gynaecology, University of Western Ontario, London, Ontario, Canada

**Wolf Reik MD FMedSci**

Babraham Institute, Babraham, Cambridge; Professor of Epigenetics, Centre for Trophoblast Research, Department of Physiology, Development & Neuroscience, University of Cambridge, Cambridge, UK

**Jacques Rigo MD PhD**

Pediatrics and Neonatal Department, University of Liège, CHR Citadelle, Liège, Belgium

**Paul Rozance MD**

Perinatal Research Center, Department of Pediatrics, University of Colorado Denver, Aurora, Colorado, USA

**Thibault Senterre MD**

Pediatrics and Neonatal Department, University of Liège, CHR Citadelle, Liège, Belgium

**Kevin D. Sinclair PhD**

School of Biosciences, University of Nottingham, Sutton Bonington, Leicestershire, UK

**Alison C. Tse SM**

Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

**Wendy L. Wrieden PhD**

Public Health Nutrition Research Group, Section of Population Health, Institute of Applied Health Science, University of Aberdeen, Aberdeen, UK

**Chittaranjan Yajnik MD FRCP**

Diabetes Unit, King Edward Memorial Hospital Research Center, King Edward Memorial Hospital, Pune, India