This volume, and its companion volume on the spermatozoon, provide an authoritative and wide-ranging account of the gametes and their reproductive role and function in humans. Acknowledged authorities from around the world contribute a detailed and timely account of the oocyte. The volume starts with an evolutionary perspective before focusing on the molecular and cellular biology of the oocyte and its structure and function. The development and maturation of the oocyte is fully dealt with including the endocrine and paracrine regulation of ovarian function. Practical issues such as oocyte storage and ovarian stimulation are also fully covered. The causes of female infertility are also an important theme. The volume concludes with a thought-provoking chapter on ethical considerations.

The volume will be an essential source of information for all clinicians and scientists with an interest in human reproduction.

Gametes – the oocyte

Cambridge Reviews in Human Reproduction

SERIES EDITORS

Professor J. G. Grudzinskas, Dr J. L. Yovich, Professor J. L. Simpson, Professor T. Chard

This major new series on human reproduction provides a comprehensive and integrated review of the reproductive process. The first six volumes concentrate on the essential reproductive events leading up to birth. The series provides a synthesis of the scientific, clinical and physiological elements of the reproductive process. Each volume focuses on a well-defined aspect of reproduction and provides a multidisciplinary though self-contained review.

Each volume is prepared by an international and authoritative team of writers involving many of the world's leading experts. The series is edited to the highest standard to insure an integrated and uniformly high level of presentation. An important feature of the series is the inclusion of high-quality line illustrations.

The series provides an essential source of information for all trainees in obstetrics, gynaecology, andrology and reproductive medicine and will also be of interest to reproductive biologists and geneticists, physiologists and endocrinologists.

Titles in the series:

THE UTERUS

GAMETES – THE SPERMATOZOON

Gametes – The Oocyte

Edited by
J. G. GRUDZINSKAS
The Royal London Hospital, London, UK
and
J. L. YOVICH
PIVET Medical Centre, Perth, Australia

CAMBRIDGE
UNIVERSITY PRESS

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

First published 1995

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

Library of Congress cataloguing in publication data

Gametes : the oocyte / edited by J.G. Grudzinskas and J.L. Yovich.
p. cm. — (Cambridge reviews in human reproduction)
Includes index.
ISBN 0-521-47490-6 (hardback). — ISBN 0-521-47995-9 (pbk.)
1. Ovum—Physiology. 2. Ovulation—Regulation. I. Grudzinskas,
J. G. (Jurgis Gedimines) II. Yovich, John. III. Series.
[DNLM: 1. Oocytes. 2. Ovulation—physiology. WQ 205 G1926 1995]
QM611.G35 1995
612.6'2—dc20
DNLM/DLC
for Library of Congress 94-42701 CIP

ISBN 0 521 47490 6 hardback
ISBN 0 521 47995 9 paperback

Transferred to digital printing 2004

PR

Contents

Editors' preface

The aim of this book is to provide a complete and up-to-date account of the physiology, endocrinology and biochemistry of the oocyte, with particular emphasis on the human and on the relationship of clinical abnormalities to ovarian function. The book begins with a detailed account of the evolution of the oocyte, an extraordinary perspective of events leading to our present state of knowledge of the human oocyte by Colin Austin. The molecular and cellular aspects of oocyte development are detailed by Roger Gosden's group, whilst Gerry Schatten's team deals with the organizational and dynamic events during maturation and fertilization. The genetic aspects of oocyte function are considered by Michelle Plachot whilst genetic control of ovarian development is reviewed by Joe Leigh Simpson. A full review of the mechanisms of ovulation including endocrine and paracrine regulation are addressed by Roger Gosden, Stephen Downs, David Baird and Markku Seppälä's group. Oocyte transport (Croxatto and Villalón) and conditions which affect oocyte quality (Homburg and Shelef) together with clinical disorders (Michael Hull) and then treatment (John Yovich) are examined in detail. Paterson and Aitken highlight the role of the zona pellucida in oocyte function and Al-Hasani and Diedrich review progress on storage of human oocytes. Finally, in a provocative essay, Rob Jansen reflects on the bioethical issues and challenges resulting from research on human oocytes and its current clinical implications.

J. G. Grudzinskas
and J. L. Yovich
March 1995

Contributors

R. J. AITKEN
MRC Reproductive Biology Unit, 37 Chalmers Street, Edinburgh EH3 9EW, UK

S. AL-HASANI
Department of Obstetrics & Gynaecology, Medical University of Lubeck, Ratzeburger Alle 160, D-23538, Lubeck, Germany

C. R. AUSTIN
47 Dixon Road, Buderim, Qld 4558, Australia

D. T. BAIRD
Department of Obstetrics & Gynaecology, 37 Chalmers Street, Edinburgh EH3 9EW, UK

M. BOWNES
Institute of Cell & Molecular Biology, University of Edinburgh, Edinburgh EH3 9EW, UK

M. BRÄNNSTRÖM
Department of Obstetrics & Gynaecology, University of Götenborg, Sweden

H. B. CROXATTO
Laboratorio de Endocrinologia, Facultad de Ciencias Biologicas, Universitad Catolica de Chile, Casilla 114-D, Santiago, Chile

K. DIEDRICH
Department of Gynaecology & Obstetrics, Medical University of Lubeck, Ratzeburger Allee 160, D-23538, Lubeck, Germany

S. M. DOWNS
Department of Biology, Marquette University, 530 N. 15th Street, Milwaukee WI 52233, USA

R. G. GOSDEN
Division of Obstetrics & Gynaecology, University of Leeds School of Medicine, D floor, Clarendon Wing (LGI), Belmont Grove, Leeds LS2 9NS, UK.

J. G. GRUDZINSKAS
Department of Obstetrics & Gynaecology, Holland Wing, The Royal London Hospital, London E1 1BA, UK

R. HOMBURG
9 Hatomer Street, Ramat Ilan, Givat Schmuel, 51905, Israel

M. G. R. HULL
Dept Obstetrics & Gynaecology, Bristol Maternity Hospital, Southwell Street, Bristol BS2 8EG, UK

R. P. S JANSEN
Sydney IVF, 187 Macquarie Street, Sydney, NSW 2000, Australia

P. O. JANSON
Department of Obstetrics & Gynaecology, University of Götenborg, Sweden

W. L. LEDGER
Nuffield Department of Obstetrics & Gynaecology, John Radcliffe Hospital, Oxford OX3 9DU, UK

C. NAVARA
Department of Zoology, University of Wisconsin-Madison, 1117 West Johnson Street, Madison, WI 53706, USA

M. PATERSON
MRC Reproductive Biology Unit, 37 Chalmers Street, Edinburgh EH3 9EW, UK

M. PLACHOT
Laboratoire de Fecondation *In Vitro* de la Biologie de la Reproduction, Hôpital Necker, Paris, France

G. SCHATTEN
Department of Zoology, University of Wisconsin-Madison, 1117 West Johnson Street, Madison, WI 53706, USA

M. T. SEPPÄLÄ
Department of Obstetrics & Gynaecology, Helsinki University Central Hospital, Haarthaninkatu 2, Helsinki SF-00290, Finland

M. SHELEF
Infertility Unit, Golda Medical Centre, Petah Tikva 49372, Israel

C. SIMERLY
Department of Zoology, University of Wisconson-Madison, 1117 West Johnson Street, Madison, WI 53707, USA

J. L. SIMPSON
Department of Obstetrics & Gynaecology, Baylor College of Medicine, One Baylor Plaza, Houston, Texas, 77030-3498, USA

M. VILLALÓN
Unidad de Reproduccion y Dessarrollo, Facultad de Ciencas Biologicas, P. Universitad Catolica de Chile, Casilla 114-D, Santiago, Chile

G.-J. WU
Department of Zoology, University of Wisconsin-Madison, 1117 West Johnson Street, Madison, WI 53706, USA. *Present address*: Department of Obstetrics & Gynaecology, No. 8, 3rd Sec. Ting-Chou Road, Taipei, Taiwan 100

J. L. YOVICH
PIVET Medical Centre, 166 Cambridge Street, Leederville, Perth, W. Australia 6007