

METHODS IN MOLECULAR BIOLOGY

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Sertoli Cells

Methods and Protocols

Edited by

Marco G. Alves

Department of Microscopy, Laboratory of Cell Biology and Unit for Multidisciplinary Research in Biomedicine (UMIB), Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal

Pedro F. Oliveira

Department of Microscopy, Laboratory of Cell Biology and Unit for Multidisciplinary Research in Biomedicine (UMIB), Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal; Department of Genetics, Faculty of Medicine, University of Porto, Porto, Portugal; i3S - Instituto de Investigação e Inovação em Saúde, University of Porto, Porto, Portugal; Department of Biosciences, Biotechnologies and Biopharmaceutics, University of Bari "Aldo Moro", Bari, Italy

Editors

Marco G. Alves
Department of Microscopy, Laboratory of Cell
Biology and Unit for Multidisciplinary Research
in Biomedicine (UMIB), Institute of Biomedical
Sciences Abel Salazar (ICBAS)
University of Porto
Porto, Portugal

Pedro F. Oliveira
Department of Microscopy, Laboratory of Cell
Biology and Unit for Multidisciplinary Research
in Biomedicine (UMIB), Institute of Biomedical
Sciences Abel Salazar (ICBAS)
University of Porto
Porto, Portugal

Department of Genetics, Faculty of Medicine
University of Porto
Porto, Portugal

i3S - Instituto de Investigação e Inovação em
Saúde
University of Porto
Porto, Portugal

Department of Biosciences, Biotechnologies and
Biopharmaceutics
University of Bari “Aldo Moro”
Bari, Italy

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Preface

We are proud to present this book dedicated to the somatic testicular Sertoli cell. These cells were first described by Enrico Sertoli in 1865. Since then, they have emerged as being pivotal for spermatogenesis and thus for male reproductive potential. These remarkable cells present some unique features that go far beyond the physical and nutritional support of spermatogenesis. That is why so many researchers have chosen to use them as models for a broad range of studies in many disciplines. This book was prepared not only for nonspecialists but also for experienced researchers that may be interested in a multidisciplinary approach to study these cells. The book is divided in 20 chapters, with only two review articles that introduce useful concepts for the understanding of the subsequent chapters, highlighting the mechanisms involved in two of the most relevant functions of these cells.

The use of Sertoli cells as models in male reproductive biology or as supporters for other cell types illustrates the need for standardized protocols for their *in vitro* culture. As expected, according to the species, there are small but crucial changes necessary to have these cells in culture (Chapter 1). After a successful culture, it is pivotal to characterize the cells and guarantee that the isolation was correct and the purity is as expected (Chapter 2). Most of the time, the visualization of the internal structures of the testis in sectioning material is mandatory. In that way, it is possible to have a detailed analysis of the seminiferous tubules, where Sertoli cells and germ cells establish an important relation, and the interstitial space. Thus, the specialized microenvironment can be analyzed by immunohistochemistry (Chapters 3 and 4).

Sertoli cells undergo proliferation and apoptosis during development, but it remains a matter of debate when they reach adulthood. In addition, that process, together with apoptosis, is altered by exposure to several substances and even hormones. It is then pivotal to study Sertoli cells' proliferation and apoptosis (Chapter 5). Many of those processes are mediated by protein-protein interactions, and to fully understand the relevance of Sertoli cell, it is essential to study those interactions being that co-immunoprecipitation is used many times (Chapter 6). The analysis and interpretation of interactome is complex, but it may open new insights on the molecular mechanisms that underlie Sertoli cell physiology and function (Chapter 7). Among the several novel processes identified in Sertoli cells, phagocytosis (Chapter 8), mitophagy (Chapter 9), and autophagy (Chapter 10) have emerged as biomarkers for health and disease.

The nutritional support of spermatogenesis (reviewed in Chapter 11) is an essential process in which the Sertoli cell produces the metabolic intermediates for the developing germ cells. Thus, assessing the metabolic activity of Sertoli cells (Chapter 12) and establishing their proteome (Chapter 13) enlighten a mechanistic action that may mediate subfertility or infertility in males. To further study Sertoli cell physiology and function, gene silencing or cell ablation is often used (Chapters 14 and 15).

The blood-testis barrier is composed of adjacent Sertoli cells being essential for spermatogenesis (reviewed in Chapter 16). Thus, the study of its integrity is a very valuable tool for researchers working on reproductive biology (Chapter 17). There is a long range of toxicants that affect the male reproductive system, and thus, novel computational methods

are being refined to evaluate their effect (Chapter 18). In addition, the water movement in Sertoli cells and the composition of the tubular fluid are a key element for a successful spermatogenesis (Chapter 19). Finally, we must also highlight the relevance of testis cryopreservation (Chapter 20).

We are hopeful that this volume dedicated to Sertoli cells will be a valuable resource for experienced researchers in reproductive biology, particularly andrologists, but also for future investigators and young students starting to study these remarkable cells. We thank all authors for their support and their contributions with key and useful notes. We also thank the production team and Springer for accepting this project. Their support and guidance were very useful. Finally, we would like to thank Dr. Raquel L. Bernardino for editorial checking and support at our laboratory. Finally, we thank the readers and we hope they can find this book useful.

Porto, Portugal

*Marco G. Alves
Pedro F. Oliveira*

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Contributors

- MARCO G. ALVES • *Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal*
- YONI BAERT • *Biology of the Testis, Research Laboratory for Reproduction, Genetics and Regenerative Medicine, Vrije Universiteit Brussel (VUB), Brussels, Belgium*
- BARBARA BANCO • *Reparto di Anatomia Patologica, DiMeVet, Università degli Studi di Milano, Milan, Italy*
- ESTER BELTRÁN-FRUTOS • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- RAQUEL L. BERNARDINO • *Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal*
- BARBARA BILINSKA • *Department of Endocrinology, Institute of Zoology and Biomedical Research, Jagiellonian University, Krakow, Poland*
- NICOLAS BOURMEYSTER • *Laboratoire Signalisation et Transports Ioniques Membranaires, Université de Poitiers/CNRS, Poitiers, France; CHU de Poitiers, Poitiers, France*
- GIUSEPPE CALAMITA • *Department of Biosciences, Biotechnologies and Biopharmaceutics, University of Bari “Aldo Moro”, Bari, Italy*
- ANNE CANTEREAU • *Laboratoire Signalisation et Transports Ioniques Membranaires, Université de Poitiers/CNRS, Poitiers, France; Plateforme IMAGE-UP, Poitiers, France*
- RUI A. CARVALHO • *Department of Life Sciences, University of Coimbra, Coimbra, Portugal*
- HAIQI CHEN • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA*
- C. YAN CHENG • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA; S.B.M. Pharmaceuticals Srl, Rome, Italy*
- LUÍS CRISÓSTOMO • *Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal; Department of Genetics, Faculty of Medicine (FMUP), University of Porto, Porto, Portugal; i3S-Instituto de Investigação e Inovação em Saúde, University of Porto, Porto, Portugal*
- MICHAEL CURLEY • *MRC Centre for Reproductive Health, The Queen’s Medical Research Institute, University of Edinburgh, Edinburgh, UK*
- ANNALUCIA DARBEY • *MRC Centre for Reproductive Health, The Queen’s Medical Research Institute, University of Edinburgh, Edinburgh, UK*
- NABIL EID • *Division of Life Sciences, Department of Anatomy and Cell Biology, Osaka Medical College, Osaka, Japan*

- MARGARIDA FARDILHA • *Laboratory of Signal Transduction, Medical Sciences Department, Institute for Research in Biomedicine, University of Aveiro, Aveiro, Portugal*
- RITA FERREIRA • *QOPNA, Department of Chemistry, University of Aveiro, Aveiro, Portugal*
- CONCEPCIÓN FERRER • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- MARIA JOÃO FREITAS • *Laboratory of Signal Transduction, Medical Sciences Department, Institute for Research in Biomedicine, University of Aveiro, Aveiro, Portugal*
- HONGYONG FU • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- MARÍA N. GALARDO • *División de Endocrinología, Centro de Investigaciones Endocrinológicas “Dr César Bergadá” CONICET – FEI, Hospital de Niños Ricardo Gutiérrez, Ciudad Autónoma de Buenos Aires, Argentina*
- RENSHAN GE • *Institute of Reproductive Biomedicine, Wenzhou Medical University, Wenzhou, Zhejiang, China*
- PATRIZIA GENA • *Department of Biosciences, Biotechnologies and Biopharmaceutics, University of Bari “Aldo Moro”, Bari, Italy*
- ELLEN GOOSSENS • *Biology of the Testis, Research Laboratory for Reproduction, Genetics and Regenerative Medicine, Vrije Universiteit Brussel (VUB), Brussels, Belgium*
- AGOSTINA GORGA • *CONICET-FEI-División de Endocrinología, Hospital de Niños Ricardo Gutiérrez, Centro de Investigaciones Endocrinológicas “Dr César Bergadá”, Ciudad Autónoma de Buenos Aires, Argentina*
- VALERIA GRIECO • *Reparto di Anatomia Patologica, DiMeVet, Università degli Studi di Milano, Milan, Italy*
- HITOMI HAMAOKA • *Division of Life Sciences, Department of Anatomy and Cell Biology, Osaka Medical College, Osaka, Japan*
- ZUPING HE • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China; Shanghai Institute of Andrology, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China; Shanghai Key Laboratory of Assisted Reproduction and Reproductive Genetics, Shanghai, China; Shanghai Key Laboratory of Reproductive Medicine, Shanghai, China*
- ANNA HEJMEJ • *Department of Endocrinology, Institute of Zoology and Biomedical Research, Jagiellonian University, Krakow, Poland*
- AKIO HORIBE • *Division of Life Sciences, Department of Anatomy and Cell Biology, Osaka Medical College, Osaka, Japan*
- YUKO ITO • *Division of Life Sciences, Department of Anatomy and Cell Biology, Osaka Medical College, Osaka, Japan*
- IVANA JARAK • *Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal; Department of Life Sciences, University of Coimbra, Coimbra, Portugal*
- BERNARD JEGOU • *Université de Rennes/INSERM, IRSET, Rennes, France*

- PRANITHA JENARDHANAN • *Centre for Bioinformatics, Pondicherry University, Puducherry, India*
- JEHANGIR KHAN • *Zoology Department, Buner Campus, Abdul Wali Khan University Mardan, Mardan, Pakistan*
- YOICHI KONDO • *Division of Life Sciences, Department of Anatomy and Cell Biology, Osaka Medical College, Osaka, Japan*
- MALGORZATA KOTULA-BALAK • *Department of Endocrinology, Institute of Zoology and Biomedical Research, Jagiellonian University, Krakow, Poland*
- WILL M. LEE • *School of Biological Sciences, University of Hong Kong, Pokfulam, Hong Kong, China*
- NAN LI • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA*
- WEI LI • *State Key Laboratory of Stem Cell and Reproductive Biology, Institute of Zoology, Chinese Academy of Sciences, Beijing, People's Republic of China*
- QINGQUAN LIAN • *Institute of Reproductive Biomedicine, Wenzhou Medical University, Wenzhou, Zhejiang, China*
- CHAO LIU • *State Key Laboratory of Stem Cell and Reproductive Biology, Institute of Zoology, Chinese Academy of Sciences, Beijing, People's Republic of China*
- WING-YEE LUI • *School of Biological Sciences, University of Hong Kong, Pokfulam, Hong Kong, China*
- ANNA MAGGIO • *Department of Biosciences, Biotechnologies and Biopharmaceutics, University of Bari "Aldo Moro", Bari, Italy; Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal*
- JESÚS MARTÍNEZ-HERNÁNDEZ • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- PREMENDU P. MATHUR • *Department of Biochemistry and Molecular Biology, Pondicherry University, Puducherry, India; KIIT University, Bhubaneswar, Odisha, India*
- SILVINA B. MERONI • *División de Endocrinología, Centro de Investigaciones Endocrinológicas "Dr César Bergadá" CONICET – FEI, Hospital de Niños Ricardo Gutiérrez, Ciudad Autónoma de Buenos Aires, Argentina*
- NADIA MESSADDEQ • *Institute of Genetics and Molecular and Cellular Biology, Illkirch, France; Centre National de la Recherche Scientifique, UMR7104, Illkirch, France; Institut National de la Santé et de la Recherche Médicale, U964, Illkirch, France; Université de Strasbourg, Strasbourg, France*
- ANNIE-CLAIRE MEUNIER • *Laboratoire Signalisation et Transports Ioniques Membranaires, Université de Poitiers/CNRS, Poitiers, France*
- DOLORES D. MRUK • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA*
- MINGHUI NIU • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- PETER O'SHAUGHNESSY • *Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow, Glasgow, UK*

- PEDRO F. OLIVEIRA • *Department of Microscopy, Laboratory of Cell Biology and Unit for Multidisciplinary Research in Biomedicine (UMIB), Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal; Department of Genetics, Faculty of Medicine, University of Porto, Porto, Portugal; i3S - Instituto de Investigação e Inovação em Saúde, University of Porto, Porto, Portugal; Department of Biosciences, Biotechnologies and Biopharmaceutics, University of Bari “Aldo Moro”, Bari, Italy*
- JAIME ONOFRE • *Biology of the Testis, Research Laboratory for Reproduction, Genetics and Regenerative Medicine, Vrije Universiteit Brussel (VUB), Brussels, Belgium*
- MANIVEL PANNEERSELVAM • *Centre for Bioinformatics, Pondicherry University, Puducherry, India*
- LUIS MIGUEL PASTOR • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- VICTOR QUESADA-CUBO • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- DIANE REBOURCET • *MRC Centre for Reproductive Health, The Queen’s Medical Research Institute, University of Edinburgh, Edinburgh, UK; Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow, Glasgow, UK*
- MARÍA F. RIERA • *División de Endocrinología, Centro de Investigaciones Endocrinológicas “Dr. César Bergadá” (CEDIE) CONICET – FEI, Hospital de Niños Ricardo Gutiérrez, Ciudad Autónoma de Buenos Aires, Argentina*
- GUSTAVO RINDONE • *División de Endocrinología, Centro de Investigaciones Endocrinológicas “Dr. César Bergadá” (CEDIE) CONICET – FEI, Hospital de Niños Ricardo Gutiérrez, Ciudad Autónoma de Buenos Aires, Argentina*
- VICENTE SECO-ROVIRA • *Department of Cell Biology and Histology, School of Medicine, IMIB-Arrixaca, Regional Campus of International Excellence, Campus Mare Nostrum, University of Murcia, Murcia, Spain*
- BRUNO SILVESTRINI • *S.B.M. Pharmaceuticals Srl, Rome, Italy*
- LEE B. SMITH • *MRC Centre for Reproductive Health, The Queen’s Medical Research Institute, University of Edinburgh, Edinburgh, UK; School of Environmental and Life Sciences, University of Newcastle, Callaghan, NSW, Australia*
- MÁRIO SOUSA • *Unit for Multidisciplinary Research in Biomedicine (UMIB), Laboratory of Cell Biology, Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Porto, Portugal; Centre for Reproductive Genetics Prof. Alberto Barros, Porto, Portugal*
- ELIZABETH I. TANG • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA*
- FÁBIO TRINDADE • *iBiMED, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal; UnIC, Departamento de Cirurgia e Fisiologia, Faculdade de Medicina, Universidade do Porto, Porto, Portugal*
- DORIEN VAN SAEN • *Biology of the Testis, Research Laboratory for Reproduction, Genetics and Regenerative Medicine, Vrije Universiteit Brussel (VUB), Brussels, Belgium*
- RUI VITORINO • *iBiMED, Department of Medical Sciences, University of Aveiro, Aveiro, Portugal; UnIC, Departamento de Cirurgia e Fisiologia, Faculdade de Medicina, Universidade do Porto, Porto, Portugal*

- HONG WANG • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- LIPING WEN • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- QING WEN • *The Mary M. Wohlford Laboratory for Male Contraceptive Research, Center for Biomedical Research, Population Council, New York, NY, USA*
- XIANG XIAO • *Department of Reproductive Physiology, Zhejiang Academy of Medical Sciences, Hangzhou, Zhejiang, China*
- MARINA G. YEFIMOVA • *Laboratoire Signalisation et Transports Ioniques Membranaires, Université de Poitiers/CNRS, Poitiers, France; Sechenov Institute of Evolutionary Physiology and Biochemistry, Russian Academy of Sciences, St. Petersburg, Russia*
- QINGQING YUAN • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- WEIHUI ZHANG • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*
- FAN ZHOU • *State Key Laboratory of Oncogenes and Related Genes, Renji-Med X Clinical Stem Cell Research Center, Ren Ji Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China*