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Somatic Cell Nuclear Transfer

Edited by

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PREFACE

When I was first approached to edit the present volume, I was somewhat reluctant to undertake this humbling task because most of my own scientific expertise is derived from studies of mammalian fertilization rather than somatic cell nuclear transfer (SCNT). However, in the last ten years, I was very fortunate to train, collaborate, and communicate with a number of distinguished “cloners,” many of whom kindly agreed to contribute to the present volume. This experience made me appreciate that the understanding of cellular and molecular events during and after SCNT is deeply rooted in our knowledge of fertilization of mammalian ovum by the spermatozoon, to which I prefer to refer to as “natural fertilization,” not to say that SCNT should be regarded as “unnatural fertilization”. Unique cellular events arising from SCNT have no parallel in natural fertilization and early pre-implantation development. The list includes the requirement of donor cell-nuclear remodeling, disposal of donor cell organelles, the possibility of heteroplasmy (i.e., presence of mixed mitochondrial genomes) and altered mode of oocyte activation.

Thanks to seminal contributions of my distinguished colleagues, the present volume reviews the progress of SCNT technology in major mammalian species including mouse, pig, and cattle, while at the same time, parallels can be drawn and distinctions made between the cellular and molecular basis of nuclear transfer and fertilization.

Randall Prather will review recent progress in pig SCNT and production of transgenic and knock out pigs for biomedical research and xenotransplantation, and Björn Öback with David N. Wells will summarize the advances achieved in cattle cloning. Studies of cloned mice will be revisited from a new, behavioral point of view, by a team led by Kellie L.K. Tamashiro.

To examine the cellular and molecular mechanism of SCNT, Christopher Malcuit and Rafael A. Fissore will discuss oocyte activation; Heide Schatten with Qing-Yuan Sun, and Stefan Hiendleder will review centrosomal and mitochondrial inheritance, respectively; Keith E. Latham, Shaorong Gao and Zhiming Han will address the issues of donor cell-nuclear reprogramming; Josef Fulka Jr. and Helena Fulka will assess the importance of donor cell cytoplasm; and Jozef Laurincik will team up with Poul Maddox-Hyttel to address nucleogenesis and activation of ribosomal genes in cloned embryos.

Altogether, the present tome will offer readers a unique developmental, molecular, and cell-biological view of the exciting SCNT technology, while also discussing its pitfalls, detours, and possible future directions. We hope that it will help both students and experienced researchers to further develop their knowledge and understanding of mammalian embryonic development.

I would like to thank all contributors for outstanding chapters, Dr. Ron Landes and the staff of Landes Bioscience for making this unique volume possible, and Ms. Kathy Craighead for assistance with initial editing of all manuscripts.

Peter Sutovsky, Ph.D.

ABOUT THE EDITOR...

PETER SUTOFSKY, Ph.D., is an Assistant Professor at the University of Missouri-Columbia with joint appointments in the Departments of Animal Science and Obstetrics and Gynecology. For more than a decade he has studied mammalian spermatogenesis, fertilization and pre-implantation embryonic development, with special interest in the ubiquitin system. Dr. Sutofsky's recent work described the role of proteasomal degradation of ubiquitinated proteins in epididymal sperm quality control, fertilization, pronuclear development and mitochondrial inheritance. He has published more than 75 research articles, reviews and book chapters and was recently named the inaugural recipient of the USDA-NRI Discovery Award. In high demand as a presenter, Dr. Sutofsky has been the invited plenary speaker at numerous international symposiums in Europe, South America, Asia, and the U.K. He earned his Ph.D. in Physiology from the Czech Academy of Sciences, Prague, Czech Republic in 1994 before postdoctoral appointments at the University of Wisconsin, Madison, and Oregon Health & Science University, Portland.

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