Time-Lapse Microscopy in In-Vitro Fertilization

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Edited by
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This book is dedicated to those professional pioneers as mechanical engineers and biologists who made it possible to bring this technology into the clinical field, especially to Dr. Niels Ramsing and Dr. Jens Gundersen for their vast contribution in this task.

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Preface

Assisted reproduction is a field constantly seeking for improvement. For those who work in it, fascination is inevitable during the first microscopic observations of the cellular material. Male and female gametes can enthrall the viewer, giving rise to a mysterious structure that develops according to a pre-defined plan: the human embryo. The understanding of this complex process definitely exceeds its morphological evaluation and it welcomes new technologies on a cellular and molecular level.

The study of the embryo's metabolism was crucial for the formulation of suitable culture media. In the early 1990s a groundbreaking technique, ICSI, revolutionized the treatment of male infertility. Later on, and as we entered the world of genomics, we began to understand the extraordinarily detailed genetic assemblage that determines the fate of an embryo, a process governed by molecular mechanisms and signaling pathways. Reconciliation of the social evolution of modern women and their maternity came along with vitrification, and the wave of the "omics" initiated an era of non-invasiveness to study embryo development in the IVF laboratory. Assisted reproduction has evolved indeed; however, there will always be room for improvement.

In the past 30 years, cell biology has benefited from the achievements in the image analysis technology. During the 1980s, the use of analog videos greatly expanded the use of the microscope as an analytical tool and, most recently, analog systems have been replaced by digital ones. The culmination of this initial approach is presented to us in the form of time-lapse systems, a technology leading us to evolve from single static observations to the continuous surveillance of human embryos in the IVF laboratory.

The idea of this time-lapse atlas was forged by Marcos Meseguer, undoubtedly a pioneer in the field, in combination with the University of Cambridge. The objective was to create a dynamic and highly visual atlas of human embryo development. For this purpose a group of different leaders in the clinical and scientific fields reunite to share their experience on this new technology. The atlas gives the reader the opportunity to review known aspects of human embryo development from a different approach, as well as to learn and visualize new and useful concepts related to human embryo development. It is an absolute "must-see-read" for all the clinicians and scientists involved in the field of assisted reproduction.

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