

METHODS IN MOLECULAR BIOLOGY

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Myogenesis

Methods and Protocols

Edited by

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Preface

The skeletal muscles account for up to half of the human body mass and are mainly composed of postmitotic, multinucleated muscle fibers. The skeletal muscle comprises more than 600 individual muscles, and is not only important for movement but is also a major site of fatty acid oxidation and carbohydrate metabolism. Skeletal muscle function is highly dependent on the ability to regenerate. Fifty years ago, Mauro first suggested that satellite cells were involved in skeletal muscle regeneration. Since the first discovery of these cells, numerous reports have identified these stem cells as primary contributors to the postnatal growth, maintenance, and repair of skeletal muscles. The satellite cells are located between the basal lamina and sarcolemma (plasma membrane) of skeletal muscle fibers and are normally quiescent in the adult muscle before they become activated upon exercise, injury, or disease. Then the cells have a remarkable ability to self-renew, expand, grow, or undergo myogenic differentiation to fuse and restore damaged muscle. The conversion of mononuclear muscle precursors (myoblasts) into multinucleated myotubes is a complex process and is still not fully characterized.

This volume of the *Methods in Molecular Biology* series therefore provides a collection of many of the common experimental approaches used to study myogenesis. The chapters are all written in the same format, describing the basic theory of the method, listing all the chemicals, reagents, equipment, and materials necessary. Then the method section is written as a step-by-step description of every protocol. Most importantly, the chapters give an idea of problems that can be encountered, how these can be identified, and, finally, how to overcome the difficulties.

The book covers subjects ranging from isolation and purification protocols, manipulation of muscle cells, transcriptomics and proteomics, metabolism and exercise, and tissue engineering. Presented methods involve different species, including human, bovine, Atlantic salmon, rats, mice, larval zebra fish, and *Drosophila melanogaster*. The book includes advanced techniques for manipulation of the muscle cells including lentivirus-mediated RNAi, siRNA gene silencing, and CRISPR/Cas9-mediated targeting, as well as transcriptomics and proteomics. The book also includes protocols important for tissue engineering such as co-culture with other cells, trans-differentiation, use of serum-free media, and bioengineering skeletal muscle in bioreactors. Together, I hope that this volume will be an essential part of many laboratory libraries and assist researchers throughout the world to help reveal the unknowns of myogenesis.

I would like to thank Prof. John M. Walker, the series editor, for his help, advice, and guidance in making this book.

Enjoy!

Ås, Norway

Sissel Beate Rønning

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