

METHODS IN MOLECULAR BIOLOGY

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ERK Signaling

Methods and Protocols

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Cover illustration: Composite image with partial view of a *Drosophila* embryo showing downregulation of nuclear Capicua protein (magenta) in response to graded ERK activation at the embryo pole. The blue signal marks the cortical Actin cytoskeleton. (Designed by Marta Forés.)

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Preface

Because of its multiple essential functions in metazoans, and its strong connection to cancer, the ERK pathway is generally considered a paradigm in cell signaling. Indeed, there is hardly any cellular or developmental process that is not controlled, directly or indirectly, by a pathway (most prominently the Ras-Raf pathway) converging on the ERK kinase. Furthermore, the clinical significance of ERK signaling has been recently highlighted by its involvement in several human congenital syndromes, referred to as RASopathies. It is therefore not surprising that new research approaches are continuously being developed and adapted to study ERK signaling at all levels—from the atomic and single-molecule level to the biology of complex diseases.

This volume of *Methods in Molecular Biology* provides a collection of techniques and approaches for the study of ERK signaling. It begins with a historical perspective of genetic and molecular discoveries, followed by chapters covering specific topics and a broad range of experimental systems. To some extent, the book represents a continuation of two previous excellent volumes in the series, entitled *MAP Kinase Signaling Protocols* and edited by Rony Seger. Thus, we have primarily selected protocols and strategies developed in recent years, which update and extend those described in the previous volumes.

Editing this book has been a rewarding experience for me, and I would like to take this opportunity to thank all those who have helped me along the way to be able to do this work. In particular, I wish to thank David Ish-Horowicz for his wisdom and inspirational mentoring during my early *Drosophila* training, and my various friends, colleagues, and students for many stimulating discussions and fruitful collaborations over the last years. Special thanks are also due to the ICREA Institution and our funding agencies for their vital support, and, of course, to my family for their endless patience, love, and encouragement.

Finally, this book is a collective effort by more than 70 authors who have generously dedicated their time and expertise to prepare the chapters. I am very grateful to them, as well as to John Walker and the Springer team for their guidance throughout the project. We very much hope that this volume will aid and stimulate further advances in the vibrant field of ERK signaling.

Barcelona, Spain

Gerardo Jiménez

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