

METHODS IN MOLECULAR BIOLOGY

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Plant Cell Expansion

Methods and Protocols

Edited by

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Preface

Plant cells differ enormously in size and shape and cell volumes can vary 10,000-fold within a species, increasing in size from meristems to differentiated cells. Plant cells can be cylindrical, tubular, spherical, stellate, etc., and this complex cell shapes are produced by tight regulation of growth and need to be maintained by structural reinforcement after the cessation of growth. Plant cell expansion occurs through the controlled growth of the cell wall, which results from the interplay between turgor pressure and cell wall elasticity and extensibility. The understanding of growth at the cellular level is vital because final plant shape is dictated by two factors: cell number and cell size. The improvement of existing methods and the development of new ones to follow and study how single plant cells change over the time is one exciting area of research within plant biology.

By presenting this new volume of *Plant Cell Expansion*, I wanted to cover selected aspects of plant cell growth in different single-cell types such as root hairs and pollen tubes as well as at tissues-organ level like hypocotyls and whole roots. This volume is focused on methods to study in detail several complex aspects of cell expansion such as secretion and endocytosis, reactive oxygen species (ROS) production, and Ca^{2+} imaging as well as quantification of growth in real time. In addition, two chapters described methods for the structural and mechanical as well as the biochemical characterization of growing plant cell walls. On top, there are chapters only dedicated to the green algae *Penium margaritaceum* as a new model for single-cell growth and cell wall formation. Finally, several methods currently used in plant molecular and cell biology are described for identification of new genes related to cell growth and expansion.

As in previous books of the series, all the authors in each single chapter of this book have tried to present a collection of step-by-step protocols, described at a level of detail enough to be followed by experienced researchers and beginners. I wish this book would become an important reference book for plant scientists working on any aspect of molecular and cell biology that relates to cell growth and expansion. Finally, I would like to thank all the contributing colleagues whose knowledge, expertise, and effort have been vital for attaining the highest scientific level of this book.

Buenos Aires, Argentina

José M. Estevez

Contents

| | |
|--|-----------|
| <i>Preface</i> | <i>v</i> |
| <i>Contributors</i> | <i>ix</i> |
| 1 <i>Penium margaritaceum</i> as a Model Organism for Cell Wall Analysis of Expanding Plant Cells | 1 |
| <i>Maja G. Rydahl, Jonatan U. Fangel, Maria Dalgaard Mikkelsen, I. Elisabeth Johansen, Amanda Andreas, Jesper Harholt, Peter Ulvskov, Bodil Jørgensen, David S. Domozych, and William G.T. Willats</i> | |
| 2 Using Chemical Genomics to Study Cell Wall Formation and Cell Growth in <i>Arabidopsis thaliana</i> and <i>Penium margaritaceum</i> | 23 |
| <i>N. Worden, V. Esteva Esteve, D.S. Domozych, and G. Drakakaki</i> | |
| 3 Optimized Method for Growing In Vitro <i>Arabidopsis</i> <i>thaliana</i> Pollen Tubes | 41 |
| <i>Cecilia Borassi, Juliana Pérez Di Giorgio, María R. Scarpin, Jorge Muschietti, and José M. Estevez</i> | |
| 4 Imaging of Calcium Dynamics in Pollen Tube Cytoplasm | 49 |
| <i>María Laura Barberini and Jorge Muschietti</i> | |
| 5 Live Imaging of Root Hairs | 59 |
| <i>Silvia M. Velasquez, Jose R. Dinneny, and José M. Estevez</i> | |
| 6 Improved ROS Measurement in Root Hair Cells. | 67 |
| <i>Paola Silvina Denita Juárez, Silvina Mangano, and José M. Estevez</i> | |
| 7 A Root Hair Assay to Expedite Cell Death Research | 73 |
| <i>Joanna Kacprzyk and Paul F. McCabe</i> | |
| 8 Vacuolar Staining Methods in Plant Cells | 83 |
| <i>David Scheuring, Maria Schöller, Jürgen Kleine-Vehn, and Christian Löffke</i> | |
| 9 Live Cell Imaging of FM4-64, a Tool for Tracing the Endocytic Pathways in <i>Arabidopsis</i> Root Cells | 93 |
| <i>Adeline Rigal, Siamsa M. Doyle, and Stéphanie Robert</i> | |
| 10 Salt-Stress Regulation of Root System Growth and Architecture in <i>Arabidopsis</i> Seedlings | 105 |
| <i>Lina Duan, Jose Sebastian, and Jose R. Dinneny</i> | |
| 11 Quantification of Fluorescent Reporters in Plant Cells. | 123 |
| <i>Michael Pound, Andrew P. French, and Darren M. Wells</i> | |
| 12 Live Cell Imaging of the Cytoskeleton and Cell Wall Enzymes in Plant Cells. | 133 |
| <i>Arun Sampathkumar and Raymond Wightman</i> | |

13 Using the Split-Ubiquitin Yeast Two-Hybrid System
to Test Protein–Protein Interactions of Transmembrane Proteins. 143
Logan Bashline and Ying Gu

14 Activation Tag Screening for Cell Expansion Genes
in *Arabidopsis thaliana* 159
Chaowen Xiao and Charles T. Anderson

15 BiFC for Protein–Protein Interactions and Protein Topology:
Discussing an Integrative Approach for an Old Technique. 173
Giovanni Stefano, Luciana Renna, and Federica Brandizzi

16 N-Glycosylation and Plant Cell Growth. 183
Christiane Veit, Ulrike Vavra, and Richard Strasser

17 Peptide Separation Methodologies for In-depth Proteomics 195
*Sajad Majeed Zargar, Rie Kurata, Randeep Rakwal,
and Yoichiro Fukao*

18 Structural and Mechanical Characterization of Growing
Arabidopsis Plant Cell Walls. 211
Friederike Saxe, Ingo Burgert, and Michaela Eder

Index 229

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