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SCIENCE DIRECT
Developmental Biology 295 (2006) 403 – 413
DEVELOPMENTAL BIOLOGY
www.elsevier.com/locate/ydbio

Abstracts

Cell Fate

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Control of leaf vascular patterning by polar auxin transport

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The formation of the leaf vascular pattern has fascinated biologists for centuries. In the early leaf primordium, complex networks of procambial cells emerge from homogeneous subepidermal tissue. The molecular nature of the underlying positional information is unknown, but various lines of evidence implicate gradually restricted transport routes of the plant hormone auxin in defining sites of procambium formation. Here we show that a crucial member of the AtPIN family of auxin efflux-associated proteins, AtPIN1, is expressed prior to preprocambial and procambial cell fate markers in domains that become restricted towards sites of procambium formation. Subcellular PIN1 polarity indicates that auxin is directed to distinct 'convergence points' in the epidermis, from where it defines the positions of major veins. Integrated polarities in all emerging veins indicate auxin drainage towards pre-existing veins, but veins display divergent polarities as they become connected at both ends. Auxin application and transport inhibition reveals that convergence points positioning and PIN1 expression domain dynamics are self-organizing, auxin-transport-dependent processes. We derive a model for self-regulated, reiterative patterning of all vein orders and postulate at its onset a common epidermal auxin-focusing mechanism for major vein positioning and phyllotactic patterning.

doi:10.1016/j.ydbio.2006.04.236

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Mechanisms underlying hormone-induced changes in plant development—A genetic approach

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Development in certain mosses is particularly well suited for an examination of the progressive changes characterizing the development of a multicellular organism. During moss development, a single cell (initial cell) formed on the caulonema filament responds to a hormonal cue (cytokinin) resulting in an alteration of its pattern of growth. This cell then divides asymmetrically, and following a number of cell divisions, a simple 'meristem' is organized so as to ultimately give rise to the leafy gametophyte. The result is a change from 2-dimensional filamentous growth to the 3-dimensional growth required for completion of the moss life cycle. Random insertional mutants were created in Physcomitrella patens in an effort to further characterize the signal transduction pathway initiated by cytokinin. A mutant has been identified, which produces the initial cells in the normal manner (spatially and temporally) but which are unable to respond to the hormone. Thermal asymmetric interlaced (TAIL)-PCR is being used to amplify the sequence disrupted by the inserted foreign DNA and thereby identify a genomic sequence important in the signaling process.

doi:10.1016/j.ydbio.2006.04.237

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A mouse embryonic stem cell model for Schwann cell differentiation

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The neurofibromatosis type 1 (NF1) gene functions as a tumor suppressor gene in the autosomal dominant disorder, NF1. Loss of neurofibromin (the protein product of the NF1 gene) is associated with tumors of the peripheral nervous system, particularly neurofibromas, benign lesions in which the major cell type is the Schwann cell (SC). We have developed an in vitro system for differentiating mouse embryonic stem cells (mESC) that are NF1 wild type (+/+), heterozygous (+/−), or null (−/−) into SC-like cells, which express SC markers and are capable of expressing myelin. Two human NF1 tumor cell lines, one from a benign plexiform neurofibroma and one from a malignant peripheral

doi:10.1016/j.ydbio.2006.04.235