

Proteins identified by the overexpression screening accumulate differentially in two daughter cells generated by asymmetric cell division of protonemal stem cells in *Physcomitrella patens*

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Asymmetric cell division produces distinct fate of two daughter cells. Although unequal distribution of mRNA or proteins has been known to play a pivotal role to specialize each daughter cell, such molecules in plants remain largely unknown. The moss, *Physcomitrella patens* provides a good system for the study of cell polarity and asymmetric cell division. Isolated protoplasts show polar outgrowth and divide asymmetrically. It is conceivable that according to the polarity, developmental determinants inherit differently into two daughter cells, which results in an apical stem cell and a differentiated protonemal, non-stem cell. The apical stem cell, thereafter, continues to divide asymmetrically to generate a row of differentiated protonemal cells. Thus regeneration of the protoplasts involves many aspects of cell polarity and asymmetric cell division.

We have devised a systematic overexpression screening for genes that affect cell polarity or asymmetric cell division of *P. patens* protoplasts. About 3200 full-length cDNAs were strongly overexpressed into the protoplasts, then we identified 58 cDNAs as candidates for genes that are involved in cell polarity or asymmetric cell division. For those candidates, we made cDNA-YFP knock-in transgenic plants by using gene targeting technique to investigate protein localization during asymmetric cell division under a control of native promoters. We found several fusion proteins preferentially accumulated in apical stem cells but much less in non-stem cells. Two of the candidates, moreover, showed tip-localized distribution within the stem cell, suggesting some roles on cell polarity.