

A plant-specific kinesin-like protein, API1, regulates microtubule arrays of spindles and phragmoplasts

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Proper regulations of cell number and shape are essential for normal development in multicellular organisms. Spatial and temporal controls of microtubules are prominent molecular mechanisms, which manage these cellular processes. To understand the molecular mechanism of the microtubule regulation, we have analyzed function of a plant-specific kinesin-like protein, API1, which is expressed in dividing cells of the moss *Physcomitrella patens*. Here we present roles of these kinesin-like proteins, API1 and API1L, on microtubule organization during cell division based on their disruptant phenotypes and cellular localization.

Single disruption of *API1* or its sister gene, *API1L*, did not result in any noteworthy phenotype. However, double disruption of *API1* and *API1L* caused formation of incomplete cell plate and multinucleated cells. Immunostaining for alpha-tubulin showed that the shape of spindles and phragmoplasts was distorted, indicating that API1 and API1L are indispensable for proper formation of spindles and phragmoplasts. The phragmoplast is composed of antiparallel microtubules that overlap and crosslink at its equatorial plane in the wild type. In the distorted phragmoplasts of the double disruptants, the overlapping microtubules disappeared and two halves of antiparallel microtubules drifted apart. Expression analyses of the API1-GFP and API1L-YFP fusion proteins revealed that they were predominantly localized in the equatorial plane of phragmoplasts. Thus we propose that these proteins crosslink antiparallel microtubules at the equatorial plane of phragmoplasts.