Intracellular auxin gradient is essential for the tip growth of a protonemal cell in the moss, *Physcomitrella patens*

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The polar auxin transport produces an asymmetric auxin gradient and plays an essential role in spatiotemporal control of plant development. Auxin efflux carrier proteins, PIN mainly modulate the direction and rate of auxin movement. Several PIN family proteins coordinately establish the local auxin maxima at root tip and then consequently determine the position of a quiescent center in the root meristem in vascular plants.

Recent reports demonstrated that auxin transport machinery is functionally conserved in an early diverging land plant lineage, such as the moss, *Physcomitrella patens*. In *P. patens*, PIN carrier proteins are localized at plasma membrane in the apical tip of a protonemal cell, a tip-growing filamentous cell of the moss. Auxin promotes chloronema to caulonema transition during protonemal development. Disruption of SCF (TIR1) auxin signaling in *P. patens* by RNAi and auxin antagonist repressed the transition to caulonema. To investigate the physiological function of auxin transport in the moss, we applied chemical biology approach using competitive-type auxin transport inhibitor and fluorescent auxin analogs into auxin transport system. In consistent with the localization of PIN at the apical tip of a protonemal cell, our results indicate auxin transport system plays a crucial regulatory role for the apical tip growth of a protonemal cell in *P. patens*.