PIN-dependent auxin transport in land plants and beyond

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Plants display highly adaptive development. Plant hormone auxin acts as a versatile trigger of developmental change and its distribution depends on the polar, cellular distribution of PIN auxin transporters. Within cells, PINs undergo constitutive cycles of a clathrin-dependent endocytosis and recycling to the plasma membrane. Various signals, prominent among them auxin itself, regulate this subcellular dynamics, changing polarity of PIN localization and thus controlling directional auxin distribution. On account of this feed-back regulation and the other endogenous and external inputs, the PIN-dependent auxin transport network provides one of the key mechanisms underlying the plasticity of plant development. PIN dependent auxin transport mechanism is omnipresent in the land plants including monocots and lower land plants. Although the green algal ancestors of land plants (charophytes) contain *PIN* gene sequences within their genomes, no evidence of PIN-mediated auxin transport has yet been demonstrated in this group and thus the evolutionary origins of PIN auxin transporter family remains elusive. I will discuss progress on the characterisation of PIN protein from the basal, filamentous charophyte *Klebsormidium flaccidum* (KfPIN). Already in this simple alga, auxin has the capacity to regulate growth and KfPIN acts as a functional, substrate-specific auxin transporter when expressed in established land plant models. Both there and in *Klebsormidium* it localizes to the plasma membrane. Our results suggest that PIN-mediated auxin transport is a conserved, ancient mechanism that has been recruited to regulate the ever increasing developmental complexity of the plant lineage.