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# Systems biology study on the WOX5 role in the distal part of the root meristem in *Arabidopsis thaliana*

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Root stem cell niche functioning requires formation and maintenance of specific "auxin-rich domain" governed by directional auxin transport and local auxin production. Auxin maximum co-localizes with WOX5 expression domain in mitotically inactive quiescent center (QC) that separates mitotically active proximal and distal root meristems. Columella stem cells prematurely differentiate in loss-of-function mutant *wox5-1*. An opposite effect was observed in 35S::WOX5-GR overexpression transgene upon DEX treatment where columella stem cell daughters (CSCDs) do not undergo normal differentiation. We showed that WOX5 modulates TAA1-mediated auxin synthesis and PIN-mediated auxin transport in root apical meristem. We hypothesized that modulation TAA1-mediated auxin synthesis resulted in observed changes in anatomical structure of columella under knockout and overexpression of WOX5 genes.

We developed 1D computational model of auxin distribution in columella with growth and division of cells. Using the mathematical modeling approach we showed that WOX5-dependent changes in TAA1-mediated auxin synthesis are sufficient to reproduce all other changes observes in WOX5 knockout and overexpression lines. We can conclude that the main role of WOX5 gene for auxin distribution is modulation of TAA1-mediated auxin synthesis. In addition, we predicted that additional division occurred only in the distal part of columella while the cells in the proximal part of columella remain quiescent in 35S::WOX5-GR transgenic line. That was confirmed by experiment with kynurenine treatment.