


Elucidating extensin-less LRX1-mediated dominant negative effect on cell wall development

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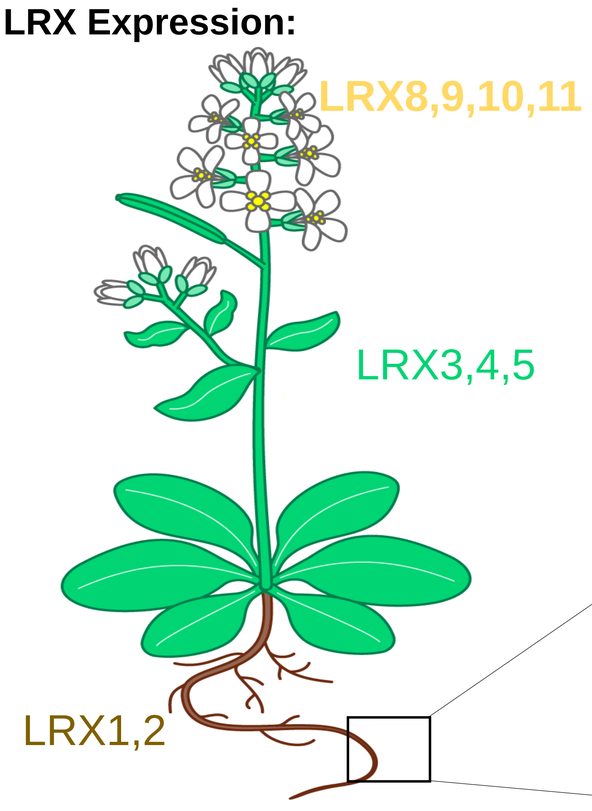
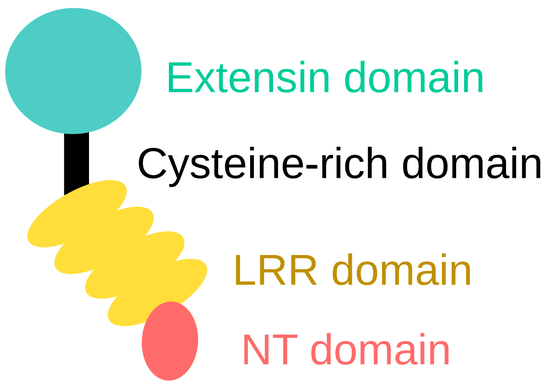
Leucine-rich repeats extensins (LRXs) are cell wall proteins involved in modulating cell wall development. LRXs bind RALF peptide hormones that modify cell wall expansion and interact with the transmembrane receptor FERONIA, which is involved in cell growth regulation. Our group uses root hair formation as a model system to study the cell wall integrity sensing mediated by LRX1.

Background

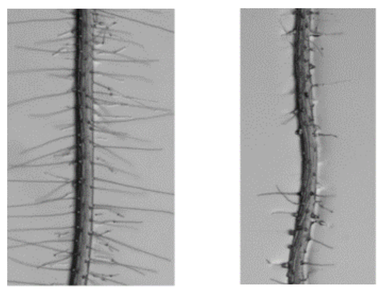
LRX Expression:



LRX Domains:



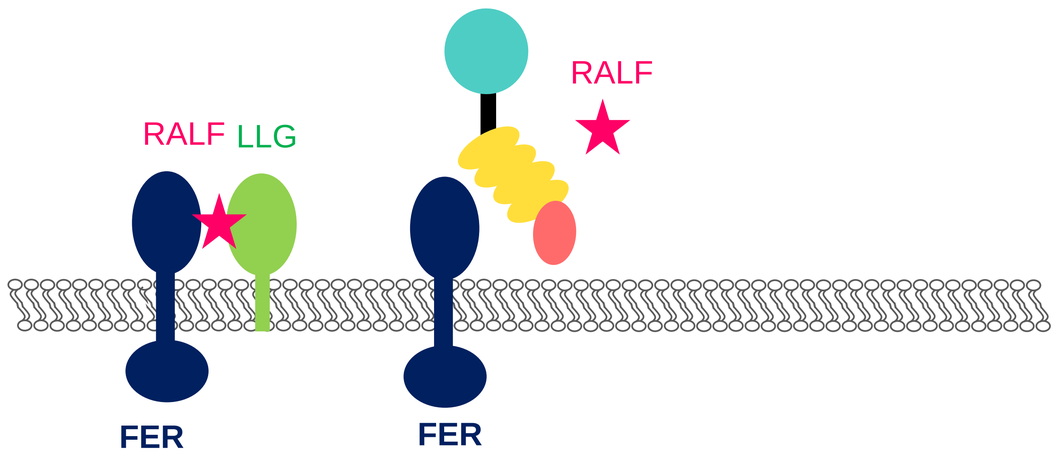
Root hair phenotype:



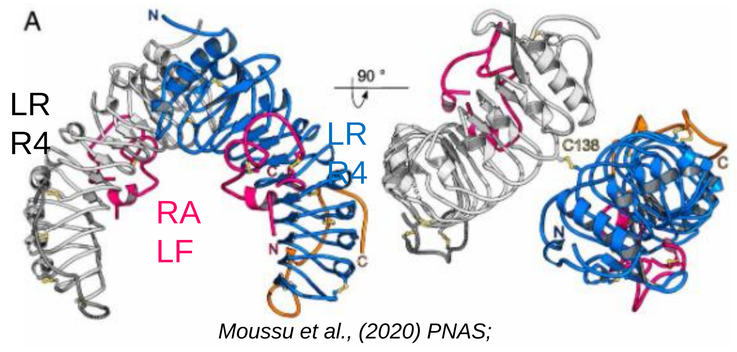
➢ *LRX1* is required for *Arabidopsis* root hair formation.

Baumberger et al. (2001), Genes & Deve; Baumberger et al. (2003), Plant Physiol

➢ LRXs form a complex with FER and directly interact with RALF peptides with their LRR domain



Herger et al., (2020) PLoS Genetics; Herger et al., (2019) Curr. Biol ; Mecchia et al., (2017) Science

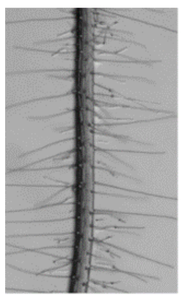


Moussu et al., (2020) PNAS;

Extensin-less LRX1 causes a dominant negative effect in WT plant

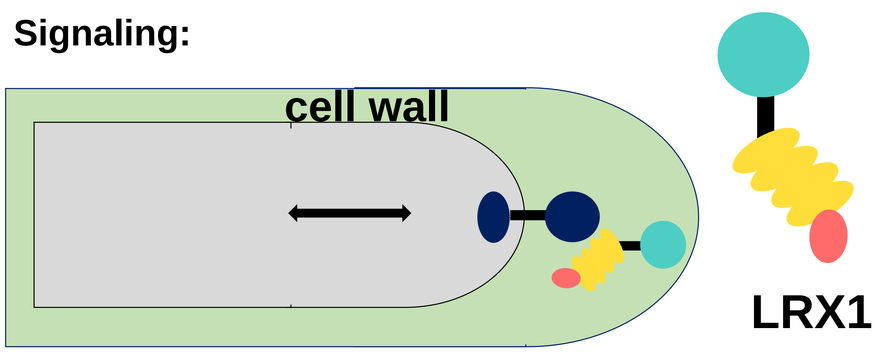
➢ Expression of the extensin-less LRX1 (LRX1$^{\Delta E}$) in wild-type *Arabidopsis* causes a dominant negative phenotype (root hair defect), suggesting that LRX1$^{\Delta E}$ interferes with the LRX-RALF-FER network.

Phenotype:



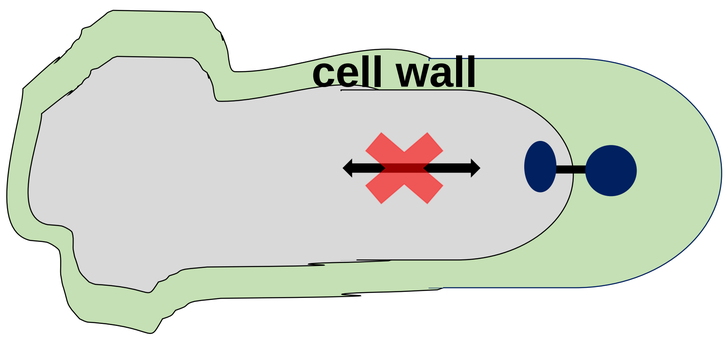
WT

Signaling:

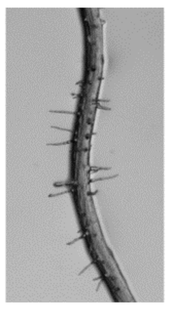


Normal cellular expansion

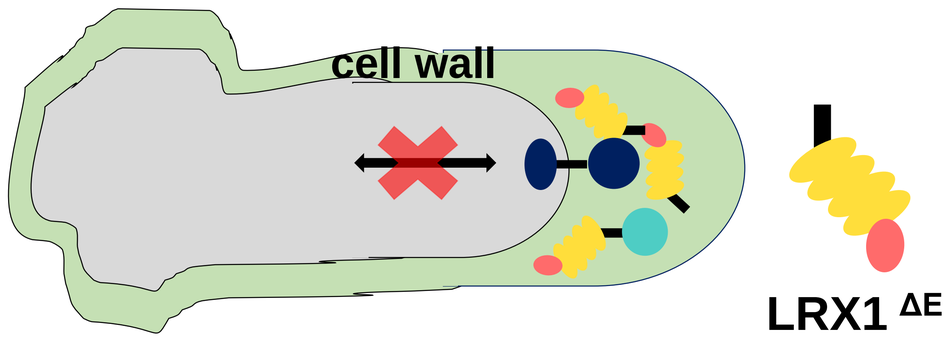
lrx1



Deformed cellular expansion

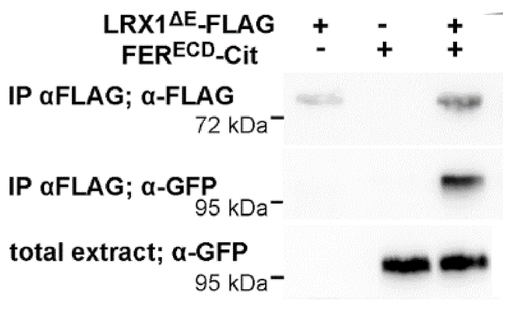


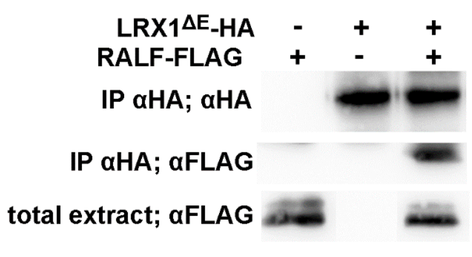
WT*; pLRX1:LRX1 $^{\Delta E}$*



Deformed cellular expansion

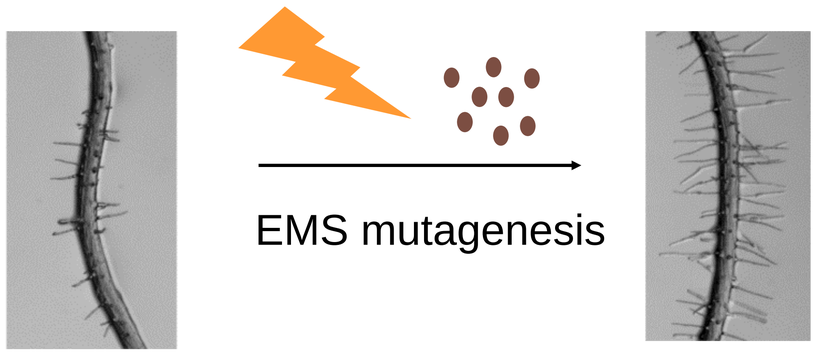
➢ LRX1$^{\Delta E}$ interacts with FERONIA and RALF peptide.





Suppression of *LRX1* $^{\Delta E}$ root hair defect

➢ *LRX1*$^{\Delta E}$ is used to characterize the interaction dynamics of LRX1-FER-RALF network and the processes influenced by these proteins.



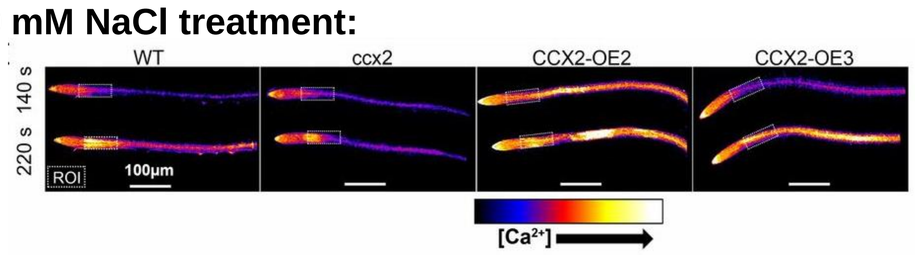
LRX1 ΔE

Suppressor of dominant negative (sune)

➢ One of the sune mutants *sune42* has a mutation in the gene ***C****ation* ***C****alcium E****X****changer 4 (CCX4).*

➢ CCX family member CCX2 regulates cytosolic Ca^{2+} levels

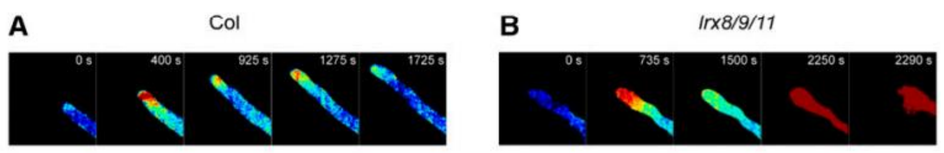
100 mM NaCl treatment:



Corso et al., (2018), PNAS

- *Arabidopsis* lines transformed with the calcium sensor. Figure shows calcium sensor fluorescence in the roots after NaCl treatment.

➢ *LRX* mutant showed altered calcium distributions



Fabrice et al.,(2018), Plant physiol

- *Arabidopsis* lines transformed with the calcium sensor. Figure shows the time series of calcium sensor fluorescence during pollen tube growth*. lrx8/9/11* shows an elevated calcium level as compared to wild type Col.

<u>Hypothesis</u>: *ccx4* suppresses *LRX1*$^{\Delta E}$ by regulating cytosolic calcium dynamics.

➢ Approach: Compare the calcium levels with the calcium sensor.

Baumberger et al., (2001) Genes & Dev; Baumberger et al (2003)., Plant Physiol; Herger et al., (2020) PLoS Genetics; Herger et al., (2019) Curr. Biol; Mecchia et al., (2017) Science; Moussu et al., (2020) PNAS; Xiao et al., (2019) Nature; Corso et al., (2018), PNAS; Fabrice et al.,(2018), Plant physiol.