P004 Reprogramming of root epidermal cells in response to nutrient deficiency

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Postembryonic development of the root system is highly plastic to environmental cues, adapting the plant to the prevailing conditions. The fate of epidermal cells of Arabidopsis roots is particularly responsive to nutritional signals leading to an increase in the surface area in the absence of the essential but immobile minerals iron and phosphate. Growth under –P and –Fe conditions affects the expression of genes involved in cell specification, indicating that nutrient starvation is perceived at an early stage of cell development. In particular, the *WEREWOLF* (*WER)* and *GLABRA* (*GL2)* genes, encoding primary determinants of the non-hair fate, are reduced in their transcript abundance due to nutrient deficiency. Mutants defective in histone acetyltransferases display increased root hair density when grown under -Fe or -P conditions, suggesting that histone modifications are critical for the control of the cell fate in response to changing bio-availability of Fe and P. In support of this assumption, histone deacetylase activity was found to be increased under -P and –Fe conditions, preceding the induction of the phenotype typical of each growth type. Application of the histone deacetylase inhibitor Trichostatin A significantly reduces the frequency of root hairs. A model explaining the environmentally-induced plasticity in root epidermal patterning is presented.