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A conserved D/E-P motif in the nucleotide binding domain of plant ABCB-type ABC transporters defines their auxin transport capacity

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Auxin transport activity of ABCB1 was suggested to be regulated by physical interaction with the bona fide peptidylprolyl cis-trans isomerase (PPIase), Twisted Dwarf1 (TWD1), but all attempts to demonstrate such a PPIase activity on TWD1 have failed so far.

By using a structure-based approach we have identified a series of surface-exposed proline residues in the C-terminal nucleotide binding fold and linker of Arabidopsis ABCB1 that do not alter ABCB1 protein stability or location but its catalytic transport activity. P1.008 was uncovered as part of a signature D/E-P motif that seems to be specific for Auxin-Transporting ABCBs, we now refer to as ATAs. Beside the proline, also mutation of the acidic moiety prior to the proline abolishes auxin transport activity by ABCB1. So far, all higher plant ABCBs for that auxin transport was safely diagnosed carry this conserved motif underlining its diagnostic potential. Introduction of this D/E-P motif into malate importer, ABCB14, increases its background auxin transport activity. The D/E-P1.008 motif is also important but not essential for ABCB1-TWD1 interaction supporting a previously suggested scenario in that TWD1 acts as a positive modulator of ABCB1 transport activity by means of its PPIase.

In summary, our data imply a novel mode of ABC transporter regulation by the FKBP42, TWD1, that apparently has dual function as a co-chaperone of ABCBs required for PM stabilization and as an activator of ABCB-mediated auxin transport by cis-trans isomerization of peptidyl-prolyl bonds.

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