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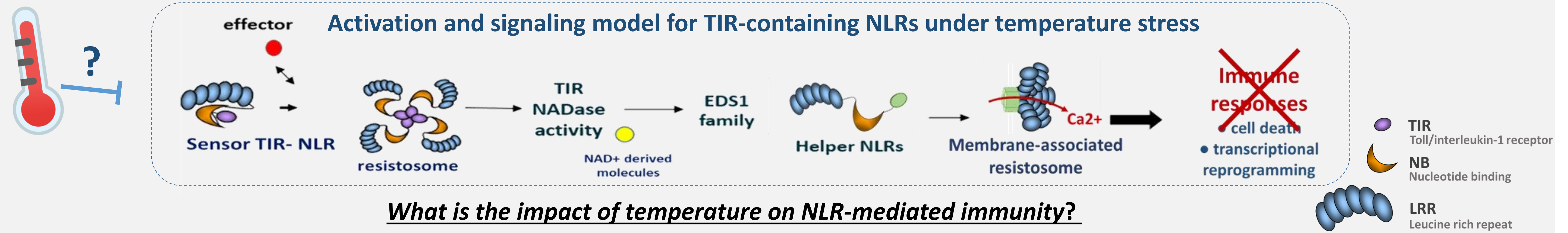
# Thermotolerant signaling induced by plant NLR TIR domains

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## INTRODUCTION

- Plant immunity is impacted by environmental stresses<sup>1,2</sup>.
- Immune responses induced by nucleotide-binding Leucine-rich repeat domain (NLR) proteins are often dampened under elevated temperatures<sup>3,4,5</sup>.
- This is alarming in the context of climate change but the mechanisms involved are poorly understood.

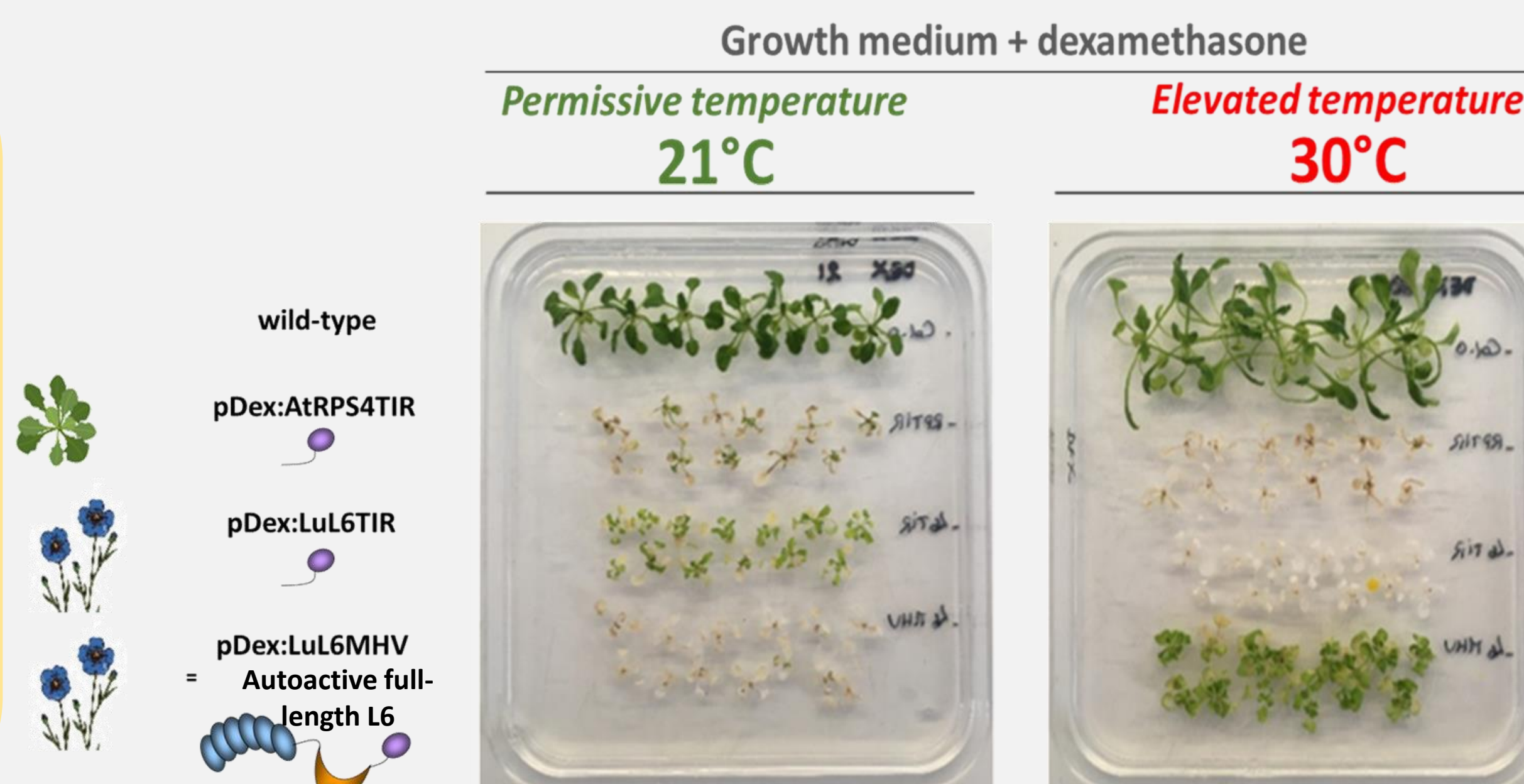


## RESULTS

Isolated TIR-mediated immune signaling is not affected by an elevation of temperature in contrast to full-length NLRs

### APPROACH

- When isolated from NLRs, TIR domains can induce immune signaling autonomously<sup>6</sup>.
- To investigate the impact of temperature on NLR immune receptors function and/or downstream signaling, we used a dexamethasone-inducible system to control and compare the activation of isolated TIR domains and full-length NLRs-mediated signaling, at different temperatures in transgenic Arabidopsis plants.

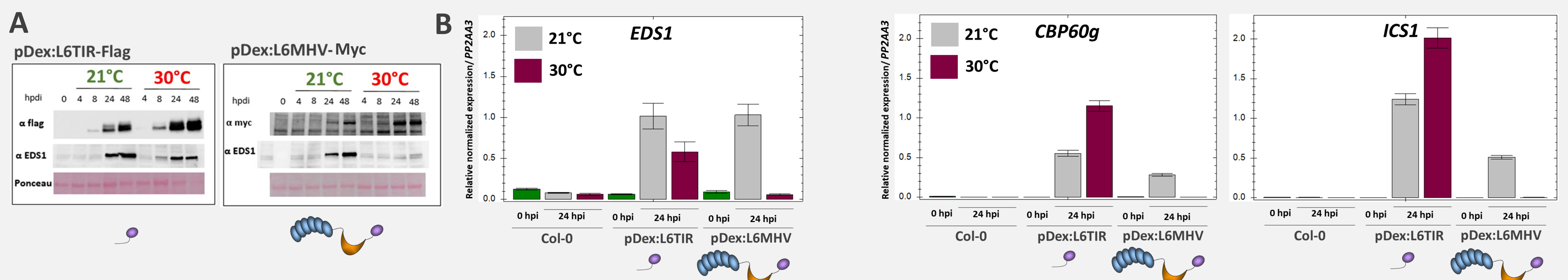


- Cell death phenotype of 10 days-old transgenic Arabidopsis seedlings expressing TIR domains isolated from Arabidopsis RPS4 and flax L6 NLRs, or full-length autoactive L6MHV, 7 days after transfer on dex-containing medium.

**Thermotolerant**  
*Isolated TIR-mediated cell death is maintained at 30°C*

**Thermosensitive**  
*Autoimmune NLR-mediated cell death is inhibited at 30°C*

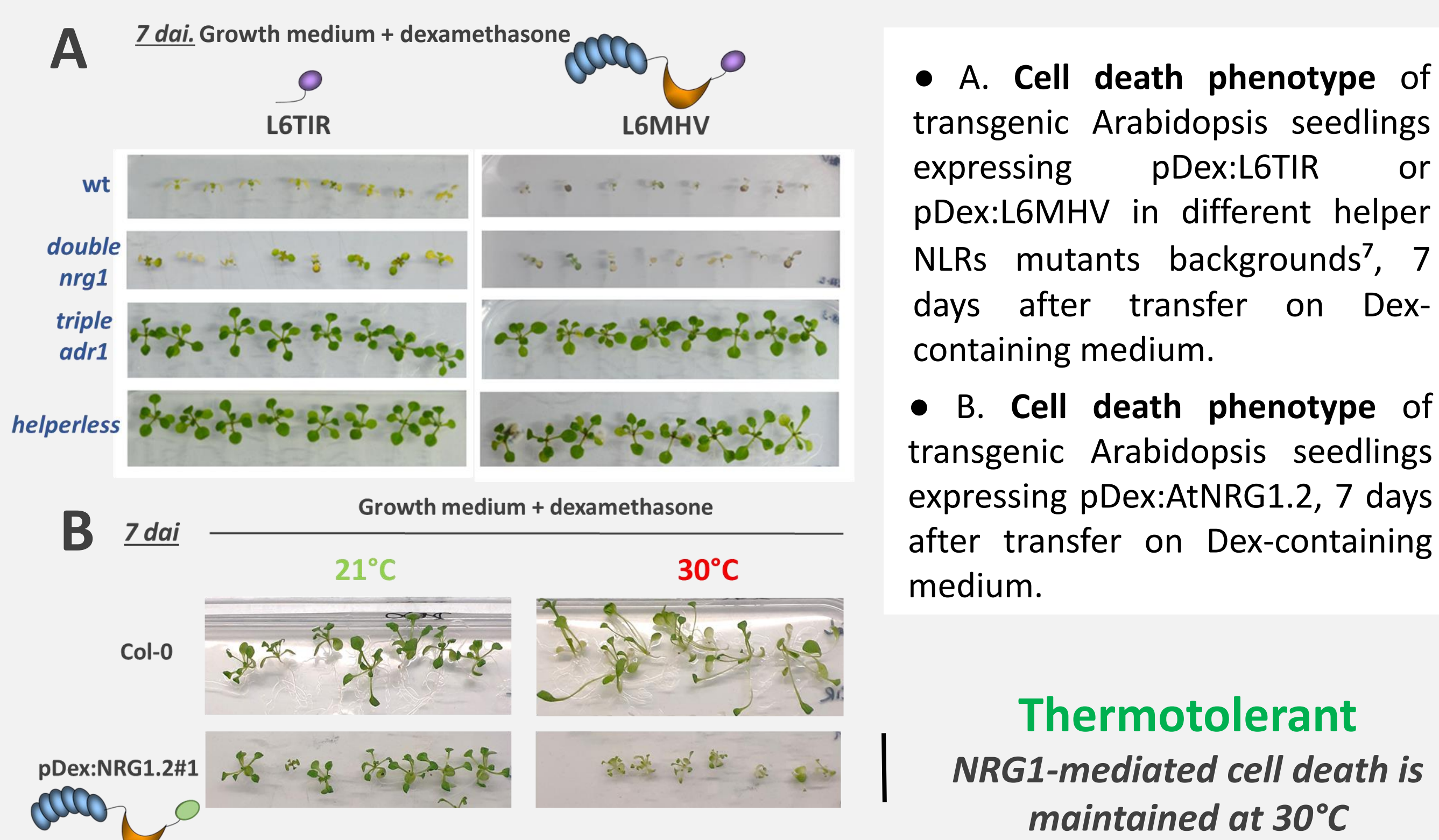
EDS1 and the SA immune pathway are maintained under elevated temperature when induced by isolated TIR but not by full-length NLR



- EDS1 protein accumulation (A) and gene expression (B) monitored from 0 to 48h (A) or 24h (B) after Dex-induction in 10 days-old Arabidopsis seedlings expressing pDex:L6TIR or pDex:L6MHV, at 21°C or 30°C.

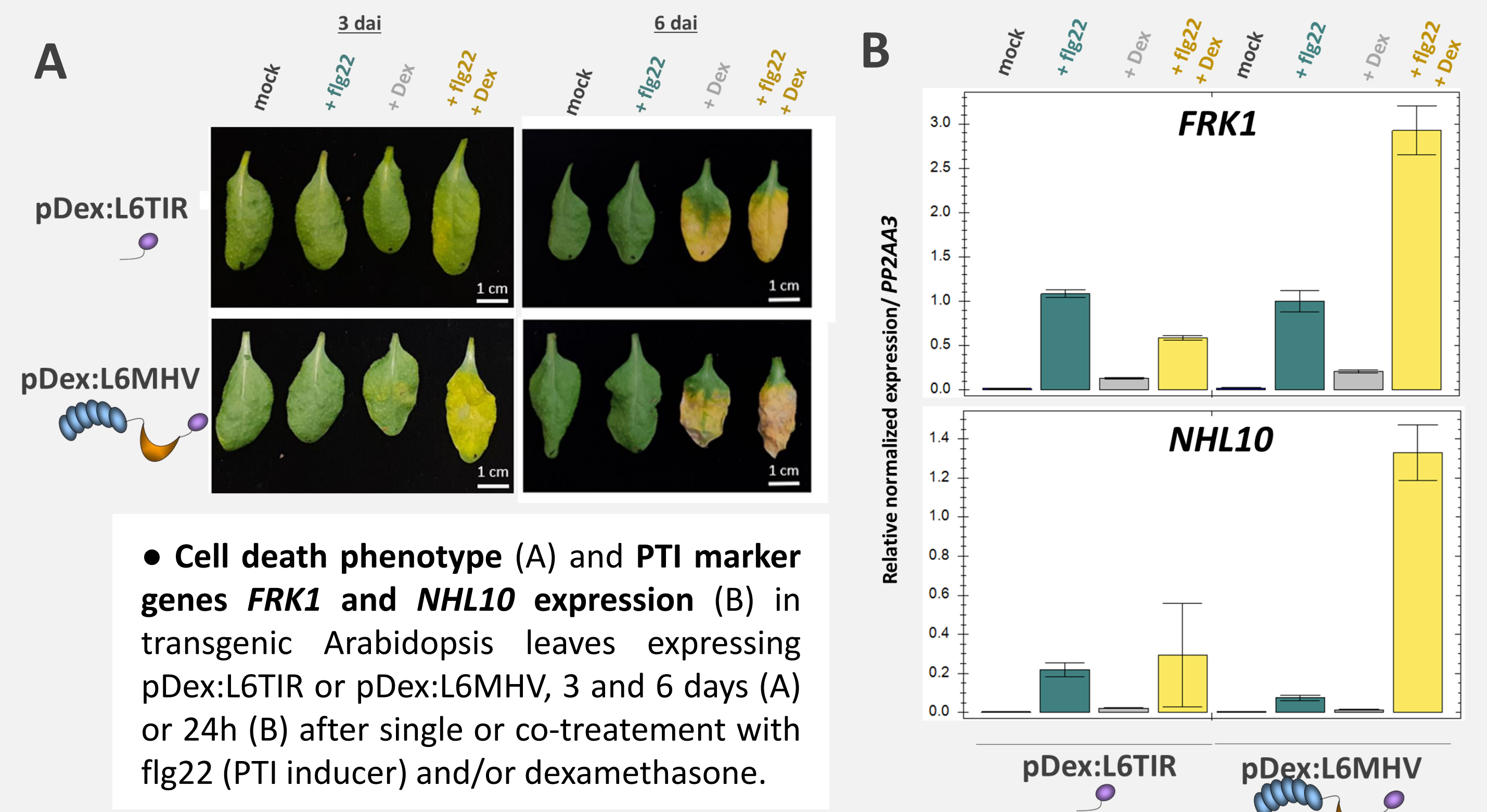
- Gene expression of major players of the salicylic acid pathway, *CBP60g* and *ICS1*, 24h after Dex-induction in 10 days-old Arabidopsis seedlings expressing pDex:L6TIR or pDex:L6MHV, at 21°C or 30°C.

Flax L6TIR signaling mainly depends on ADR1 helper NLR family



- A. Cell death phenotype of transgenic Arabidopsis seedlings expressing pDex:L6TIR or pDex:L6MHV in different helper NLRs mutants backgrounds<sup>7</sup>, 7 days after transfer on Dex-containing medium.
- B. Cell death phenotype of transgenic Arabidopsis seedlings expressing pDex:AtNRG1.2, 7 days after transfer on Dex-containing medium.

L6MHV-mediated signaling is more responsive to PTI, compared to L6TIR



- Cell death phenotype (A) and PTI marker genes *FRK1* and *NHL10* expression (B) in transgenic Arabidopsis leaves expressing pDex:L6TIR or pDex:L6MHV, 3 and 6 days (A) or 24h (B) after single or co-treatment with flg22 (PTI inducer) and/or dexamethasone.

## CONCLUSION

NLRs may detect changes in their environment to accordingly modulate their signaling

- NLRs may sense changes in their environment, such as temperature increase or PTI, and modulate the activation of downstream signaling accordingly.
- Due to their simplified structure, isolated TIR domains may not sense these changes, explaining their thermotolerance and reduced response to PTI.

## PERSPECTIVES

What about naturally occurring TIR-containing truncated NLRs?

