

Determination of the gene responsible for the production of Salicylic acid in *Arabidopsis thaliana*

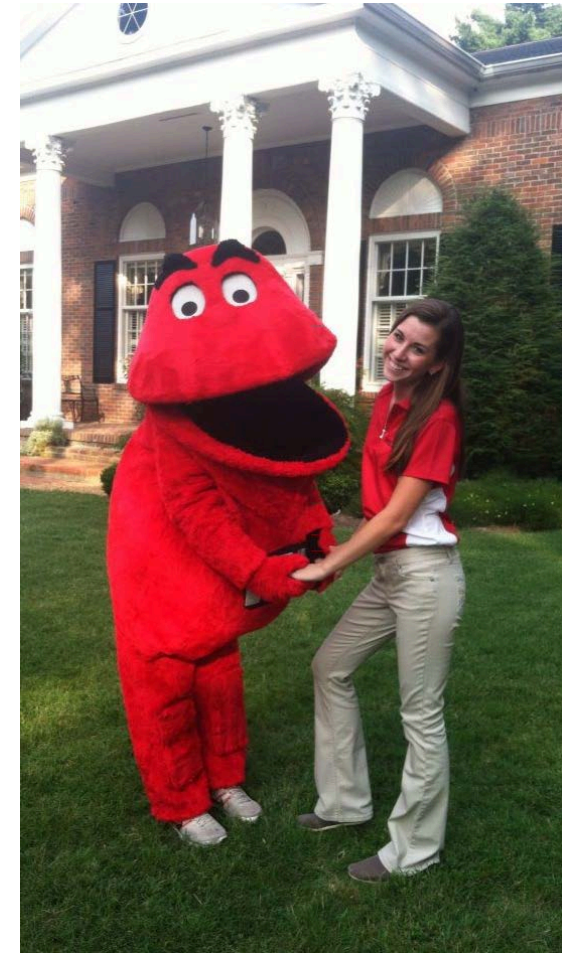
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Background and Future Goals

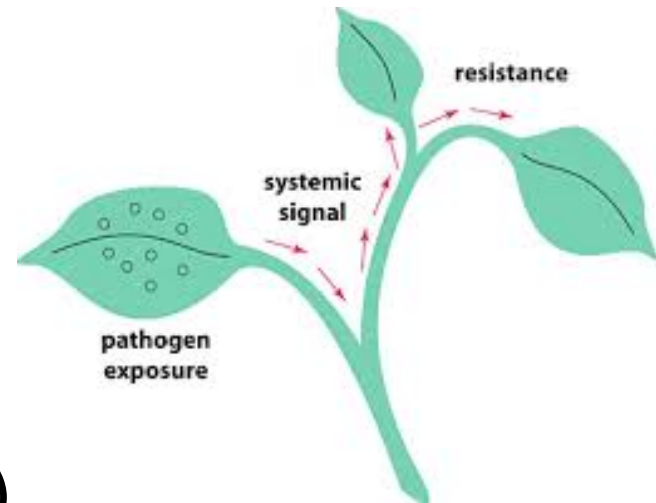


Research Introduction

- What is Salicylic Acid?
 - Hypersensitive cell death response



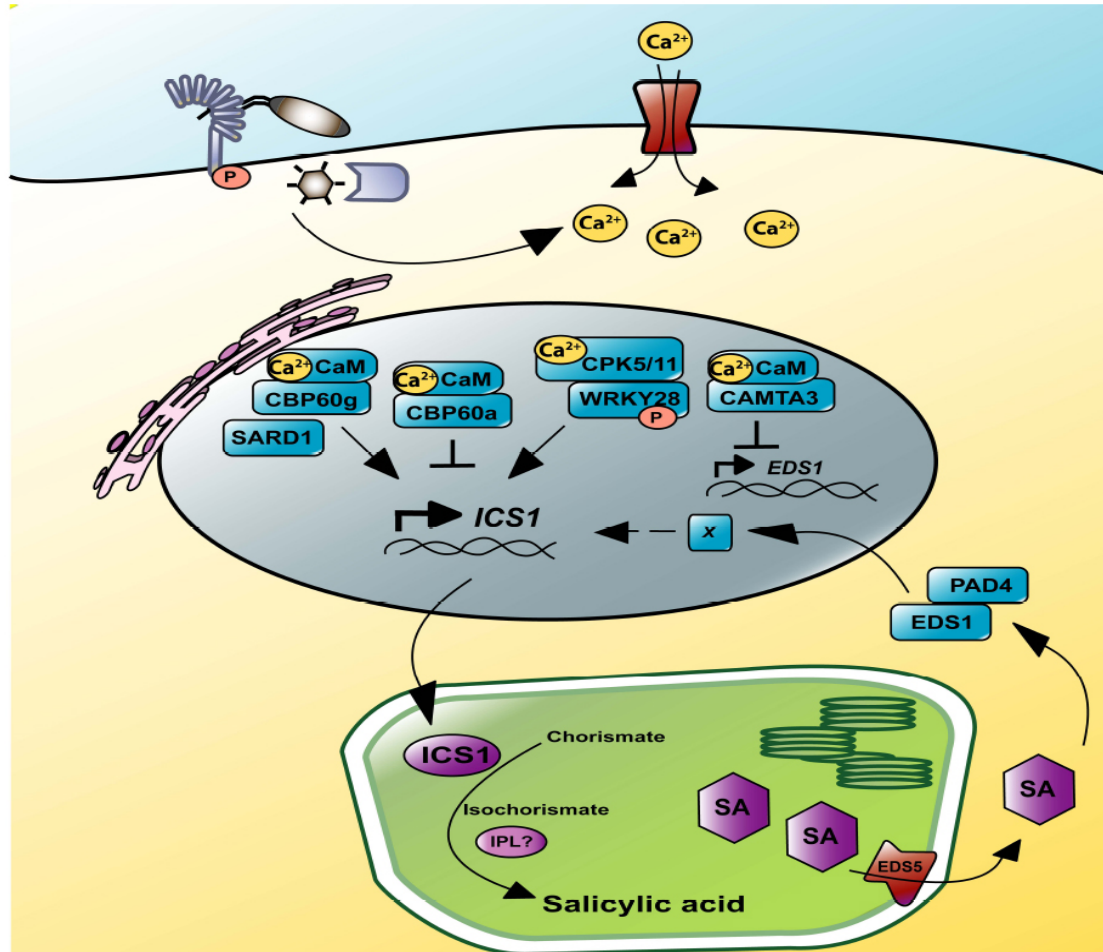
- Systemic Acquired Resistance (SAR)



Synthesis of Salicylic Acid

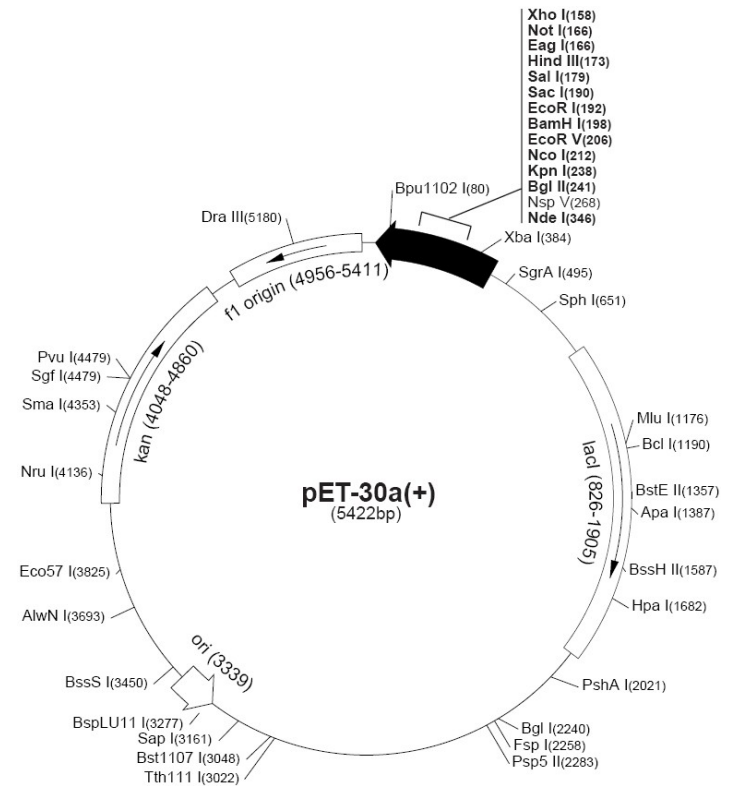
- Phenylalanine ammonia-lyase (PAL) pathway
- Isochorismate (IC) pathway
 - Major contributor of SA in regards to plant immunity
 - Bacteria: Isochorismate synthase to catalyze chorismate into isochorismate, and then the enzyme isochorismate pyruvate lyase (IPL) catalyzes isochorismate into salicylic acid
- Lack of IPL (or genes similar to the genes that code for IPL) in plants

SA Production and Regulation



Experimental Set-up

- BL21 Strain of *E. coli* as expression host
 - pASK-IBA: PMSB
 - Gene to produce PCL
 - Pet30a+:luxCDABE
 - Gene to produce light in
 - SA medium



Expected Results

- Colony of BL21 *E. coli* strain identified that produces light on SA medium in the absence of transformed PMSB gene
- Compare to cDNA library of *E. coli* to determine gene variance

Acknowledgments

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Yingjie Zhou



Thank you!

Questions?

References

1. Seyfferth, C., and Tsuda, K. (2014) Salicylic acid signal transduction: the initiation of biosynthesis, perception and transcriptional reprogramming, *Frontiers in Plant Science* 5.
2. Freeman, B. C., and Beattie, G. A. (2008) An Overview of Plant Defenses against Pathogens and Herbivores, *The Plant Health Instructor*.
3. Halim, V. A., Vess, A., Scheel, D., and Rosahl, S. (2006) The Role of Salicylic Acid and Jasmonic Acid in Pathogen Defense, *Plant Biology* 8, 307-313.
4. An, C., and Mou, Z. (2011) Salicylic Acid and its Function in Plant Immunity, *Journal of Integrative Plant Biology* 53, 412-428.
5. Chen, Z., Zheng, Z., Huang, J., Lai, Z., and Fan, B. (2009) Biosynthesis of salicylic acid in plants, *Plant Signaling and Behavior* 4, 493-496.
6. Nawrath, C., Heck, S., Parinshawong, N., and Metraux, J.-P. (2002) EDS5, an Essential Component of Salicylic Acid-Dependent Signaling for Disease Resistance in Arabidopsis, Is a Member of the MATE Transporter Family, *The Plant Cell* 14, 275-286.
7. Wu, Y., Zhang, D., Chu, J. Y., Boyle, P., Wang, Y., Brindle, I. D., Luca, V. D., and Despres, C. (2012) The Arabidopsis NPR1 Protein is a Receptor for the Plant Defense Hormone Salicylic Acid, *Cell Reports* 1, 639-647.
8. Fu, Z. Q., Yan, S., Saleh, A., Wang, W., Ruble, J., Oka, N., Mohan, R., Spoel, S. H., Tada, Y., Zheng, N., and Dong, X. (2012) NPR3 and NPR4 are receptors for the immune signal salicylic acid in plants, *Nature* 486, 228-232.
9. Huang, W. E., Wang, H., Zheng, H., Huang, L., Singer, A. C., Thompson, I., and Whiteley, A. S. (2005) Chromosomally located gene fusions constructed in Acinetobacter sp. ADP1 for the detection of salicylate, *Environmental Microbiology* 7, 1339-1348.