

SUMMARY FINAL REPORT FOR CDFA AGREEMENT NUMBER 15-0218-SA:
CHARACTERIZATION OF THE LIPOPOLYSACCHARIDE-MEDIATED RESPONSE TO *XYLELLA FASTIDIOSA* IN GRAPEVINE.

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Grant Period: The results reported here are from work conducted July 2015 to July 2018.

BACKGROUND

Xylella fastidiosa is a Gram-negative and xylem-limited bacterium that is the causal agent of Pierce's disease (PD) of grapevine as well as numerous scorching diseases in other economically important plant species. Lipopolysaccharide (LPS) covers the majority of the bacterial cell surface of Gram-negative bacteria and is a well-described pathogen-associated molecular pattern (PAMP) that can elicit plant innate immune responses. To understand how *X. fastidiosa* LPS mediates host-pathogen interactions in PD, we performed transcriptome profiling, *ex-vivo* assays, and histological analysis of grapevines inoculated with *X. fastidiosa*, containing a wild type LPS molecule, or a *wzy* mutant, containing a truncated LPS with no O-antigen. In addition, we investigated grapevine tolerance to *X. fastidiosa* by priming plants with purified LPS and then challenging with the bacterium. Finally, we provide first evidence for the structure of the *X. fastidiosa* O-antigen molecule.

Study Highlights:

- Using a *X. fastidiosa* mutant lacking an O-antigen as a tool, we demonstrate that *X. fastidiosa* utilizes its O-antigen to shield itself to effectively delay innate immune recognition in grapevine.
- *X. fastidiosa* LPS acts as a PAMP in grapevine.
- *X. fastidiosa* can elicit PAMP-triggered immune responses that are localized to the xylem tissue, a tissue compartment not traditionally associated with PTI.
- Purified LPS can prime grapevine defenses to protect against subsequent *X. fastidiosa* infection.
- The *X. fastidiosa* O-antigen consists primarily of linear α 1-2 linked rhamnan.

Accomplishments:

- In 2013, this collective work was selected as a Senior Editor's pick by *Molecular Plant Microbe Interactions* journal (Clifford *et al.* (2013). *Mol Plant Microbe Interact* 26, 676-85).
- In 2015, our work was featured on the cover of *Applied and Environmental Microbiology* and selected as a "spotlight" article (Rapicavoli *et al.* (2015). *Appl Environ Microbiol* 81, 8145-8154).
- Recently, this work led to a publication featured in *Nature Communications* (Rapicavoli *et al.* (2018) *Nature Communications* 9, 390).
- This work was also featured in *The Conversation*, an online forum designed to communicate scientific research to the general public (<https://theconversation.com/primed-for-battle-helping-plants-fight-off-pathogens-by-enhancing-their-immune-systems-43689>).
- Dr. Jeannette Rapicavoli, former Roper laboratory Ph.D. student, competed and won first prize in the UCR Grad Slam event while presenting her research on *X. fastidiosa* LPS. This earned her an opportunity to present this research to UC President Janet Napolitano at the UC Office of the President.