FAST BREAKING PAPERS - 2009

February 2009

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Keehoon Sohn & Jonathan D. G. Jones talk with *ScienceWatch.com* and answer a few questions about this month's Fast Breaking Paper in the field of Plant & Animal Science

Article Title: The downy mildew effector proteins ATR1 and ATR13 promote disease susceptibility in *Arabidopsis* thaliana
Authors: Sohn, KH;Lei, R;Nemri, A;Jones, JDG
Journal: PLANT CELL
Volume: 19
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Year: DEC 2007
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SW: Why do you think your paper is highly cited?

We report a novel method of using bacterial type III secretion (T3S) to deliver oomycete effectors into plant cells, as well as the first molecular evidence showing oomycete effector-mediated suppression of plant immunity. We coordinated publication with the Brian J. Staskawicz lab at the University of California, Berkeley, which was taking a similar approach (MC Rentel *et. al., PNAS,* 2008).

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

The most significant and new observation in the paper is that oomycete effectors can be delivered by bacterial T3S and the T3S-delivered oomycete effectors can activate or suppress plant innate immunity to bacterial pathogen. This creates a method that might be used to assay any effector from a eukaryotic pathogen.

SW: Would you summarize the significance of your paper in layman's terms?

In nature, plants are exposed to various potentially pathogenic microbes. However, most plants are resistant to most pathogens and therefore survive. Microbes evolved to overcome plant innate immunity by delivering highly evolved drugs (effectors) into plant cells. Therefore, identification of effector functions is one of the keys to understanding pathogen virulence and host defense. Our paper describes a novel method to study effector functions and we believe the method will accelerate research into plant pathogens in the future.

SW: How did you become involved in this research, and were

there any problems along the way?

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It became clear that genome sequences of the most important plant disease organisms would become available. However, the challenge was figuring out how to assay candidate genes for involvement in plant/pathogen interaction. Delivery via T3S from *P. syringae* provides a better assay than we had dared hope. The main difficulty, as always in this field, is generating reproducible pathogen growth data, because it is difficult even in growth chambers to ensure reproducibility of host plant material.

SW: Where do you see your research leading in the future?

This idea of using bacterial T3S system to deliver oomycete effectors provides a new opportunity to investigate functions of effectors from various pathogens, particularly the pathogens that are difficult to genetically engineer. We plan to investigate functions of effectors from economically important oomycete and fungal pathogens using this method, particularly *Albugo candida* (white rust) of brassicas and *Arabidopsis*. We also will test whether non-host resistance (e.g., resistance in *Arabidopsis* to brassica strains of a pathogen) results from *Arabidopsis* recognition of some of the effectors from the brassica strain, and if so, whether those *Arabidopsis* recognition genes can be identified and moved into brassica.

SW: Do you foresee any social or political implications for your research?

Food supplies are tight. The application of agrochemicals is unpopular. We must use the best possible genetic strategies to improve crop resistance to disease. This may involve taking resistance genes from one plant (e.g., *Arabidopsis*) and putting them into another (e.g., brassicas). This may be controversial, but the battle must be fought.

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