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University of Delaware, College of Agriculture and Natural Resources
(Article by Christopher Lepine)

# Genetics Researcher Pursues Scientific Mission

Often, researchers are criticized for being "out of touch" and unaware of their work's impact. This clearly is not the case with Allan Shapiro, assistant professor of biochemistry and molecular genetics.

"The long-term applied goal of what I'm doing is to be able to engineer broad-spectrum resistance to diseases into plants in a rational way. The goal (for me) is to be a contributing factor towards feeding the planet in the next century and doing so in an environmentally sustainable way," shares Shapiro.

Shapiro points out that the main way we control plant diseases is through spraying. "Doing these sorts of things with genetic engineering technology is much more specific. That's probably the ultimate environmentally friendly disease control," stresses Shaprio.

"If that's doable, that would reduce or perhaps eliminate the use of agricultural chemicals. The implications of that are twofold: first, the obvious environmental implications, and secondly, implications for third world economics. Seeds are cheap, and chemicals are expensive," according to Shapiro. In addition, Shapiro says this research can help us better use plants as "biofactories" to produce desired substances.

Shapiro explains that when combating disease or other pests, plants do many things. Some activities are directed at the site of infection and others occur throughout the plant. While researchers began by looking at very specific defenses to specific threats, many scientists now examine plant mechanisms that may control sets of these specific responses.

Based on data, researchers make flowcharts of these activities and try to define connections -– signaling pathways -- between the activities. The goal is to refine these flowchart models to guide further research and improve biotech design.

"We're trying to understand the signaling pathways leading to disease resistance, including higher order control over these signaling pathways. I'm hoping to 'soup' them up in one way or another. These are natural things that under certain circumstances are made naturally by plants. It's just a matter of directing this response to when it's needed, making it as vigorous and as fast as possible," Shapiro explains.

As part of this work, Shapiro is continuing his leading study of NDR1. "That particular gene was the first one identified that was a component critical for resistance to a wide variety of different strains of the same pathogen and also different pathogens," says Shapiro. Another research area examines the role of "programmed cell death." In response to disease, a plant can cause cells in the area of the disease to die that also begin –- signal -- other plant defensive measures.

Dr. Shapiro is assisted by a variety of campus and industry collaborators. At UD he works with a staff of nine which includes Ph.D., graduate, and undergraduate researchers, as well as with another department -- chemical engineering. Further, he dialogs with local scientists in many of the DuPont groups. Of special note, he has helped begin a new graduate program with local industry in which students will study equally at UD and with industry scientists at plant sites.

Overall, Shapiro says he most enjoys "being able to sit with my group and discuss complicated data and come to interesting hypotheses and plan the next experiment." Considering the promise of plant genetics, Shapiro should always have good company and worthy accomplishments.