Tobacco plants may provide virus cure

February 1 2008

Scientists from ASU's Biodesign Institute and Polytechnic campus have embarked on an ambitious, four-year, $1.5 million grant from the National Institutes for Allergy and Infectious Disease to tackle West Nile virus.

The virus, which is spread by infected mosquitoes, can be a serious, life-altering – and even fatal – disease.

There is no current cure or drug treatment against West Nile virus, which in 2007 afflicted more than 3,500 people in the United States, resulting in 109 fatalities.

Qiang “Shawn” Chen, a researcher in the institute’s Center for Infectious Diseases and Vaccinology, and assistant professor at the Polytechnic campus’ Department of Applied Biological Sciences, will lead the interdisciplinary research project that will use tobacco plants to produce novel therapeutic agents against the virus. Participants in the project include fellow Biodesign and Polytechnic campus colleagues, and scientists from Washington University in St. Louis.

“Through the leadership of Charles Arntzen, our group has assembled some of world’s greatest research expertise in plant-based vaccines and therapeutics, and now we want to apply that knowledge to address the leading mosquito-borne health threat in the United States,” Chen says.

The plant-made pharmaceutical group at ASU has demonstrated research success on a variety of plant-based vaccines, including the first U.S. regulatory approved-plant based vaccine against a poultry infection, Newcastle’s disease.

In the West Nile project, the team’s goal is to have the plants produce antibodies against the virus in the hopes of neutralizing and destroying the virus before it can trigger its harmful effects.

“One of the challenges for this particular – or for any – central nervous system-related disease is that, after the infection, in a few days the virus will get into the central nervous system and get past the blood-brain barrier,” Chen says.

This microscopic biological filter acts as the brain’s chief defense mechanism against unwanted substances from entering the brain. But during infection, the virus manages to bypass and infect the brain while unfortunately keeping out potential therapeutics.

“The antibodies we are developing have good binding features against

the virus," Chen says. "But my approach to this question is to try to make them better, and get the therapeutic past the blood-brain barrier so that people who have been infected beyond the initial treatment window still have hope."

The therapeutic "plantibodies" designed to target West Nile virus will be produced in an innovative tobacco system.

To make the potential therapeutics, the group is able to use young tobacco plants, infiltrate them with a protein expression system, and harvest the potential therapeutics in the leaves.

It takes as little as 10 days to harvest the material from the plants.

Chen hopes to provide proof of concept of the approach in the next one to two years and prove efficacy and safety of the technology by the end of the funding period.

"We want to take what we've learned during the grant period with the ultimate goal of entering clinical trials," he says.

Source: ASU