A vaccine 'revolution' aims for safer, cheaper treatments

May 4 2011

Professor Henry Daniell works in his lab at the University of Central Florida in Orlando. Credit: UCF

An innovative way of making vaccines at the University of Central Florida has attracted the support of the Bill & Melinda Gates Foundation for its potential to make vaccines lessexpensive, more effective and needle free.

Since 2000, UCF Professor Henry Daniell has been developing a new method of creating vaccines using genetically engineered tobacco and lettuce plants to fight diseases like malaria, cholera, dengue or biothreat agents like anthrax or plague.

This month, the Gates Foundation awarded Daniell a two-year $761,302 grant to develop a polio vaccine. Konstantin Chumakov, associate

director, Center for Biologics Evaluation and Research at the Food and Drug Administration, is a collaborator in the grant and will facilitate advancement of this novel technology.

Should Daniell's vaccine receive FDA approval, it would open the door for the production of a variety of cheaper, more effective vaccines around the world.

"If this proceeds as we expect, it will revolutionize how vaccines are made," Daniell said. "We're currently using decades-old technology that is expensive and inefficient. Our new process is a game changer that could make a global difference."

Thanks to the global immunization effort, polio has been reduced 99% and is on the threshold of becoming the second disease ever to be eradicated. However, 1,292 cases of polio were confirmed in 2010. Having less expensive and more accessible vaccines could help combat polio and other diseases that are of concern such as malaria and cholera.

Faster, Safer Vaccines

Currently vaccines are made through a fermentation process that requires expensive equipment. Vaccines are made using killed, inactivated or avirulent forms of bacteria or viruses. These vaccines also require refrigeration and don't have a very long shelf life, forcing continual production. Injections require sterile needles and health professionals for their delivery.

Vaccines produced by Daniell's technique are delivered in capsule form, and are less expensive because fermentation and refrigeration are not required. This also increases the vaccine's shelf life.

"This means they would be accessible to all people and all countries,

even the poorest and most remote," Daniell said. "That's why I am so grateful for the opportunity to pursue this work."

Using plants to produce vaccine capsules has an additional benefit.

Once ingested, the pills activate the immune system housed in the gut, which is the largest and more powerful than the blood's immune system – the traditional target of injectable vaccines for the past century.

Most importantly, Daniell's technique does not use killed, inactivated or avirulent forms of bacteria or viruses but instead uses only proteins that could not cause any disease but are effective in stimulating protective immunity.

"This makes these vaccines much more potent, effective and safer," Daniell said.

A Career of Research

"I can't tell you how excited I feel," Daniell said. "I've dedicated most of my academic life to this because I want to make people's lives better. My dream is to eradicate the world's top 10 diseases, and this opportunity is a huge leap in reaching that dream."

Daniell joined UCF's Burnett School for Biomedical Sciences, a part of the College of Medicine, in 1998. His research led to the formation of the university's first biotechnology company.

He has published more than 200 academic research papers, speaks at conferences around the world and has been honored by several organizations for his pioneering work. Daniell is only the 14th American in the last 222 years to be elected the Italian National Academy of Sciences.

He also is a Fellow of the American Association for the Advancement of Sciences. The Juvenile Diabetes Research Foundation, Bayer HealthCare of Germany and several federal funding agencies, including the National Institutes of Health and USDA, currently fund his research.

Provided by University of Central Florida