Vaccination for nicotine addiction being developed

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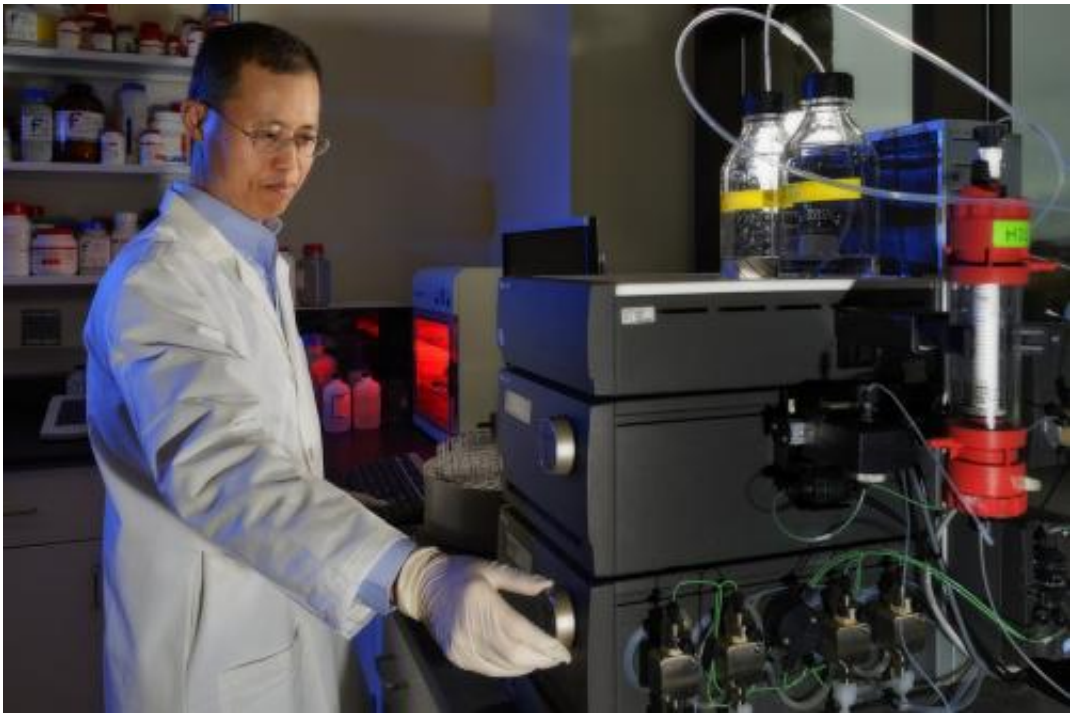

Virginia Tech Professor Mike Zhang is working on a vaccine that could help smokers conquer their nicotine addiction, making many smoking-related diseases and deaths relics of the 21st century. He was recently awarded $2.4 million by the National Institutes of Health to develop the vaccine and test it on mice. Credit: Virginia Tech

A Virginia Tech professor is working on a vaccine that could help smokers conquer their nicotine addiction, making many smoking-related diseases and deaths relics of the 21st century.

Mike Zhang, a professor of biological systems engineering in the College of Agriculture and Life Sciences was recently awarded $2.4 million by the National Institutes of Health to develop the vaccine and test it on mice.

Zhang said the nicotine vaccine could ultimately be developed as a patch or nasal spray. Within several days of inoculation, patients would cease to experience the physiological pleasure that nicotine elicits in the brain.

"Nicotine is one of the most dependency inducing drugs out there," said Zhang, "It's just as addictive as much harder drugs such as heroine or cocaine. When someone smokes, the brain makes more dopamine in response to receiving the nicotine. Over time your body needs more nicotine just to feel normal and that's when addiction occurs. By using this vaccine to block the pleasure response, a person addicted to nicotine will be much more likely to quit smoking or consuming tobacco products."

Cigarette smoke contains 250 chemicals known to be toxic and smoking is the most significant source of preventable disease and premature death worldwide. Smoking-related diseases claim an estimated 443,000 American lives each year and in the United States about 8.6 million people have at least one serious illness caused by smoking, according to the American Lung Association.

Zhang's research could offer the millions of smokers in the United States—and the estimated 1 billion smokers worldwide that suffer from nicotine addiction—another tool for kicking the nicotine habit.

He is performing the research in conjunction with Marion Ehrich, a professor of pharmacology and toxicology at the Virginia-Maryland College of Veterinary Medicine, and Dr. Paul Pentel, a professor of medicine and pharmacology at the University of Minnesota.

Zhang has been working on the delivery system using biodegradable nanoparticles that are very tiny particles between 100 and 500 nanometers in size. The antibodies generated from the vaccine would interact with nicotine molecules in the bloodstream to prevent their entrance into the brain. The vaccine Zhang is developing uses biodegradable nanoparticles that attach to small molecules called haptens, which when attached to a larger carrier such as a protein elicit an immune response.

In effect, the vaccine blocks the pleasure-receiving parts of the brain by using these nanoparticles to deliver the vaccine.

Zhang, who is not a smoker, said that he found the research rewarding because many of his family members were smokers, and even succumbed to the smoking-related diseases.

"I had an aunt who was a heavy smoker and died of lung cancer," said Zhang. "It was hard to see her struggle with addiction."

"Our vaccine will hopefully boost the rates of those who are able to quit smoking once they decide they are ready."

Provided by Virginia Tech

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