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Northwestern professors hatch potential cure to peanut allergy over beers

Tests on humans still years away, they say

By William Mullen, Tribune Reporter

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An idea hatched in a Streeterville pub by two guys sitting over a couple of Friday night beers has led to a treatment that could someday overcome the peanut allergy, a growing and sometimes fatal problem that has bedeviled parents, schools and airlines.

The treatment has so far worked only on laboratory mice, but it looks promising for humans. In fact, the same concept shows promise far beyond just the peanut allergy, according to the two researchers who cooked it up. It could be an effective tool to battle all sorts of food allergies and autoimmune diseases that are growing at alarming rates in the world's healthiest societies — the leading industrialized nations.

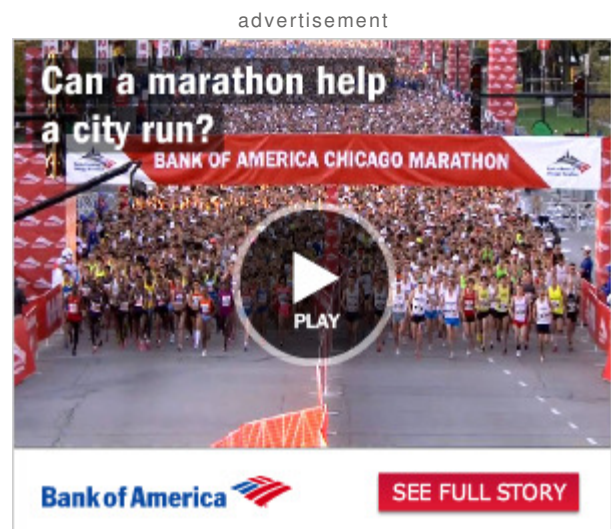
The two men behind all this are not your typical barroom philosophers, of course. Stephen Miller, 63, is a Ph.D. who has spent most of his career researching autoimmune diseases at Northwestern University's Feinberg School of Medicine. Scottish-born Paul Bryce, 38, is a Ph.D. specializing in food allergy research. When Bryce arrived at a different research division of the school six years ago, Miller befriended him, and the two often meet to talk shop.

"Most researchers are very secretive about their work until they publish it, fearing somebody will steal their ideas," Miller said of his collaboration with Bryce. "This is an instance where Paul and I weren't competing, but we each brought different expertise to bear on the problem."

Much of Miller's work has focused on multiple sclerosis, a degenerative disease in which a patient's immune system mistakenly identifies myelin, a protective tissue surrounding nerve axons in the brain and spinal cord, as a dangerous pathogen and so attacks and destroys it.

"It's like when you strip off the insulation of electrical wiring," Miller said. "Gradually the brain impulses are no longer conducted along the axons as the myelin sheath is destroyed, and the patient begins to have trouble walking and loss of other physical functions."

Using mice as models, Miller hit on the idea of taking blood from a mouse with MS symptoms, attaching myelin protein to certain white blood cells and infusing the blood back into the mouse's



bloodstream.

"The idea is to convince the patient's immune system that the myelin is not dangerous and to turn off its attack," Miller said.

The technique, called antigen-specific tolerance therapy, was so successful in stopping the progression of MS in the mice that it is now being tested on humans at the University of Hamburg in Germany, where two of Miller's research colleagues work.

Early last year, Miller was recounting the success of the MS therapy to Bryce at one of their frequent Friday night beer sessions in a pub near the medical school and suggested maybe it should be tried on food allergies.

"We decided it was a good idea to give it a try, and we started in on it the next Monday," Bryce said. "Within a month, we knew we were onto something."

Bryce had to develop lab mice that were sensitive to peanuts and would suffer the same reactions as allergic humans — hives and swelling and, in more severe cases, constriction of breathing, plummeting blood pressure and shock that can lead to loss of consciousness and death.

In the U.S. each year, there are 15,000 to 30,000 severe reactions to food allergies and 100 to 200 deaths. So far, nobody has come up with a safe treatment.

In their experiments, Bryce and Miller drew blood from their peanut allergic mice and attached peanut protein to white blood cells. They then infused the blood back into the mice and fed them peanut extracts that normally would set off severe allergic reactions.

Bingo.

The system increases the number of regulatory T cells in the peanut allergic mouse while "turning off" other cells that cause the allergy, restoring tolerance to peanuts to the immune system.

"We think we have recalibrated the immune system," Bryce said, "but we're still trying to understand how it works."

Bryce and Miller give credit to the work of two of their graduate students, Charles Smarr and Chia-Lin Hsu.

Miller cautioned that before their approach can become a viable human medicine, it has to prove itself through years more of animal testing and, if it survives that, more years of human testing.

"We're probably looking at three to five years before we try it on human patients," he said of the peanut allergy treatment.

If their peanut allergy treatment works on humans, he said it's likely their method also could be applied to the burgeoning list of food allergies and to autoimmune diseases.

"It's really exciting," Ruchi Gupta, a pediatrician and assistant professor at Northwestern's Institute for Healthcare Studies, said of Miller's and Bryce's work. "Any cure right now would be incredible."

In June, Gupta authored a study showing 1 in 12 American children, nearly 6 million kids, may suffer

from food allergies, far more than previously suspected. About 40 percent of them have suffered severe reactions from their allergies, underscoring the worry it causes parents.

A recent federal study showed an 18 percent growth in food allergies in American children from 1997 to 2007.

Food allergies and autoimmune diseases have been on the upswing for 60 years. The increase is puzzling, largely plaguing industrialized nations, places with the best health care and public health systems in the world.

Nobody has figured out yet what is causing the growth of those ailments, though it looks like it might involve environmental factors and the fact that food routinely is imported from all over the world, bringing risk of exposure to undetected microorganisms and chemicals.

"I live with this every day," said Gupta, who cheers Miller's and Bryce's research not just as a working pediatrician but as a mother with a 5-year-old daughter with peanut allergies.

"You worry about everything they do, going to school, going to birthday parties, restaurants, on vacations," she said. "It impacts your family and it impacts your entire school because it is likely every classroom on average will have two children with food allergies.

"I think this is a really big step. I hope we see a cure in the next 5 to 10 years."

wmullen@tribune.com

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