Scientists create GMOs to fight E. coli

Natalie Jacewicz *4:18 p.m. PDT September 30, 2015*

(Photo: The Salinas Californian)

Plants may finally fight back in the battle against E. coli. Scientists have discovered a way to grow crops with an antimicrobial protein that can be extracted to fight E. coli outbreaks, according to a study published in the Proceedings of the National Academy of Sciences.

The technology relies on colicins, a type of protein produced by E. coli to attack other E. coli strains.

“E. coli have to fight for nutrients with other bacteria,” explains one of the study’s authors, Chad Stahl, chair of the Department of Animal and Avian Sciences at the University of Maryland. “Colicins are their form of chemical warfare.”

The researchers engineered a bacterium containing genes that code for colicin production. They then inserted this bacterium into tobacco, spinach, and beets. The plants incorporated the genes and began producing colicins themselves. Extracting these plant colicins and spraying the purified mixture on contaminated meat leads to significant decreases in E. coli, in as little as an hour.

E. coli outbreaks in recent years have familiarized Californians with the pathogen’s dangers. Though many adults recover from E. coli infections after a couple of weeks, an infection can cause kidney failure and death in children. The food industry has spent over $2 billion to combat the problem.

The study’s authors say that producing anti-E.coli proteins in edible plants offers a safe, scalable, and affordable way to treat contaminated products before they reach consumers. Though the research was partially funded by the biotech company Nomad Bioscience, not all authors will benefit financially from its findings.

“I actually stand to lose money from this study,” Stahl says. Stahl holds a patent for producing colicins in yeast, but he expects the superior scalability of plant-produced colicins to make his patent obsolete.

Significant hurdles, however, remain before this technology becomes mainstream.

Todd Callaway, a microbiologist at the U.S. Agriculture Department, notes that despite the technology’s promise, further tests are needed. “Safety and efficacy are critical for approval before anything enters the food chain.”

Jeffrey Smith, executive director of the Institute for Responsible Technology, is unconvinced that farmers should use genetically modified crops to solve a problem he links to GMOs.

“What’s interesting is that genetically engineered crops have likely contributed to the spread of E. coli based on the increased use of Roundup,” Smith observes, referencing the world’s bestselling weed killer, which has spawned Roundup-resistant GMOs. “Roundup kills certain bacteria in soils, but it’s not particularly strong against E. coli.” This decreased bacterial competition may allow E. coli to flourish, he explains.

Smith has written popular books discussing the threats of GMOs and has also produced a documentary on the subject. He does not hold a science degree and declined to provide the number of employees at his institute.

Concerns like Smith’s will present a greater challenge to the colicin technology’s adoption than any regulatory obstacles, according to Peggy Lemaux, a faculty member specializing in crop biotechnology at UC Berkeley. Lemaux’s lab has developed hypoallergenic wheat, but can find few people willing to eat it.

“In the courtroom of consumer issues, it won’t be as easy as saying it’s GRAS,” she explains, referring to the regulatory designation “generally recognized as safe.” “There’s a lot of anti-science right now.”

She suggests many Americans may be unwilling to eat food modified to prevent E. coli, because Americans believe the pathogen is unlikely to affect them personally.

“People don’t think about this until something happens to a friend or a relative,” Lemaux says.

Smith suggests that such dangers could be better addressed through natural solutions. He cites Golden Rice, a vitamin A-enriched GMO, as an example of needlessly invasive technology.

“Native crops like red rice in India and sweet potatoes have more vitamin A than Golden Rice,” he explains. “If we spent the same amount of money on vitamin A supplements and gardening that we’ve spent on Golden Rice, we could have wiped out vitamin A deficiency on the planet by now.”

Stahl agrees that some GMOs have given genetically modified foods a bad name, in particular, herbicide-resistant crops. But he contends that all GMOs are not created equal.

“There’s a difference between trying to create something that’s never been in nature before and what we’re doing,” he says, referring to producing a naturally occurring protein. “There’s an antimicrobial protein that’s been used in French cheeses for generations – nisin. If we could take that protein and make more of it so it could be more effective – to me, it seems like a very reasonable thing to do that.”

He also suggests that consumers will support plant-produced colicin technology if they appreciate the threat E. coli poses. “It’s a really big problem, and things we can do to mitigate it are critically important.”

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