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Monsanto researchers showcase new breakthrough in protein science

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Research published today is poised to deliver never-before-seen breakthroughs for the role of protein science in agriculture and lead to new innovations for farmers and society. The advance, the application of PACE (phage-assisted continuous evolution) technology to generate novel insect control traits for crops, demonstrates the ability to optimize proteins to convey specific benefits to plants or to specifically target pests and pathogens of plants - paving the way to target pests that have developed resistance to prior agriculture solutions.

Researchers at Monsanto Company and Harvard University have published the results of a recent study using PACE technology in Nature. The manuscript titled 'Continuous evolution of Bacillus thuringiensis toxins overcomes insect resistance', showcases how the new application of protein science can be practically applied to agriculture. Co-authors of the paper from Cornell University provided contributions to enable this published work, which was initiated under an ongoing research collaboration between Monsanto and Harvard University on PACE technology.

PACE technology was originally invented in the Harvard laboratory of Dr. David Liu, Professor of Chemistry and Chemical Biology, who is also a Howard Hughes Medical Institute Investigator. Dr. Liu and his lab developed this tool as a way to create, identify and evolve optimized proteins, up to 100 times faster than previous methods.

The ability to speed the discovery of improved and optimized proteins enables faster advancements in the improvement of crops, as proteins are the central building blocks to the agronomic traits farmers' value, such as insect control and herbicide tolerance. At a time when farmers are battling a changing climate and volatile weather, which often results in increased pest pressure on a faster time horizon, it becomes increasingly important to drive new innovations in agriculture more quickly.
"Scientific breakthroughs like PACE technology are key to continue bringing solutions to farmers to help them get more out of every acre," said Tom Adams, Vice President of Biotechnology at Monsanto. "The remarkable progress that's been made in applying PACE to agriculture biotechnology is a huge testament to the success that comes when parties work together and collaborate to advance science in a way that can bring long-term benefits to global agriculture."

Monsanto and Harvard initiated their ongoing collaboration on PACE technology in 2013, and Monsanto has since entered into a limited-term, exclusive license agreement with Harvard for the use of this technology for agricultural applications.
"The research published in Nature is an important demonstration of David Liu's PACE platform, validating its potential as a tool not only for agriculture, where it can address compelling scientific challenges, but across diverse areas of future application including health care, where it could evolve tailor-made therapies for human disease," says Isaac T. Kohlberg, Harvard's Senior Associate Provost and Chief Technology Development Officer. "The PACE collaboration is just one example of how researchers in academia and industry can pool their expertise to advance science in areas of mutual interest and speed the development of impactful technologies."

Farmers are continually challenged by effects of a changing climate, including increased insect pressure, disease and weed infestations. A broad-range of agriculture solutions are critical to help farmers address and manage these on-farm challenges in a sustainable way. Collaborating on the advancement of science in agriculture, in addition to driving key scientific breakthroughs like PACE technology, will continue to be critical in helping farmers mitigate these challenges, and ultimately provide sustainable solutions to increase yields and improve harvests.