# Novel RNAi Technology Targets Leading Global Crop Pest

Fall armyworm (*Spodoptera frugiperda*) has been wreaking havoc on vital global crops, including corn, wheat, and rice, in more than 100 countries. According to the United Nations Food and Agricultural Organization (FAO), the impact of fall armyworm is economically profound, with damages ranging from $1 billion to $3 billion annually and crop yield reductions of up to 50%. However, widely used chemical defenses against the fall armyworm can impact other species and lead to resistance in the pests. Furthermore, existing treatment methods come with hefty registration costs and have a history of drawing public scrutiny. Available biological alternatives are limited by poor shelf life, field instability, unpredictable performance, and high production costs.

Virginia-based AgroSpheres is developing biocontrol technologies that are poised to counter the global fall armyworm threat. Made possible with funding from the U.S. National Science Foundation (NSF), AgroSpheres' patented AgriCell technologies enable the development of biological pesticides that are shelf-stable, nontoxic to humans and animals, target specific pests, manage resistance, and perform consistently in the field.

AgroSpheres has developed a novel manufacturing, encapsulation, and delivery methodology for the AgriCell line that will complement and supplement existing chemistries experiencing resistance or low efficacy. AgriCell is completely biodegradable and features a breakthrough mechanism of action that allows for successful RNA interference (RNAi) performance in the fall armyworm.

RNAi is a natural process in cells that can be used to turn off specific genes by targeting their "blueprints" and regulating protein production. RNAi biomolecules have demonstrated great promise in the lab in governing the gene expression of pests and pathogens but have generally struggled to yield consistent results for commercial development. The AgriCell technology is the missing link in delivering reliable field performance and opening new markets for high-performance biopesticides.

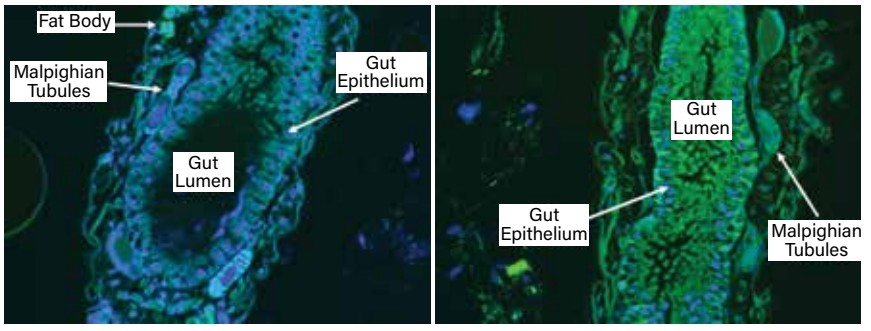
When produced in its naked form without a protein or lipid membrane enclosure, RNA is highly susceptible to environmental degradation from enzymes (RNases), ultraviolet (UV) light, and pH fluctuations. As a result, naked RNA fails to perform in the highly alkaline and resistant digestive system of the fall armyworm.

AgroSpheres' technology encapsulates the RNA in a protective shell, creating a physical barrier that shields it from degradation, which provides stability and efficacy across a broad range of conditions. For example, AgriCell can withstand a pH range of 4 to 11 and temperatures of 0–54°C, with a shelf life of 24–30 months.

The AgriCell shell enables a consistent gene silencing response so the crop protection product can perform as intended. When the pest consumes a plant treated with AgriCell, the RNA provokes a rapid cellular response that terminates the pest. Both the pest and the treatment then biodegrade safely in the environment.

In the instance of the fall armyworm, AgriCell-encapsulated RNA effectively permeates the pest's gut, silences the targeted gene, and prevents the worm from reaching adulthood. This breakthrough in delivery and efficacy underscores the broad potential for RNAi technologies in agriculture. AgroSpheres has earned endorsement from the state of Virginia and biotech industry giants, including former Monsanto Chief Technology Officer Robb Fraley. The company has also secured multi-year development agreements with global agricultural chemical companies like Bayer. FMC Corp., an agricultural sciences company, has made a significant investment in AgroSpheres.

"We believe AgroSpheres' innovative micro-encapsulation technology shows exciting promise, and that is why we have invested in them to reimagine the future of crop protection," says Seva Rostovtsev, FMC Vice President and Chief Technology Officer. "Together, we are identifying ways to leverage that technology for the benefit of growers worldwide." CEP




▲ The technology's effectiveness is showcased above in the comparison between a fall armyworm treated with naked RNA (left) and AgriCell RNA (right). The AgriCell-RNA treated specimen is marked by green fluorescence, indicating effective RNA delivery and rapid gene silencing, which will eventually kill the insect.

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