# 'Green' pesticides in the pipeline

***As pressure grows to limit the use of conventional pesticides that may harm health and the environment, EU-funded researchers have brought eco-friendly alternatives a step closer to reality by turning insects' own hormones against them.***



Chemical pesticides have been used for decades to control insect pests that attack food crops and transmit infectious diseases. But this comes at a cost. The toxic substances they contain may harm health and the environment, while some pests can survive and grow resistant to the chemicals. An estimated 500 insect species have developed this ability over the past 50 years, costing US agriculture about $10 billion each year.

These concerns have led European legislators to vote for a ban on neonicotinoids, the world's most widely used type of insecticide, fuelling efforts by researchers to find 'greener' ways to control pests that are responsible for at least 40 % of crop losses globally.

Part of the problem with conventional pesticides is that they may poison both damaging and beneficial insects such as honeybees. Looking to solve this problem, an EU-funded research consortium worked on a new generation of 'biopesticides' by turning insects' own hormones against them.

The NEUROSTRESSPEP project created chemicals similar to insects' natural hormones, which can now be used to develop 'green' pesticides. These biopesticides target some insects while protecting others and can potentially be used in agriculture, horticulture and even forestry without causing harm.

'There's a lot of chemistry [that was done] to modify those peptide hormones from their natural state so that they are stable in the environment, but the good thing is that they will

also break down,' says project coordinator Shireen Davies of the University of Glasgow in the UK. 'This is the real beauty of using these molecules. The other major output has been the successful generation of transgenic insect strains.'

**Tweaking natural hormones**

Working with 20 species of insects, and using advanced techniques, the researchers focused on hormones that help the brain and tissues communicate with each other.

They began by looking more closely at these natural hormones in order to identify chemical structures unique to them. They then developed artificial substances that are similar but built in such a way that they block insects' ability to survive and reproduce, while also breaking down in the environment without leaving harmful residues.

They also genetically modified male insects so that they are blocked from producing the hormones. When released into the wild to mate with 'normal' females, the newborn insects will also carry the lethal genetic trait. Over time, this reduces the number of harmful insects.

**From lab to shelf**

Among the project's publications is a database with more than 5 000 insect hormones, from which the researchers produced many candidates with a potential to become biopesticides.

After testing in the lab, testing began on prototype versions of the biopesticides in greenhouse trials to evaluate how they work against insects that attack crops such as cereals and vegetables. The next step is to test them outdoors, in the real world.

'Of course, some of this is now going to be commercialised – and we have very tough hurdles for that,' Davies says. She explains that going from fundamental research to getting a product on the shelf for a farmer or grower to buy is a long and complex process that involves meeting regulatory standards and extensive testing.

For that reason, the project has applied for patents and formed a spinout company, a start-up that can more easily work with industry partners to get the new chemicals ready for the market. 'We've had significant interest [from industry] this year in terms of what these commercial products could be,' says Davies.

Over the course of the project, which brought together expertise from around the world, 25 researchers were trained in cutting-edge technologies, from functional genomics to metabolomics and advanced imaging.

The team also worked closely with national agencies such as the US Department of Agriculture. Results were discussed with the public, farmers, policymakers and industry, who all share a concern for finding 'greener' ways of controlling pest insects to ensure food security and to meet consumer needs.

**Project details**

- Project acronym: **NEUROSTRESSPEP**
- Participants: **United Kingdom (Coordinator)**, Belgium, Israel, Sweden, Germany, South Africa
- Project N°: 634361
- Total costs: € 6 995 053
- EU contribution: € 6 995 053
- Duration: June 2015 to May 2019

**See also**

**Project website**: http://www.neurostresspep.eu/
**Project details**:
https://cordis.europa.eu/project/rcn/193282/factsheet/en

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