Sniffing out honey bee disease: American foulbrood

The CRC for Honey Bee Products has identified the smell of the devastating honey bee disease American foulbrood to enable earlier detection and treatment.

Pivotal to a flourishing and economically sustainable honey bee industry is the maintenance of healthy Australian bees. American foulbrood is a bacterial disease lethal to honey bee larvae. It reduces larvae to a foul-smelling glue-like mass, causing colonies to die out. The disease is one of the most economically and biologically devastating pathogens for honey bees in Australia.

Due to the fatal and contagious nature of the disease, it represents a serious biosecurity threat for Australia, with beekeepers required to destroy infected colonies and hive materials.

American foulbrood costs Australian beekeepers millions each year through the loss of bee colonies and lost opportunities for honey production and pollination services.

Identifying hive diseases requires manual identification of symptoms by beekeepers. This can be time consuming, inaccurate and risks the further spread of disease.

The Australian honey bee industry requires early, accurate and non-invasive detection of diseases such as American foulbrood to keep honey bees healthy and allow the continued expansion of the industry.

CRC researchers used an innovative approach to develop an early American foulbrood detection method by using the foul smell of the infection.

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bee health

biomarkers

biosecurity

Researchers manually test hives for American foulbrood disease during the development of disease-specific biomarkers

In collaboration with the Bee Industry Council of Western Australia and the WA Department of Primary Industries and Regional Development, researchers collected samples of American foulbrood-affected bee larvae from across Western Australia. The researchers identified the key smell compounds and selected accurate and specific American foulbrood biomarkers for sniffing out low levels of the disease.

CRC researchers succeeded in using the biomarkers to separate American foulbrood compounds from a range of other smells that may be present in hives, including smells from healthy honey bees and from other common beehive diseases. This provides confidence in the CRC's ability to specifically identify American foulbrood infection in bee larvae.

A patent application has been filed for the disease biomarkers to ensure this innovative intellectual property remains in Australia and attracts further research, education and investment.

The biomarkers identified by the CRC are specific to American foulbrood and highly sensitive. They can detect the disease even when less than 10 infected brood cells exist within a hive.

'Collaborating with the CRC to understand and identify American foulbrood-specific smell compounds has been fascinating. It's easy to see the wide range of beneficial applications of this research for developing fast, easy and accurate hive disease diagnostics,' says Mr Brendan Fewster from the Bee Industry Council of Western Australia.

There is already considerable international interest in the American foulbrood biomarkers, especially from Europe.

The identification of American foulbrood-specific biomarkers also has the potential to be applied in the early detection of a range of other honey bee diseases and health issues that threaten the viability and health of Australian beehives.

'Our research opens the door for the development of novel technologies and tools to allow beekeepers to manage and respond to outbreaks quickly and easily,' says Dr Julia Grassl, Bee Health Program leader at the CRC for Honey Bee Production. 'This will strengthen Australia's biosecurity, keep our honey bees healthy and our beekeepers in business.'

CRC researchers collect diseased hives

Dr Julia Grassl
School of Molecular Sciences
University of Western Australia
Email: julia.grassl@uwa.edu.au
www.crchoneybeeproducts.com

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