Sniffing out honey bee disease

American foulbrood

Dr Julia Grassl, Research Fellow, CRC Honey Bee Products, University of Western Australia

The Cooperative Research Centre for Honey Bee Products (CRCHBP) is driving innovation within the honey bee industry.

Pivotal to a flourishing and economically sustainable honey bee industry is the maintenance of healthy Australian bees. A new method patented by researchers from the Honey Bee Health Group at The University of Western Australia sniffs out American foulbrood, a devastating honey bee disease that ravages hives across Australia.

American foulbrood (AFB) is a bacterial disease lethal to honey bee larvae. AFB reduces larvae to a foul-smelling glue-like mass, causing colonies to die out, and can quickly spread between hives when they are in high-densities, such as pollination events. The disease is the most economically and biologically devastating disease for honey bees in Australia.

Despite costing Australian beekeepers millions of dollars per year through the loss of bee colonies, honey production and pollination services, preventing AFB outbreaks at pollination events can be difficult. Diagnosis requires manual hive inspections by skilled beekeepers and biosecurity officers, but inspections are labour-intensive, time-consuming, invasive to the honey bee colony, and can easily miss infected colonies as only 10% of hives are usually inspected during a bee health audit.

To de-risk pollination services and increase beekeeper participation, the Australian honey bee industry requires early, accurate and non-invasive detection of diseases to keep honey bees healthy and allow the continued expansion of the industry.

CRC researchers took an innovative approach to developing a non-invasive AFB detection method by using the infections' foul smell. Dr Julia Grassl and her team collected samples of AFB-affected larvae from across Western Australia.

UWA PhD student Jessica Moran analysed over 100 compounds emitted by honey bee larvae, and identified the key compounds that are unique to AFB infections. These AFB biomarkers can be used to accurately diagnose AFB from a sample of beehive air.

Collaborating with AgriFutures Australia, with the support of funding from the Department of Agriculture, Water and the Environment and the AgriFutures Honey Bee & Pollination Program, Dr Grassl's research group is now developing novel chemical sensors that specifically target the AFB biomarkers.

These sensors will allow AFB to be detected rapidly and accurately in beehive air, without opening the hive or disturbing the colony. Patent applications have been submitted for the disease biomarkers and sensor design to ensure this innovative intellectual property remains in Australia and attracts further research and investment.

"A beehive breathalyser for AFB will help safeguard the honey bee pollination services in Australia. By rapidly screening hives for AFB, beekeepers will be able to detect outbreaks earlier, preventing severe losses in production and revenue," Jessica Moran said.

The commercialisation of a sensor device for early detection of AFB has the potential to transform the disease detecting capabilities of the honey bee and pollination industry on a global scale.