

# Development of an immune response assay in honey bees

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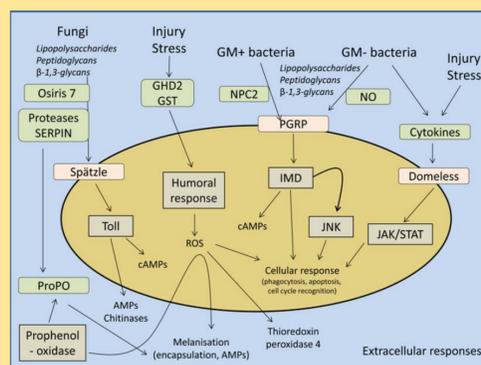
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## Introduction

Declines in managed and feral honey bee populations raise concerns of future pollinator shortages. Honey bees are susceptible to bacteria, fungi, parasitic mites and viral infections, which consequently compromise bee health, and decrease colony health and productivity. Treating diseases with pesticides is unsustainable in the long term, therefore much research focuses on breeding more disease resistance bees. Using targeted proteomics we are quantitating immune proteins in diseased versus healthy bees. These proteins may then become biomarkers which could be used for marker-directed breeding of more immunocompetent bees.

## Innate immunity in honey bees

Insects lack adaptive immunity as seen in vertebrates. However their innate immune system is quite complex. Immune defences comprise of cellular responses including phagocytosis and nodulation, and humoral responses such as haemolymph coagulation and AMP secretion.



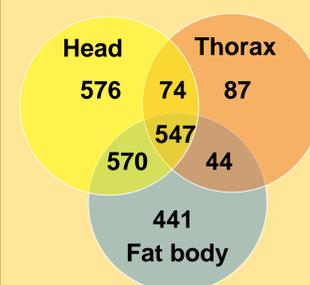
Sourced from Grassl et al. (2016)<sup>1</sup>

## Preliminary results

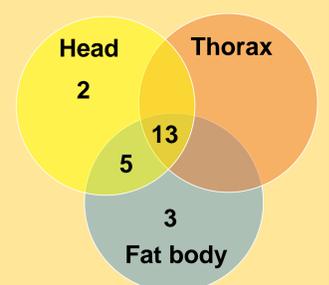
### 1. Mapping immune proteins

We identified > 2,000 proteins in male and female honey bees. The head, thorax and fat body were analysed separately to find the optimal body part for assay development. More proteins were identified in the head and fat body compared to the thorax. Of the 31 immune-related proteins identified in honey bee seminal fluid<sup>(1)</sup>, we located 23; including 10 proteins which had previously been shown to change in abundance when bees were infected with a pathogen.

#### All Proteins

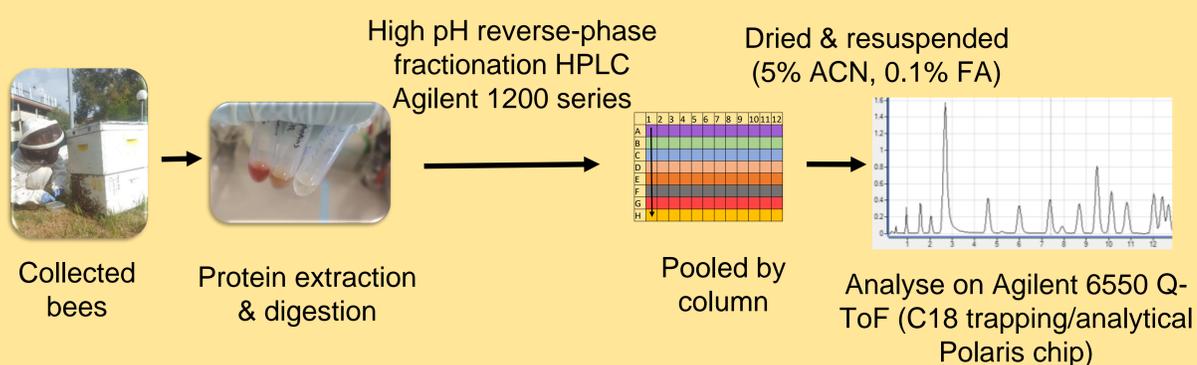


#### Immune Proteins

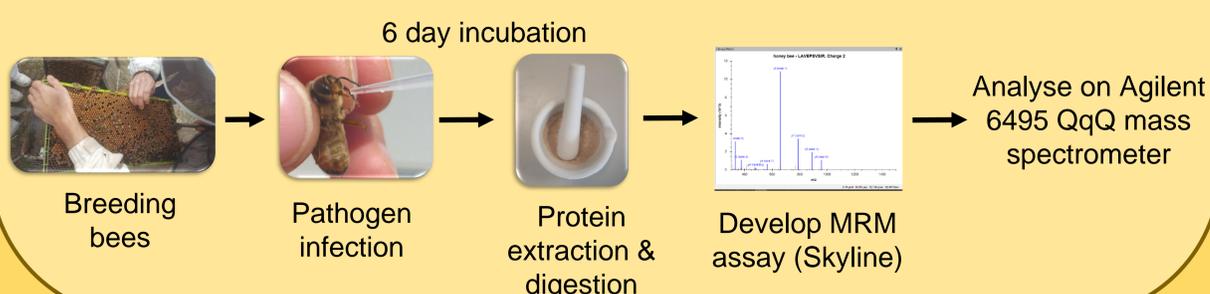


## Methods

### 1. Mapping immune proteins



### 2. Targeted proteomics



## Significance

We are developing an MRM assay of immune proteins that can be quantitated in response to any disease or resistance state. Assisting further research which could potentially lead to marker-directed breeding of more immunocompetent bees. This will be valuable for Australian breeding programs, especially when exotic diseases become established in Australia.

1. Grassl, J., et al. (2016). Journal of Proteome Research 16(1): 319-334.