Differential Regulation of Innate Immune Responses by Sensory Neurons in *Caenorhabditis elegans* Against Microbial Infections

The survival of an organism depends on its ability to sense potential threats and develop defense mechanisms to fight against infections. Both anecdotal evidences and published studies indicate that the immune response is influenced by alterations in the state and function of the nervous system. However, the mechanism of regulation of immunity by direct sensing of environmental cues by the nervous system is not known. Using a simple host-pathogen system, *Caenorhabditis elegans-Enterococcus faecalis/Pseudomonas aeruginosa*, we wanted to understand how sensory perception of environmental cues by the nervous system regulates the susceptibility to infection. *E. faecalis* is a Gram positive bacterium commonly found in the gastrointestinal tracts of humans. It is known to cause life threatening infections, especially it is the major cause of hospital acquired infections. *P. aeruginosa* is a gram negative, rod-shaped bacterium commonly found in environment. It is a potent human opportunist pathogen infecting those with compromised immunity. Using mutants that affect sensory perception and ablation of certain amphid sensory neurons, we observed that nervous system indeed play a role in fighting against microbial infections. Out results indicate upon exposure to *E. faecalis* or *P. aeruginosa* neurons mediate pathogen-specific response via neuropeptide to regulate transcription factors that regulate synthesis of anti-microbial effectors. Sensory neurons of *C. elegans* appear to have combinatorial effect on immune response. In future, we plan to use microfluidics and calcium imaging to observe pathogen-specific response of amphid neurons.