Exploring the Role of the Gut Microbiome in *C. Elegans* Pathogen Avoidance Behaviors

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Background

The gut-brain axis is a bidirectional communication network existing between the gut and the central nervous system that is modulated by an assembly of neural, endocrine, and immune pathways.

Emerging evidence increasingly supports an association between neurologic function, behavior, and the gut-associated immune system.

C. elegans feeding depends on the actions of a neuromuscular tube called the pharynx. The pharyngeal nervous system may possess genes that help induce aversive feeding behaviors in response to pathogens.

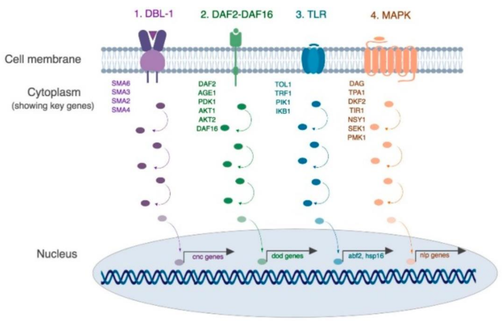


Figure 1. Molecular pathways of *C. elegans* immune response, including Toll pathway and MAPK

Research Question

What is the role of npr1, pmk1, flp21, flp18, and daf7 in modulating *C. elegans* immune system in response to pathogen stress in the gut?

Objectives

1. To characterize the genetic basis of learned avoidance behaviors in *C. elegans* infected with *C. albicans*
2. To quantify the role of *npr1*, *pmk1*, *flp21*, *flp18*, and *daf7* in modulating pathogen avoidance via qPCR
3. To demonstrate the role of the gut brain axis in immune modulation

Method

1. Grow *C. elegans* on NGM until they reach L4 stage
2. Wash eggs off plates with M9
3. Infect mature *C. elegans* with *C. albicans* for 2 or 4 hours
4. Extract RNA from infected worms
5. Synthesize cDNA
6. Perform qPCR to analyze expression of target genes

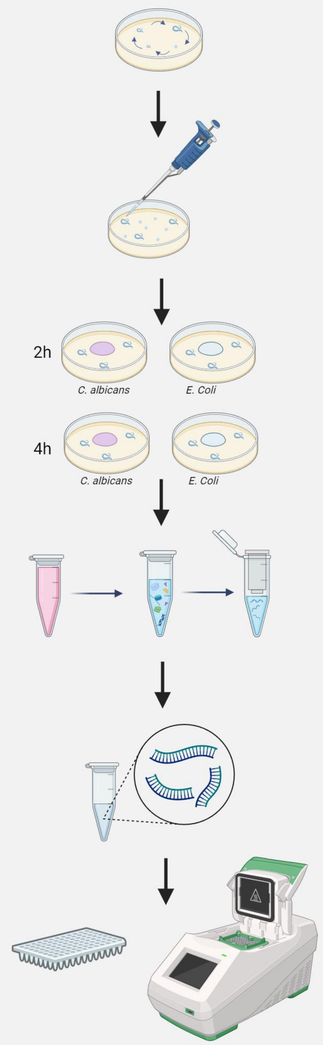
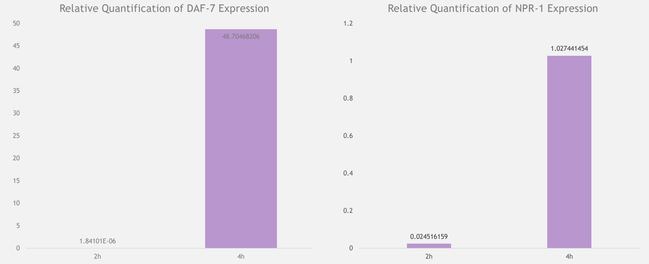


Figure 2. Graphical depiction of *C. elegans* growth, infection, and analysis procedures

Results



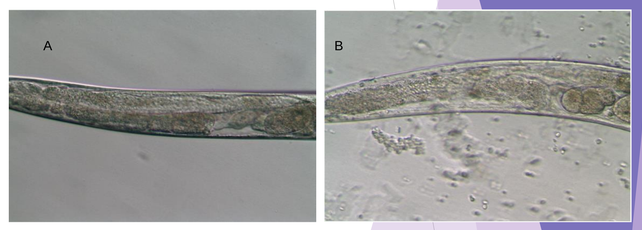


Figure 3. Posterior view of *C. elegans* before and after 24-hour *C. albicans* exposure

Discussion

Expression of npr1, pmk1, flp21, and daf7 was significantly greater after 4 hours of exposure to *C. albicans* than 2 hours of exposure.

These results suggest that pathogen avoidance is an immune response regulated by the expression of these and potentially other genes.

These results also demonstrate the role of the gut-brain axis in modulating immune responses to enteric disruptions, such as infection.

References

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Chen, X., D'Souza, R., & Hong, S.-T. (2013). The role of gut microbiota in the gut-brain axis: current challenges and perspectives. Protein & Cell, 4(6), 403–414. https://doi.org/10.1007/s13238-013-3017-x