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Aversive learning in C. elegans upon E. faecalis infection

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Abstract

Caenorhabditis elegans, a natural bacterivore, has proven to be a fruitful model organism for studying host-pathogen interactions, feeding behaviors, and learning. Previous studies have shown that the opportunistic human pathogen Enterococcus faecalis is a C. elegans pathogen, able to form a persistent, lethal infection in the intestine following ingestion. In addition to mounting a molecular immune response upon infection, C. elegans has developed avoidance strategies to escape harmful bacteria, homologous to danger avoidance seen in nearly all animals. Here, we describe both the molecular immune response and, for the first time, the behavioral response of C. elegans to E. faecalis. Immune signaling pathways come online quickly upon ingestion of E. faecalis. In addition, a fast form of aversive learning takes place along multiple sensory modalities in order to allow the animal to escape and avoid lethal patches of bacteria. Using the powerful genetic toolset available in C. elegans, along with simple behavioral analyses, we have been able to begin elucidating the neuronal and molecular pathways governing this aversive learning.