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2007 PROJECT SUMMARY

Name(s)
Adriana M. Mujal

Project Number
S0418

Project Title
Role of Lipid Metabolism in C. elegans Innate Immune Response

Abstract

Objectives/Goals
Fats have traditionally been considered rich sources of energy and major components of cell membranes. Recent studies, however, have established roles for fatty acids in the immune response # roles of which our experimentation explored. We hypothesized that firstly, the C. elegans immune response involved specific modulation of lipid metabolism, and that secondly, this alteration of gene expression was important for an effective immune response.

Methods/Materials
Wild-type C. elegans were infected with pathogenic Pseudomonas aeruginosa, and quantitative RT PCR analysis was used to determine shifts in the expression of lipid metabolic genes.

RNA interference treatments were then used to knock down the expression of candidate genes identified in the above RT analysis. Treated worms were placed in survival assays against the pathogen Pseudomonas aeruginosa and observed for differences in survival rate.

Results
From the RT PCR data, we observed a significant down-regulation of the mitochondrial ß-oxidation and glyoxylate pathways as well as differential regulation of specific lipid binding proteins in response to infection, and an up-regulation of peroxisomal ß-oxidation.

Currently from our screen of survival assays, we have identified seven specific genes that appear to have an effect on the C. elegans immune response, as with reduced expression, the survival rate of the nematode is altered.

Conclusions/Discussion
These changes in gene expression of various fatty acid metabolic pathways lent support to our hypothesis that the infection response provokes a specific modulation of the fat metabolism in the worm.

The data collected from the survival assays suggests that lipid metabolism does indeed possess a fundamental role in C. elegans innate immunity, and due to conservation of these metabolic pathways in plants and animals, might function similarly in mammalian innate immunity.

Summary Statement
This project explores the potential roles of specific fatty acids within innate immunity, employing C. elegans as a model organism to do so.

Help Received
Used lab equipment in the Tan Lab at Stanford University under the supervision of Madhu Nandakumar.