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Abstract

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PI Name:	SEYDOUX, GERALDINE C.
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PI Title:	ASSOCIATE PROFESSOR
Project Title:	REGULATION OF GERM CELL FATE DURING EMBRYOGENESIS

Abstract: The germ line is essential for reproduction and the perpetuation of species; yet little is known about the molecular mechanisms that guide its development during embryogenesis. The long-term goal of this proposal is to characterize these mechanisms using the genetic model system Caenorhabditis elegans. C. elegans is particularly well suited for this study, since, in this nematode, it is possible to track the development of the germline continuously from egg to adult. This proposal focuses on the essential germline factor PIE-1 and on two evolutionarily- conserved mechanisms which it regulates. The first mechanism involves the global inhibition of mRNA transcription in embryonic germ cells. Our previous studies suggest that PIE-1 protects the germline from somatic transcription factors by blocking mRNA transcription in early germ cells. We will ask the following questions: 1) how is PIE-1 localized to the germ lineage? 2) what domains in PIE-1 repress transcription? and 3) what effects does transcriptional repression have on germ cell fate? These questions will be addressed by determining the localization and function of different PIE-1 domains in vivo, and by identifying factors that function with these domains. These experiments are made possible by recent technical advances which permit the expression of transgenes in early embryos. The second mechanism involves the regulation of maternal RNAs associated with the germline-specific P granules. We have identified one such RNA, nos-2, and have shown that expression of NOS-2 protein in primordial germ cells is dependent on PIE-1. NOS-2 is related to Drosophila nanos, and together with another nanos homologue NOS-1 is essential for primordial germ cell development. We will determine 1) what aspects of PIE-1 localization and structure are required for NOS-2 expression, and 2) what aspects of germ cell fate are controlled by NOS-1 and NOS-2. We expect these studies to provide insights into basic developmental processes including the asymmetric segregation of proteins and mRNAs, transcriptional repression, and the control of germ cell fate. The many conserved characteristics between the germline of C. elegans and vertebrates suggest that principles gathered in this simple model system will be applicable to other animals, including humans.

Thesaurus Terms:
embryogenesis, gene induction /repression, germ cell, invertebrate embryology, protein structure /function

DNA directed RNA polymerase, enzyme inhibitor, gene expression, genetic transcription, messenger RNA, phenotype
Caenorhabditis elegans, chimeric protein, immunofluorescence technique, in situ hybridization, nucleic acid sequence, yeast two hybrid system

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