Caenorhabditis elegans as a model for stem cell biology.

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Public Summary:
Model systems ahve provided a great deal of essential and fundamental knowledge about the molecular mechanisms that underlie stem cell bioogy. We review the application of Caenorhabditis elegans as a model system to understand key aspects of stem cell biology. The only bona fide stem cells in C. elegans are those of the germline, which serves as a valuable paradigm for understanding how stem-cell niches influence maintenance and differentiation of stem cells and how somatic differentiation is repressed during germline development. Somatic cells that share stem cell-like characteristics also provide insights into principles in stem-cell biology. The epidermal seam cell lineages lend clues to conserved mechanisms of self-renewal and expansion divisions. Principles of developmental plasticity and reprogramming relevant to stem-cell biology arise from studies of natural transdifferentiation and from analysis of early embryonic progenitors, which undergo a dramatic transition from a pluripotent, reprogrammable condition to a state of committed differentiation. The relevance of these developmental processes to our understanding of stem-cell biology in other organisms is discussed. The worm can teach us important things that pertain to stem cells from all species, including human. Knowledge gained will help us understand stem cells so we can develop cellular therapies for human disease.

Scientific Abstract:
We review the application of Caenorhabditis elegans as a model system to understand key aspects of stem cell biology. The only bona fide stem cells in C. elegans are those of the germline, which serves as a valuable paradigm for understanding how stem-cell niches influence maintenance and differentiation of stem cells and how somatic differentiation is repressed during germline development. Somatic cells that share stem cell-like characteristics also provide insights into principles in stem-cell biology. The epidermal seam cell lineages lend clues to conserved mechanisms of self-renewal and expansion divisions. Principles of developmental plasticity and reprogramming relevant to stem-cell biology arise from studies of natural transdifferentiation and from analysis of early embryonic progenitors, which undergo a dramatic transition from a pluripotent, reprogrammable condition to a state of committed differentiation. The relevance of these developmental processes to our understanding of stem-cell biology in other organisms is discussed.