

# Germline Stem Cells

Edited by

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The knowledge gained by studying germline stem cells, the source of human and animal reproduction, may find immediate application in preserving endangered wildlife, managing commercial livestock, overcoming fertility problems in humans, and treating testicular and ovary tumors. In *Germline Stem Cells*, leading experts explore the parameters that define germline stem cells and the mechanisms that regulate the cell behavior in order to better isolate, characterize, and maintain them. Divided into two parts, the volume begins by providing protocols for germline stem cell identification and regulation in model organisms, and concludes with detailed chapters covering current techniques involving *in vitro* culture and the applications of the cells. Following the highly successful *Methods in Molecular Biology*™ series format, each chapter includes a brief introduction to the subject, a list of necessary equipment and reagents, step-by-step laboratory protocols, and tips on troubleshooting and avoiding known pitfalls.

Comprehensive and cutting-edge, *Germline Stem Cells* is the perfect reference for scientists exploring this particular exciting and important subdivision in the fast-paced field of stem cell research.

## FEATURES

- Readily reproducible protocols for the manipulation of germline stem cells in model organisms
- State-of-the-art methods optimized by leading experts in germline stem cells
- Identification and regulation of germline stem cells in model organisms
- Current techniques used in *in-vitro* culture and application in germline stem cells
- Presents sophisticated genetic, molecular, and cellular techniques used in germline stem cell research

## CONTENTS

**Part I. Identification and Regulation of Germline Stem Cells in Model Organisms.** The Development of Germline Stem Cells in *Drosophila*. Analysis of the *C. elegans* Germline Stem Cell Region. Immunohistological Techniques for Studying the *Drosophila* Male Germline Stem Cell. Genetic Tools Used for Cell Lineage Tracing and Gene Manipulation in *Drosophila* Germline Stem Cells. Structural Polarity and Dynamics of Male Germline Stem Cells in an Insect (Milkweed Bug *Oncopeltus fasciatus*). High-Resolution Light Microscopic Characterization of Spermatogonia. Identification and Characterization of Spermatogonial Subtypes and Their Expansion in Whole Mounts and Tissue Sections from Primate Testes. Epigenetic Control in Male Germ Cells: A Transillumination-Assisted Microdissection Method for the Analysis of Developmentally Regulated Events. GDNF Maintains Mouse Spermatogonial Stem Cells *In Vivo* and

*In Vitro*. **Part II. In Vitro Culture and Applications of Germline Stem Cells.** Ectopic Grafting of Mammalian Testis Tissue into Mouse Hosts: Spermatogonial Stem Cell Transplantation, Testicular Function, and Restoration of Male Fertility in Mice. Isolating Highly Pure Rat Spermatogonial Stem Cells in Culture. Deriving Mouse Spermatogonial Stem Cell Lines. Production of Knockdown Rats by Lentiviral Transduction of Embryos with Short Hairpin RNA Transgenes. Testicular Germ Cell Tumors in Mice: New Ways to Study a Genetically Complex Trait. Study Origin of Germ Cells and Formation of New Primary Follicles in Adult Human and Rat Ovaries. Index.

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