

STEM CELL ENGINEERING

PRINCIPLES AND PRACTICES

With contributions from pioneers and experts, **Stem Cell Engineering: Principles and Practices** highlights recent advances in the understanding of the cellular and molecular composition of the stem cell niche, systems biology investigation of mechanisms by which this niche regulates cell behavior, and approaches to build upon this basic information to direct stem cell differentiation into therapeutically valuable cell lineages.

Features

- Covers the temporal evolution of cell differentiation state and overall tissue structure in the early developing embryo as well as some parallels with embryonic stem cell differentiation within embryoid bodies
- Discusses how mechanical cues regulate cellular processes such as proliferation and differentiation, as well as highlights parallels for how what has been learned about the mechanobiology of tumors can be applied to stem cells
- Describes recent efforts to develop culture systems that can support the indefinite expansion of human pluripotent stem cells, potentially by emulating the microenvironment that such pluripotent cells experience during their brief window of existence in early embryogenesis
- Details a number of important considerations in the application of stem cell therapies to the central nervous system, including cell sources, disease and injury targets, and practical issues associated with cell differentiation and implantation
- Provides an in-depth analysis of the design of stem cell-based cardiac therapies, including sources of resident and exogenous cells, as well as natural and synthetic biomaterials for the differentiation and implantation of cells to enhance their viability and engraftment

This book discusses advances made during the last decade that have led to increasingly defined culture systems for stem cells, starting from co-culture with feeder cells in the presence of serum to growth on synthetic substrates in defined medium. In addition to highlighting many recent advances, it underscores the need for future work.



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