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Foreword

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This issue of *Disease Markers* is dedicated to the topic of "Stem Cells and Disease." The various chapters will describe the role of cancer stem cells and progenitor cells in disease progression and treatment. These reviews cover the gamut of tissue types and cell lines as well as differentiate between normal and diseased cells and tissues. It is our hope that by examining the role of these self-renewing cells in disease we can work towards developing novel therapeutics for a variety of afflictions in today's society. It is first necessary to distinguish between embryonic stem (ES) cells and adult stem cells. Embryonic stem cells are undifferentiated cells with the ability to undergo asymmetric cell division to form a committed progenitor cell and another self-renewable stem cell. Adult stem cells are those that are either de-differentiated or activated at later stage and are able to self renew and are usually a committed tissue type. Use of adult stem cells holds incredible potential because not only are we able to study the proliferative aspects of already differentiated tissues, but we can also perhaps apply the knowledge obtained to "turn-off" proliferating cancer cells. This would be of tremendous benefit for use in therapeutics and treatments of disease.

Contributors have attempted to provide an overview of the developing concepts and controversies in the area of stem cell biology as it relates to disease formation in a variety of tissue types. Specifically, our investigators refer to the role of stem cells in well-characterized diseases such as gastrointestinal cancer, leukemias, Niemann-Pick disease, and spinal cord injury. Other contributors have also examined stem cells in the liver, lung, and spermatogonia tissues, as well as Leydig and neural stem cells. In this issue we have attempted to shed light on some of the current stem cell research as well as place special emphasis on potential targets for therapeutic focus in these diseases.

In this issue, Dr. Connie Eaves focuses on stem cell biomarkers that have both biological and clinical potential in treating Chronic Myeloid Leukemia. Ruth He and Lopa Mishra examine the role of stem cells in gastrointestinal cancers by focusing on cancer stem cells and some of the key genes, pathways, and surface markers that are involved in the formation of GI malignancies. Hideki Taniguchi reviews the role of stem cells in the liver, which is known for its regenerative capacity, and how it relates to the development of liver diseases such as hepatocellular carcinoma and cholangiocarcinoma. Kyung-Sun Kang and friends discuss neural stem cell defects by examining the role of stem cells in the development of Niemann-Pick disease – a neurodegenerative disease. Niemann-Pick is believed to develop due to impaired self renewal ability and differentiation of NPC$-/-$ neural stem cells as compared to wild-type. Dr. Jean Wrathall discusses the implications of the role of stem cells in spinal cord injury by examining recent evidence that suggests that following traumatic injury, endogenous glial cells (stem/precursor/progenitor cells) are naturally stimulated to proliferate thereby leading to limited recovery of function. Bibhuti Mishra et al. focus on TGF-β regulation of Neuronal Stem Cells, including the dual control of cell-cycle via TGF-β/Notch regulation. In a review of the current stem cell pathways and biomarkers used to identify and characterize lung cancer stem cells, Varticovski et al. discuss the various types of lung tumors including: squamous cell carcinoma, adenocarcinoma/bronchoalveolar (non-small lung cancer), and neuroendocrine carcinomas. Spermatogonial Stem Cells (SCS) are known both for their capacity for self-renewal but also for their ability to differentiate. Nagano et al. discuss the role of these SCS cells following testicular damage such as cytotoxic cancer treatments and as a potential target to reestablish male fertility. Although a mouse model is used, there are numerous implications for treatment in humans – such as spermatogonial transplantation in which donor cells are injected into the seminiferous tubules of the infer-

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tile host males (the donor cells maintain their ability for spermatogenesis) in order to regenerate fertility in the host. Matthew Hardy et al. characterize Stem Leydig Cells (SLCs) and the potential therapeutic applications of SLCs in the reversal of age-related testosterone loss and the stimulation of testosterone production in males.

We have chosen to review multiple systems and tissues because of their involvement in extensive studies of stem cell biology, which could potentially become a model for other fields of research. We hope that *Disease Markers* readers will find these articles applicable to their own investigations.