# Foreword

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This issue of *Cancer Biomarkers* is dedicated to the topic of "Stem Cells and Cancer." The various chapters will describe the role of cancer stem cells and progenitor cells in the progression to cancer. These reviews cover the gamut of tissue types and cell lines as well as differentiate between normal cells and tissues and those that become cancerous. It is our hope that by examining the role of these self-renewing cells we can work towards developing novel therapeutics. 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 cells and 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 cancer.

Contributors have attempted to provide an overview of the developing concepts and controversies in the area of stem cell biology as it relates to the formation of cancer in various tissue types. Specifically, our investigators refer to the role of stem cells in well-characterized diseases such as prostate and hepatocellular cancer, melanoma, chronic myeloid leukaemia as well as examine stem cell/cancer stem cell properties. We have also examined the Wnt pathways, stem cell lineage, and characteristics of specific stem cell biomarkers. In this issue we have attempted to shed light on the some of the current stem cell research as well as place an emphasis on potential targets for therapeutic focus in these diseases.

In this issue, Krit Kitisin and Lynt B. Johnson review the role of stem cells in the formation and treatment of Hepatocellular Cancer (HCC) by examining not only the regenerative capacity of liver stem cells but by also discussing the deregulation of certain signaling pathways including the TGF-$\beta$ and Wnt pathways as it relates to the development of HCC. Toru Kondo examines the behavior of "stem cell-like" cancer cells, or cancer stem cells (CSCs) by use of cancer cell lines treated with CD133, a stem cell marker. Dr. Kondo proposes that cancer cell lines be used as a good source of CSCs due to the ease of study and maintenance. Francesca Pellicano and Tessa Holyoake focus on haemopoietic stem cells (HSCs) in Chronic Myeloid Leukaemia (CML) by examining specific biomarkers and targeted therapeutics. In an effort to tie this all together, the review by FitzGerald and Natarajan addresses the role of various biomarkers in both normal and stem cells in hopes of elucidating the cancer stem cell model of tumorigenesis. This model assumes that cancer stem cells arise due to a loss of control or failure to inhibit differentiation/self renewal of proliferating cells. William Pavan's article "Stem cells of the melanocyte lineage" discusses abnormal melanocyte stem cell maintenance as it relates to hair graying and other follicular ailments as well as malignant transformation of melanocytes into melanoma – the $6^{th}$ most common cancer in the US. The complex nature of prostate stem cells is addressed by G.I. Gallicano in his review which elucidates the underlying characteristics of prostate cancer stem cells as opposed to normal prostate stem cells and prostate cancer cells as well as their biomarkers. The self-renewal ability of tissue stem cells as regulated by tumor-related genes is examined in a review by Atsushi Hirao. Dr. Hirao focuses on tumor-related genes ATM, FOXO, and PTEN to demonstrate the similarities between tis-

sue stem cells and cancer cells as it may lead to improved therapeutic options for cancer patients. Robert Glazer examines mammary stem and progenitor cell regulation by looking at the Notch and Wnt signaling pathways which are both involved in stem cell self-renewal. The final review by Michael Pishvaian and Stephen Byers delineates the various functions of the Wnt signaling pathway and the biomarkers that have diagnostic, prognostic, and therapeutic implications such as c-myc, MMP-7, COX-2, VEGF, and MDR-1.

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 *Cancer Biomarkers* readers will find these articles applicable to their own investigations.