Preface

Somatic stem cells (SSCs) or adult stem cells can be found in almost all tissues of the body. They can self-renew and proliferate and differentiate to produce some or all of the cells in a tissue or an organ. SSCs play a very important role in the maintenance of normal tissue homeostasis by replenishing dying cells and regenerating damaged tissues for the entire lifespan of an organism. Normally, SSCs reside in a special microenvironment called the "stem cell niche" which can significantly influence their fate. In addition, maintenance of genomic stability has been shown to be crucial for the preservation of SSC longevity and prevention of SSCs from transformation. Therefore, perturbation of the ability of SSCs to self-renew, proliferate and differentiate to produce progeny and disturbance of the stem cell niche microenvironment have been implicated in various pathological conditions and a variety of disease processes, including normal tissue injury induced by cancer treatment with chemotherapy and ionizing radiation (IR). Furthermore, because SSCs can self-renew, they are long lived cells that represent ideal cellular targets for acquisition of multiple mutations which may transform SSCs to cancer stem cells (CSCs) to cause malignancies. Like SSCs, CSCs can also self-renew and have high tumorigenic potential. In addition, CSCs are usually more resistant to chemotherapy and IR than SSCs. Failure to eradicate CSCs may be responsible for tumor recurrence after cancer treatment.

In this special issue of *Translational Cancer Research* on "Stem Cells in Cancer", Shahar Biechonski and Dr. Michael Milyavsky discuss some of the fundamental differences between hematopoietic stem cells (HSCs) and the committed progenitors from humans and rodents in their ability to repair DNA damage and propensity for apoptosis in response to the damage. Their review also covers current progress in the understanding of the roles of various cell-intrinsic DNA damage repair pathways and DNA damage response (DDR) signaling molecules and the cellular microenvironment in the regulation of HSC self-renewal and of the potential implications of dysregulation of HSC DNA damage repair and DDR in aging, bone marrow suppression or failure, and leukemogenesis. Dr. Jian Yu provides an excellent overview on recent advances in the identification and characterization of intestinal stem cells, their responses to genotoxic stress, and strategies for their protection to reduce IR- and chemotherapy-induced acute intestinal damage. Dr. Lijian Shao and his colleagues highlight the discoveries of the role of reactive oxygen species in regulating HSC self-renewal and the role of oxidative stress in mediating IR- and chemotherapy-induced HSC senescence and long-term bone marrow injury. In addition, they discuss several new strategies that can be exploited to potentially reduce the late adverse effects of conventional cancer therapy on the hematopoietic system in long-term cancer survivors. Dr. Chang-Lung Lee and colleagues review the non-apoptotic roles of p53 in normal tissue response to IR. They cover various key tissues/organs that play important roles in mediating the body response to radiation such as the hematopoietic system and the gastrointestinal system. Their discussions provide an excellent overview of the complexities and nuances of the roles of p53 and its associated factors in protecting or sensitizing various tissues to radiation. Their review should be of interest to those who are interested in targeting p53 as a strategy to ameliorate radiation induced tissue injury. Dr. Lina Wang and her colleagues provide a valuable appraisal on the novel evidence suggesting that tumor cells may be capable of creating a special stem cell niche that favor CSC self-renewal and propagation while inhibiting the function of SSCs. Understanding of the changes in tumor microenvironment may facilitate the development of new therapeutics that can be used to more specifically target CSCs while promoting SSC self-renewal and regeneration of damaged tissues. Dr. Jialiang Wang and his colleagues summarize the current status of glioma stem cell research, highlighting some of the important controversies such as hierarchical organization *vs*. stochastic clonal evolution, elevated radiation resistance of glioma stem cells, etc. They also discuss key pathways involved in specifying the stem cell fate for glioma stem cells. It is definitely a review that should be of interest to those who want to catch up on the most up-to-date information on this important subject. Finally, Dr. Wooi Loon Ng and colleagues provide a historical overview of the key molecular factors involved in tumor response to radiotherapy. Starting from the concept of the 4 "R"s (repair, reoxygenation, repopulation, and redistribution), they focus on significant advances in the past 20 years in the field of molecular radiation biology. Controversial topics such as the roles of endothelial cells in tumor response to radiation and new concepts such as radiation induced recruitment of bone marrow cells, hypoxia-independent induction of HIF1a by radiation, and cell death induced tumor cell repopulation are covered. It provides a good, balanced perspective on this important subject.

We would like to thank all the authors for their excellent contributions to this special issue of *Translational Cancer Research* on "Stem Cells in Cancer", and the reviewers and the staff members of *Translational Cancer Research* for their constructive comments and attentive assistance, respectively, in helping us to put together of this special issue for the journal. We hope that the collection of these review articles in this special issue of *Translational Cancer Research* on "Stem Cells in Cancer" can serve as a valuable resource to the cancer and stem cell research community to stimulate more in depth studies on stem cells in cancer.

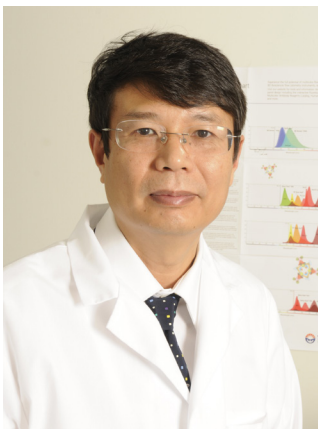
Acknowledgments

Funding: None.

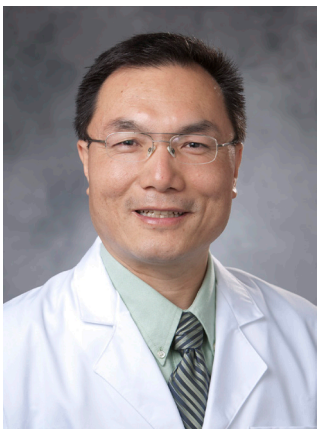
Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Translational Cancer Research* for the series "Stem Cells in Cancer". The article did not undergo external peer review.

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.3978/j.issn.2218-676X.2013.10.06). The series "Stem Cells in Cancer" was commissioned by the editorial office without any funding or sponsorship. DZ and CYL served as the unpaid Guest Editors of the series and serve as the unpaid editorial board members of *Translational Cancer Research*. The authors have no other conflicts of interest to declare.



Daohong Zhou, MD



Chuan-Yuan Li, Ph.D

Daohong Zhou, MD
Winthrop P. Rockefeller Cancer Institute, University of Arkansas for Medical Sciences, Little Rock, Arkansas, USA.
(*Email: DZhou@uams.edu.*)
Chuan-Yuan Li, Ph.D
Duke University Medical Center, Durham, NC 27710, USA.
(*Email: Chuan.Li@duke.edu.*)
Submitted Oct 15, 2013. Accepted for publication Oct 22, 2013.
doi: 10.3978/j.issn.2218-676X.2013.10.06
View this article at: http://www.thetcr.org/article/view/1673/html

Cite this article as: Zhou D, Li CY. Preface. Transl Cancer Res 2013;2(5):370-371. doi: 10.3978/j.issn.2218-676X.2013.10.06