Hindawi

Oxidative Medicine and Cellular Longevity

Special Issue on

Reactive Oxygen Species in Stem Cells

CALL FOR PAPERS

Stem cells are defined by their unique ability to self-renew and their multipotent differentiation capacity, thus maintaining tissue homeostasis throughout the life of a multicellular organism. Stem cells reside in niches characterized by hypoxia and low reactive oxygen species (ROS), both of which are critical for maintaining the potential for self-renewal and stemness. Moreover, stem cells display a metabolic profile different from that of terminally differentiated cells, showing a preference for the inefficient anaerobic metabolism. In fact, aerobic metabolism could generate an excess of ROS, leading to DNA damage, senescence, apoptosis, or cell death. Until recently, the focus in stem cell biology has been on the adverse effects of ROS, particularly the damaging effects of ROS accumulation on tissue aging and the development of cancer. However, it has become increasingly clear that, in some cases, redox status plays an important role in stem cell maintenance, that is, regulation of the cell cycle. In fact, ROS at low levels function as signaling molecules to mediate cell proliferation, migration, differentiation, and gene expression. ROS levels in stem and progenitor cells have a clear correlation with cellular functions and are regulated by a fine-tuning of the balance between ROS-generating and antioxidant defense systems. Molecular targets of ROS and distinct redox signaling pathways in stem and progenitor cells have been identified to activate transcription factors, such as Nrf2, ultimately determining cell fate. Thus, to fully decipher the underlying molecular mechanisms involved in the maintenance of stem cell self-renewal, it is critical to address the important role of redox homeostasis in the regulation of both self-renewal and differentiation of stem cells. Similar to normal stem cells, cancer stem cells (CSCs) also show lower intracellular ROS levels than non-CSCs, suggesting that maintenance of a reduced intracellular environment is associated with an undifferentiated state. However, the roles of ROS in CSCs remain poorly understood and intensive research for ROS in CSCs is desperately needed.

We invite investigators to contribute original research articles as well as review articles that will stimulate the continuing efforts to understand the precise effects of ROS on stem cells in vitro and in vivo. We are particularly interested in articles describing the molecular mechanisms of action by which ROS modulate both normal and cancer stem cells properties.

Potential topics include, but are not limited to:

- Role of ROS in maintaining the stemness capacity such as self-renewal
- Role of ROS in determining differentiation potential
- Role of ROS in causing senescence of stem cells and the stem cell niche
- Role of ROS in regulating cancer stem cell properties

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