Preface

Stem Cells are Finally Starting to Jell

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The advent of stem cells as a tool to decipher the cell's biology and as a source of transplant therapy to correct aging and diseases has become a core research arena for tissue engineering and regenerative medicine. It is thus fitting that The Open Tissue Engineering and Regenerative Medicine hosts this volume dedicated to a pivotal source of stem cells – the umbilical cord's Wharton jelly. Much kudos go to lead editor Dr. Giampero La Rocca for organizing this special volume of the journal, comprising of pioneering scientists who have advanced the basic and translational applications of Wharton jelly-derived stem cells (La Rocca, TOTERMJ 2011).

A unique cell population of Wharton jelly that has been suggested as displaying the stemness phenotype is the mesenchymal stromal cells or MSCs. The prototypical feature of MSCs is their plastic adherence expressing a phenotypically defined set of surface markers inculding CD90, CD73 and CD105. Although MSCs have been harvested from many different tissues, novel considerations of tissue specificity may dictate the eventual fate of MSCs. In particular, MSCs' stemness and immune properties appear to be more robustly expressed and functional with fetal than adult-derived MSCs. To this end, the young age of Wharton jelly suggests that MSCs harvested from this fetal origin will exhibit a much more proliferative, immunosuppressive, and even therapeutically active stem cells than those isolated from older, adult tissue sources such as the bone marrow or adipose. The present compilation of milestone discoveries on Wharton jelly-derived stem cells should aid in further moving the field of cell biology and therapy towards clinical applications.

In this special volume, Dr. Conconi lays out the groundwork on the Wharton jelly's characterization by providing an overview on the human umbilical cord [1]. Next, Dr. Kita focuses on the specific region of the umbilical cord lining and Wharton jelly that stem cell niches [2]. Dr. Prasanna then makes the case for the therapeutic utility of the Wharton jelly-derived stem cells emphasizing the regenerative and immunomodulatory potential of these cells [3]. The next set of papers details the different disease indications, namely, cancer therapy [4], liver disease [5], peripheral nerve repair [6], cardiovascular diseases [7], cartilage regeneration [8], and tendon injury repair [9]. To further maximize the isolation and differentiation of stem cells derived from Wharton jelly, the next set of studies describes optimization experimental protocols, such as the use of oxygen concentration and plating density [9], cardiac differentiation factors [10], and gestational abnormalities (i.e., diabetes mellitus) [11]. Finally, new frontiers in Wharton jelly research are discussed, including the identification of umbilical cord-derived perivascular cells [12] and the use of magnetic resonance imaging in contrast labeled-umbilical cord stem cells [13]. Altogether, these studies offer authoritative views on what we know about Wharton jelly-derived stem cells, as well as provide insights on what the future holds for the cells' biological and therapeutic applications.

We are witnesses to the many tissue sources of stem cells. Here, we are given the many appealing features of a unique set of stem cells that jell – the Wharton jelly!

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DISCLOSURES/CONFLICT OF INTEREST

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