



David T Harris

University of Arizona, USA

Younger is better: Old stem cells aren't what they used to be

The idea of stem cells as medical therapy has become almost commonplace. Millions of individuals have stored stem cells in biobanks for future use, and tens of thousands of have received stem cell transplants or infusions for regenerative medicine therapies. But often overlooked are everyday factors that may impair the utility of these stem cells, including stem cell age and donor health. There is increasing evidence that both factors can significantly impact the therapeutic potential of stem cells.

The hematopoietic stem cell is the best characterized of all stem cells. Weissman and others have shown significant functional changes with age, a finding confirmed upon analysis of cord blood transplant recipients. Similar findings have also been observed with neural stem cells. In terms of regenerative medicine, many are looking at mesenchymal stem cells (MSC). Numerous studies have indicated that MSCs isolated from older donors, as well as from patients with chronic disease conditions, are neither as prevalent (in terms of the number of cells in the sample) nor as potent as those isolated from younger, healthier donors. MSCs collected from older donors seem less able to differentiate into the different cell types needed for tissue engineering, slower to proliferate and expand to numbers of cells that would allow for multiple treatments, and more prone to dying during culture and use.

Evidence that MSC quality declines with donor age warrants concern for cell based therapies. The ability of older stem cells to respond to injury may be compromised and could contribute to inferior tissue repair. We have observed such results when analyzing the effects of stem cell age in a chronic wound model. In addition, Shen et al at the University of Texas-Arlington found that aging female mice transplanted with young MSCs had prolonged life span (by 15-20%). In contrast, older MSCs failed to prolong life span at all.

Thus, it seems that stem cells, like the rest of the cells in our bodies, also suffer from the ravages of time. Stem cells (of various types) collected from younger, healthier donors are more effective for transplantation and regenerative medicine than those collected from older individuals, which makes a strong case for the preservation of stem cells at the earliest possible time, and for the consideration of donor age when transplanting stem cells.

Biography

Harris is a graduate of Wake Forest University in Winston-Salem, North Carolina where he obtained Bachelor of Science degrees (cum laude) in Biology, Mathematics and Psychology in 1978. He earned a Masters of Medical Sciences (summa cum laude) from Bowman Gray Medical School in 1980 and his Doctorate in Microbiology and Immunology (magna cum laude) from Bowman Gray Medical School in 1982. From 1982-1985 Dr. Harris was a Post-doctorate Fellow at the Ludwig Institute for Cancer Research in Lausanne, Switzerland. In 1985 he joined the faculty at the University of North Carolina-Chapel Hill as a Research Assistant Professor in the Department of Medicine. In 1989 Dr. Harris joined the faculty at the University of Arizona in Tucson as an Associate Professor in the Department of Microbiology & Immunology. In 1996 Dr. Harris was promoted to Professor of Immunology. Dr. Harris established the first cord blood bank in the USA in 1992. He currently serves as Director of the Cord Blood Stem Cell Bank, is a member of the Arizona Cancer Center, a member of the Children's Research Center, and a member of the Arizona Arthritis Center. Dr. Harris's research interests include stem cells and regenerative medicine, cancer research/stem cell transplantation and gene therapy. He has published more than 300 articles (papers, book chapters and abstracts), given more than 100 talks on stem cells over the past 7 years, and has served as a consultant to the governments of China, Hong Kong, Singapore and South Korea. Dr. Harris has also founded 4 companies while at the University of Arizona; Cord Blood Registry, Inc.; Immune Regen BioSciences, Inc.; QuReGen, Inc. and AdiCyte.

davidh@u.arizona.edu