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Realistic Prospects for Stem Cell Therapeutics

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Abstract

Studies of the regenerating hematopoietic system have led to the definition of many of the fundamental principles of stem cell biology. Therapies based on a range of tissue stem cells have been widely touted as a new treatment modality, presaging an emerging new specialty called regenerative medicine that promises to harness stem cells from embryonic and somatic sources to provide replacement cell therapies for genetic, malignant, and degenerative conditions. Insights borne from stem cell biology also portend development of protein and small molecule therapeutics that act on endogenous stem cells to promote repair and regeneration. Much of the newfound enthusiasm for regenerative medicine stems from the hope that advances in the laboratory will be followed soon thereafter by breakthrough treatments in the clinic. But how does one sort through the hype to judge the true promise? Are stem cell biologists and the media building expectations that cannot be met? Which diseases can be treated, and when can we expect success? In this review, we outline the realms of investigation that are capturing the most attention, and consider the current state of scientific understanding and controversy regarding the properties of embryonic and somatic (adult) stem cells. Our objective is to provide a framework for appreciating the promise while at the same time understanding the challenges behind translating fundamental stem cell biology into novel clinical therapies.

Topics: stem cells, neural stem cells, adult stem cells, embryonic stem cells

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Clinical Uses of Stem Cells. Topics. Focus of Human Stem Cell Debate. Ethical Issues in SC Research. NIH Definition of hESCs. Office of Pediatric Therapeutics Office of the Commissioner, Food and Drug Administration. Robert.Nelson@fda.hhs.gov. Presented on April 4, 2010. ▪ "Research volunteers must be educated about the realistic potential for therapeutic benefit as they may have recourse to…therapeutic alternatives and…[have] misconceptions about the potential for therapeutic efficacy." ▪ "Research subjects' comprehension of relevant information - especially of the risks and uncertainties – [should] be evaluated at the time of obtaining consent." Stem cell therapeutics—reality versus hype and hope. J Assist Reprod Genet (2011) 28:287–290 DOI 10.1007/s10815-010-9520-6. COMMENTARY. Stem cell therapeutics—reality versus hype and hope. Nicolas H. Zech & Karl-Heinz Preisegger & Peter Hollands. Received: 2 November 2010 / Accepted: 22 November 2010 / Published online: 8 December 2010 # Springer Science+Business Media, LLC 2010. Keywords Stem cells . Adult . Embryonic . iPS cells . Capsule Human cord blood stem cells have a realistic and proven potential for the treatment of various diseases compared to embryonic stem cells / iPS cells. N. H. Zech (*) IVF Centers Prof. Zech - Bregenz, Roemerstrasse 2, 6900 Bregenz, Austria e-mail: n.zech@ivf.at. Stem-cell therapy is the use of stem cells to treat or prevent a disease or condition. As of 2016, the only established therapy using stem cells is hematopoietic stem cell transplantation. This usually takes the form of a bone-marrow transplantation, but the cells can also be derived from umbilical cord blood. Research is underway to develop various sources for stem cells as well as to apply stem-cell treatments for neurodegenerative diseases and conditions such as diabetes and heart disease.