

Human stem cell research and regenerative medicine—present and future

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Introduction: Stem cells are cells with the ability to grow and differentiate into more than 200 cell types.

Sources of data: We review here the characteristics and potential of human embryonic stem cells (hESCs), induced pluripotent stem cells (iPSCs) and adult stem cells (ASCs).

Areas of agreement: The differentiation ability of all stem cell types could be stimulated to obtain specialized cells that represent renewable sources of functional cells useful for cell-based therapy.

Areas of controversy: The proof of functional differentiated cells needs to be investigated in more detail using both *in vitro* and *in vivo* assays including animal disease models and clinical studies.

Growing points: Much progress has been made in the ASCs-based therapies. Meanwhile hESCs and iPSCs have dramatically emerged as novel approaches to understand pathogenesis of different diseases.

Areas timely for developing research: A number of new strategies become very important in regenerative medicine. However, we discuss the limitations of stem cells and latest development in the reprogramming research.

Keywords: stem cells/pluripotency/reprogramming/cell therapy/regenerative medicine

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Introduction

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Stem cells have the capacity to divide and give rise to identical daughter stem cells (symmetrical division) or to differentiate into specific cells of somatic tissues (asymmetrical division).¹ Commonly, stem cells are derived from two main sources: (i) early embryos (embryonic stem cells, ESCs) and (ii) adult tissue (adult stem cells, ASCs). Thomson

