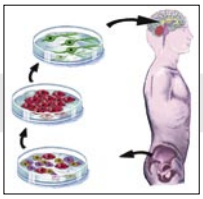

Regenerative Medicine and Stem Cell Therapy

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Regenerative medicine concerns the development of cells, tissues and organs for the purpose of restoring function through transplantation. The general thought is that replacement, repair and restoration of function is best accomplished by cells, tissues or organs that can perform the appropriate physiologic/metabolic duties better than any mechanical device, recombinant protein therapeutic or chemical compound.

Stem cells, whether of embryonic or adult origin, bone marrow-derived or tissue-specific, are viewed as starting material for regenerative medicine. They are especially appealing because of their ability at the single-cell level, to both self-renew and give rise to mature daughter cells [1]. While fascinating and provocative findings over the last few years have drawn the stem cell research field into the center of attention, it is clear now that studies challenging the old dogma of cell lineage restriction must be carefully interpreted [2]. Accordingly, doubts have been raised concerning the trans-differentiation potential of hematopoietic stem cells into non-hematopoietic fates. On the other hand, much similar to hematopoietic stem cells, stem/progenitor-like cells with slow cellular turnover have been identified in many adult tissues such as heart, kidney, muscle and brain, bearing the ability to repopulate mature cells within the organ itself and participate in its repair. In addition, efforts have been made to induce pluripotent human embryonic stem cells into a desired cell lineage in the culture dish toward the therapeutic application of these cells. Apart from stem cells, embryonic progenitor tissues, fetal cells, well-differentiated adult cells (with or without the support of bioartificial materials) are all valuable sources for regenerative medicine. Which approach will prevail? While to date there is not a definite answer, the goal of the "regenerative medicine and stem cell therapy" series presented in *IMAJ* is to clarify, at least in part, the different approaches, with special emphasis on translational rather than basic aspects of the field. For the convenience of the readers, different organ systems (heart, brain, pancreas, kidney, cartilage/bone and vasculature) will be separately reviewed. In addition, for most organs, advances being made with either adult or embryonic cells will be discussed. To clarify the somewhat confusing terminology of the field, see http://stemcells.nih.gov/info/glossary.asp.

When thinking of the time frame necessary to clinically translate regenerative medicine and stem cell therapy to fields other than bone marrow transplantation, we might extrapolate from renal transplantation to other organs. An individual receiving an allograft nowadays will need a new one within almost 15 years. That is a reasonable time to clinically translate at least one approach so that when the countdown begins we would not need to enter our patient into the ever-long organ waiting list.

References

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2. Weissman I. Stem cell research: paths to cancer therapies and regenerative medicine. *JAMA* 2005;294(11):1359–66.

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The eyes of others are our prisons; their thoughts our cages

Virginia Woolf (1992-1941), British novelist, biographer and central figure of the "Bloomsbury group," whose novels include *Mrs. Dalaloway, To the Lighthouse,* and *The Waves.* She and her husband Leonard founded the Hogarth Press