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Potential of Stem Cell Research

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Stem cells are relatively primitive cells that are characterized by the ability to renew themselves through mitotic cell division and differentiate into a diverse range of specialized cell types. Stem cells in the embryo are capable of the huge variation in the kinds of tissues they make, reproduce rapidly and have attracted interest of researchers for decades. Even with the advent of new drugs and medical technologies, there remain a number of devastating diseases including retinal degeneration, diabetes and Parkinson's which continue to pose a challenge to the well-being of people around the world. Stem cells have the potential to create the miracle as it have many potential scientific uses in cell based therapies (regenerative or reparative medicine), therapeutic cloning, gene therapy, cancer research and basic research [1]. Basic research to study stem cells and their differentiation is important to many areas of science and are utilized to develop alternatives to animal testing in drug screening and toxicology, and are envisaged as targets for gene therapy. They can replace or repair any damaged tissue; they have the potential to tackle degenerative diseases, from Alzheimer's to cancer, from diabetes to heart disease, to leukaemia and sight loss.

Based on their origin, stem cells are broadly categorized into either adult or embryonic stem cells. Both cell types have the capability to differentiate into various specialized cells and tissues, which have created considerable scientific and medical interest. Haemopoietic stem cell transplantation is the oldest stem cell therapy and is the treatment that is most widely available [2]. Clinical studies over the last decade suggest that stem cell transplantation has potential as a therapy for neurodegenerative diseases. Clinical trials have involved grafting brain tissue from aborted foetuses into patients with Parkinson's disease and Huntington's disease [3].

Embryonic Stem (ES) cells can be directed into a wide range of cell types and proof of concept studies are taking place for preclinical studies to correct human diseases in animal models of a variety of conditions, including diabetes, myocardial infarction, Parkinson's disease, and liver disease. One of the opportunities with ES cells is for correction of loss of central vision through age-related macular degeneration. Embryonic stem cells have huge clinical potential because they can be expanded, in the laboratory, to generate millions of identical ES cells that can readily be converted into any tissue type. Several researchers explore the potential of adult stem cell to be used in therapy. Adult stem cells can be received from bone marrow, muscle, brain and placental cord. The type of adult stem cell that has huge clinical potential is termed as Mesenchymal Stem Cells (MSC), which are found in fat and bone marrow and thus can be readily harvested and multiplied for use as stem cell therapies. MSCs can be turned into bone, cartilage, tendons and muscle, and thus could be invaluable for the treatment of orthopaedic injuries. Also, there is evidence that MSCs are more plastic than initially believed and can transdifferentiate into nonskeletal tissues, including liver, pancreas and neural cells. Adult stem cells have some advantages in terms of clinical applications over embryonic and induced pluripotent stem cells because their use poses no ethical conflicts nor involves immune rejection problems. In common with embryonic stem cells, adult stem cells have the ability to differentiate into more than one cell type, but unlike the former they are often restricted to certain types or "lineages" [4].

Certain cancers and various disorders of the blood or immune system require treatment that depletes the population of stem cells responsible for generating the body's blood and immune cells. Bone marrow transplantation is the procedure most often used to remedy this situation. Umbilical cord blood has emerged as a new source for transplanting blood stem cells to treat some malignant and nonmalignant blood diseases. Stem cells collected from the umbilical cord after a baby is born can reconstitute a patient's blood-forming system as effectively as a bone marrow transplant. Gene therapy applied to haematopoietic stem cells (blood-cell-generating stem cells, HSCs) is a promising approach to treating some cancers and a variety of diseases affecting either the blood or the immune system [5,6].

Stem cell research has potential use for clarification of complex events that occur during human development and understanding the molecular basis of cancer. Stem cells can provide specific cell types to test new drugs and in gene therapy to be utilized as a vehicle after they have been genetically manipulated. The most important and potential application of human stem cells is the generation of cells and tissues that could be used for cell-based therapies. As knowledge of stem cells grows, investigators will be able to ask meaningful questions about therapeutic approaches, including whether to implant cells in an undifferentiated state or a differentiated state, and which of the various sources of stem cells are best suited to address a specific clinical need. It may become apparent that combined stem cell therapies with other treatments may increase therapeutic options in the future. In conclusion, stem cells offer exciting promise for future therapies, but significant technical hurdles remain that will only be overcome through years of intensive research.

Reference

1. Mimeault M, Hauke R, Batra SK (2007) Stem cells: a revolution in therapeutics-recent advances in stem cell biology and their therapeutic applications in regenerative medicine and cancer therapies. Clin Pharmacol Ther 82: 252-264.
2. Perry AR, Linch DC (1996) The history of bone-marrow transplantation. Blood Rev 10: 215-219.
3. Wright BL, Barker RA (2007) Established and emerging therapies for Huntington's disease. Curr Mol Med 7: 579-587.
4. Liras A (2010) Future research and therapeutic applications of human stem cells: general, regulatory, and bioethical aspects. J Transl Med 8: 131.
5. Khan Z, Tiwari RP, Khan N, Prasad GB, Bisen PS (2012) Induction of apoptosis and sensitization of head and neck squamous carcinoma cells to cisplatin by targeting survivin gene expression. Curr Gene Ther 12: 444-453.
6. Weissman I (2005) Stem cell research: paths to cancer therapies and regenerative medicine. JAMA 294: 1359-1366.

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