Human body is a perfect machine, which is preprogrammed to expire automatically, probably because it also has the unique property of reproducing a new one which can replace it. During the lifetime it faces wear and tear which needs to be repaired. For that purpose human being is gifted with stem cells which persist even during adult life and are capable of regenerating tissue loss e.g. epithelial cells on the skin, and lining gastrointestinal tract, various component of blood cells are replaced continuously. A new branch of medicine called Regenerative Medicine has now emerged and it is thought that cell based therapy will soon replace pharmacotherapy. Regenerative medicine will result in extended healthy lifespans, as we will be able to repair some of the damage caused by aging, organ by organ. Aging damages every part of our bodies, however - including our stem cells! Until we can address the root causes of age-related degeneration, we must learn how to regenerate every part of the human body. Its time that clinicians start becoming familiar with this new branch of medicine.

Basic human instinct inspires him to try maximum for his survival. Emerging genomics technology will allow individuals to establish personalized programs, while early detection of heart disease and cancer will contribute to longevity. Biotechnological therapies involving stem cells, recombinant DNA, proteomics, therapeutic cloning and gene-based therapies are expected to play major roles in promoting successful aging. We are at the threshold of artificial intelligence (AI) and nanotechnology (NT).1

All of the most impressive demonstrations of regenerative medicine since 2002 have used embryonic and adult stem cells to trigger healing in the patient. A great deal of press attention, for example, has been given to successes in alleviating life-threatening heart conditions in Japan, the US, South America, and Germany. Stem cells are unprogrammed cells (primal undifferentiated cells) in the human body that can continue dividing forever and can change into other types of cells. They have following peculiar characteristics viz - They are capable of dividing and renewing themselves for long periods. They are unspecialized cells that renew themselves for long periods through cell division and under certain physiologic or experimental conditions, they can be induced to become cells with special functions. Stem cells are either Human or Animal and Embryonic or Adult. Embryonic stem cells are derived from inner cell mass (ICM) of embryos that develop from eggs that have been fertilized in vitro and then donated for research purposes. An adult stem cell is an undifferentiated cell found among differentiated cells in a tissue or organ, can renew itself, and can differentiate to yield the major specialized cell types of the tissue or organ. It was not until the 1990s that scientists agreed that the adult brain does contain stem cells that are able to generate the brain’s three major cell types—astrocytes and oligodendrocytes, which are non-neuronal cells, and neurons, or nerve cells. Adult stem cells typically generate the cell types of the tissue in which they reside. However, a number of experiments over the last several years have raised the possibility that stem cells from one tissue may be able to give rise to cell types of a completely different tissue, a phenomenon known as plasticity. Certain kinds of adult stem cells seem to have the ability to differentiate into a number of different cell types, given the right conditions. If this differentiation of adult stem cells can be controlled in the laboratory, these cells may become the basis of therapies for many serious common diseases. Stem cells make it possible to treat patients by transplanting specialized healthy cells produced from them to repair damaged and diseased body parts. This concept is known as “stem cell therapy”.2 Hematopoietic stem cells may differentiate into: three major types of brain cells (neurons, oligodendrocytes, and astrocytes); skeletal muscle cells; cardiac muscle cells; and liver cells. Bone marrow stromal cells may differentiate into: cardiac muscle cells and skeletal muscle cells. Brain stem cells may differentiate into: blood cells and skeletal muscle cells. Current research is aimed at determining the mechanisms that underlie adult stem cell plasticity. If such mechanisms can be identified and controlled, existing stem cells from a healthy tissue might be induced to repopulate and repair a diseased tissue.

The sources of adult stem cells are Bone marrow – Bone marrow contains a complex assortment of progenitor cells, including hemopoetic stem cells (HSC); side population (SP) cells, defined by their ability to expel a Hoechst dye, which account for most if not all long-term self-renewal3 and reconstitute the full panoply of hematopoietic lineages after single-cell grafting; mesenchymal stem cells or stromal cells; and multipotential adult progenitor cells (MAPCs), a subset of mesenchymal stem cells (MSCs),6 Umbilical cord and Peripheral blood – hematopoetic stem cells.

Currently stem cell therapy is now evolving practice it has been tried for variety of human diseases. In Cardiology for regeneration of cardiac tissue after myocardial infarct and it is often bone marrow which is, at present, the most frequent source of cells used for clinical cardiac repair. Stefanie Dimmeler has reviewed multiple human studies on stem cell therapy in cardiac regeneration.7 In Neurology now Stem cell therapy for diseases like Parkinsons,8 Huntingtons9 and Stroke10 have been extensively reviewed and is near certain to emerge replacing current therapy. In Spinal cord injury following successful animal experiment case report of improvement after stem cell therapy in spinal cord injured patient has been reported. In Burgers Disease Korean scientists have used stem cell therapy and demonstrated...
symptomatic improvement in patients. In Diabetes use of stem cell therapy for treatment of diabetes in humans is restricted to anecdotal unpublished evidence of data from All India Institute of Medical Sciences though looks a distant and still needs a long way to go.

There is a lot of confusion surrounding use of the term “cloning,” which essentially means “copying,” and in this context, “making an identical (or near identical) genetic copy.” The subject of cloning became a matter of public debate and concern after the announcement of the cloning of Dolly the sheep in 1997. The public was concerned that human beings would be cloned for inappropriate purposes. The different methods of cloning are namely Somatic cell nuclear transplant (SCNT) involves the fusion of a somatic cell with an enucleated egg, or the transfer of a nucleus of a somatic cell into an enucleated egg. The somatic cell and egg may be from different individuals or from the same individual. Human embryos can be cloned by a process much less controversial than SCNT. Another cloning type is Reproductive Cloning in which cloning is done by nuclear transfer from a differentiated somatic cell, although conceptualized and developed in other species over decades of research, became a reality in mammals in 1997. The 1997 report describing the cloning, by SCNT, and the apparently normal birth of Dolly had an enormous impact on the scientific community. Other mammalian species including mice, cattle, cats and monkeys have since been cloned. Korean scientists and scientists at Advanced Cell Technologies have claimed to have cloned human embryos, but their work has been met with skepticism amongst many scientists and now is clouded with plagiarism. While there are some who find the theoretical possibility of human cloning acceptable, the vast majority of commentators consider human reproductive cloning to be unethical – mainly on the basis that it is somehow contrary to human dignity. At the international level, the United Nations has recently taken steps to draft an international treaty that would ban human reproductive cloning. Therapeutic Cloning is now emerging where SCNT is initiated without the intention of implanting the blastocyst in a uterus, it has been termed “therapeutic cloning.” Therapeutic cloning is simply used to create a blastocyst that provides a source from which ESCs can be extracted and cell lines created for research. One possible application of ESCs is to use them to make cells, tissues and/or organs that can be transplanted back into the same person who donated the somatic cell nucleus. This technology is important because it may provide a solution to the significant problem of shortage of organs for transplantation and of the rejection of transplanted organs and tissues by the recipient’s immune system. Essentially a transplant of this type is an “autotransplant.” The process of obtaining ESCs from the inner cell mass effectively destroys the embryo. In this context, the word “destroy” is emotive; some prefer to use the term “disaggregate.” If it were possible that embryonic stem cells could be obtained without having to disrupt embryonic development, much of the current controversy would dissipate. This is not currently possible.

The real Issues Relevant to Stem Cell Law and Policy need also to be understood like Section 3(3)(d) of the UK Human Fertilisation and Embryology Act expressly prohibits one type of cloning technique, namely the nuclear substitution of any cell whilst it forms part of an embryo. Furthermore, section 3(1) of the Act requires that a licence be obtained from the Authority for any creation, use or storage of a human embryo outside the body. Damaging legislation has been adopted in many countries, including the US, scaring away private funding and slowing or stopping this vital medical research. Because the most promising regenerative science uses embryonic stem cells, this research has become mired in the same mud that clogs the abortion debate. Additionally, the scientific methodology known as “therapeutic cloning” or “somatic cell nuclear transfer” (SCNT) has come under attack for a variety of political reasons, largely stemming from confusion with reproductive cloning (a completely separate technology that uses some shared methods). The US has also attempted to push for a global ban on therapeutic cloning (and thus on much of the most promising stem cell medicine) at the United Nations - fortunately, this initiative was defeated in late 2004.

All told, these tasks will prove to be a mammoth undertaking. Nonetheless, like all great advances in medicine, it is a worthy, noble cause. Today, hundreds of millions of people live in pain and suffering - and will eventually die as a result of degenerative conditions of aging. The situation is not much better in most other Western countries around the world. Stem cell research that will lead to cures for a wide array of conditions and diseases is being stifled. We are responsible for our own future health, and this responsibility extends to telling our elected representatives that what they need to be more proactive. It will lead to millions of completely avoidable deaths as the years of delay and legislative battles pass by. Embryonic and adult stem cells appear to have different effects, limitations and abilities. The current scientific consensus is that adult stem cells are limited in their utility, and that both embryonic and adult stem cell research will be required to develop cures for severe and degenerative diseases. India like many Asian countries like Korea and China via its own Department of Biotechnology has a more pragmatic and open approach. However Asian scientists including Indians will need to uphold strict balance of high quality science with top research integrity. This an ideal opportunity for clinical and basic scientists to collaborate to change the therapeutic paradigm from drug therapy to cell based therapy.

**References**