

Stem Cell Therapy:

What are stem cells?

Stem cells are basic unspecialized cells present in human body with remarkable capacity to renew. They differentiate and develop into desired tissue or organ, thus help in curing variety of fatal and non-fatal diseases such as cancer, Parkinson's disease, spinal cord injuries, multiple sclerosis, and muscle damage.

Stem cells show potential for many different areas of health and medical research, and studying them can help us understand how they transform into the dazzling array of specialized cells that make us what we are. Some of the most serious medical conditions, such as cancer and birth defects, are caused by problems that occur somewhere in this process. A better understanding of normal cell development will allow us to understand and perhaps correct the errors that cause these medical conditions.

Stem Cells and Diseases

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Another potential application of stem cells is making cells and tissues for medical therapies. Today, donated organs and tissues are often used to replace those that are diseased or destroyed. Unfortunately, the number of people needing a transplant far exceeds the number of organs available for transplantation. Pluripotent stem cells offer the possibility of a renewable source of replacement cells and tissues to treat a myriad of diseases, conditions, and disabilities including Parkinson's disease, amyotrophic lateral sclerosis, spinal cord injury, burns, heart disease, diabetes, and arthritis.

Hematopoietic Stem Cells

These are mostly present in bone marrow, peripheral blood, cord blood, etc. They are blood forming cells and completely repair and regenerate the damaged tissue or organ.

Mesenchymal Stem Cells

These are mostly found in adipose/liver/ lung/ foetal tissue, Umbilical cord, placenta, amniotic fluid, peripheral blood and even in deciduous teeth. They are extensively used in gene therapy due to their high proliferation potential.

Sources of Stem Cells:

- Embryonic Stem Cells
- Umbilical Cord Stem Cells
- Adult Stem Cells

Embryonic Stem Cells

- Derived from blastocytes
- Most primitive and best source
- Numerous ethical and legal issues
- Possibility of some unwanted side effects and malignancies
- Readily available source
- Rich source of stem cells
- Decrease risk of viral infection
- Ease of collection
- Donor patient match 100% higher
- Highly proliferative
- Lower risk and severity of graft versus host disease in HLA match and unmatched recipients
- Have not developed ABO and HLA antigens so do not induce graft versus host reactions

Adult Stem Cells

Bone Marrow

- Most widely used transplants
- Bone marrow transplants into cancer patients to fight cancer
- Less preferred to umbilical cord as they may carry dormant viruses
- MSC population in scarce
- Significant drop in proliferative capacity with age

Blood Stream

- Stem Cells are collected by 'apheresis' with cell separator
- Generally for cell use (autologous)
- Lengthy procedure and low cell yield.
- Less plastic so homing and engraftment is a problem

Adult Tissue

- Stem cells can be collected from skin/ cornea/ fat/ teeth/ small intestine/ liver
- Gaining popularity
- Can be genetically modified
- Generally use for Self (autologous)

How Stem Cells work?

Stem cells divide and renew at will, thus replicate and proliferate to form a desired tissue or migrate to damaged area or site of injury.

Stem cells show

- Plasticity i.e. ability to generate into completely different tissue
- Homing i.e. get attracted to site of injury
- Engraftment i.e. ability to unite with other tissue

Benefits of Stem cells

- Non toxic
- Devoid of side effects
- Low treatment cost
- Promote longer lives
- Potential to cure many diseases

Treatable Diseases

Vascular Disorders

- Chronic Heart Failure
- Acute Myocardial Infarction
- Cardiomyopathy
- Buerger's Disease
- Peripheral Vascular Disease

Liver Disorders

- Liver Cirrhosis

Bone and Cartilage Disorders

- Osteoarthritis
- Non-healing fractures

Neuro-Muscular Disorders

- Cerebral Palsy
- Multiple Sclerosis
- Parkinson's Disease
- Spinal Cord Injury
- Stroke
- Alzheimer's Disease
- Muscular Dystrophy
- Spinal Muscular Atrophy
- ALS
- Autism

Haematological Disorders

- Acute Leukemias
- Chronic Leukemias
- Myelodysplastic Syndromes
- Marrow Failure
- Thalassemia
- Myeloproliferative Disorders
- Lymphoproliferative Disorders

- Inherited Immune System Disorders
- Plasma Cell Disorders
- Other Malignancies

Diabetes, Anti ageing, Eye Disorders, cancers are also curable to the extent by stem cell Therapy.