

## Stem Cells - The Future of Therapeutics

--Probal Kr. Chowdhury, Assist. Professor, Dept. of  
Botany, Govt. Degree College, Dharmanagar

Days are not so far when you visit a dentist and the doc ask you “well you have to extract your decayed teeth but don’t worry I will make an arrangement to regrow a new original teeth there”. Is not it looking funny? But the concept that I am discussing is a challenging and interesting issue in contemporary Biological science. I am talking about Stem cell and stem cell research. Stem cells are a population of cells that have the capacity to self-renew as well as the ability to generate more differentiated progeny of cells. It means that these are group of cells that have the potential to divide and also can acquire specific function. These cells can divide and re-divide to maintain the population of stem cells or it can transform to a tissue specific cell that bears the function of cells of that organ tissue or in simple words stem cells can generate a new organ in animals. Thus these cells have the ability to develop an organ and actually it happens normally in embryonic stage from where all the organs of our body develop. So researchers thought that whether from stem cells can we develop entire human organ? If this is possible then there will be drastic change in medical science and a person with a damaged body organ or tissue can get replacement for it. The research started extensively in this field to achieve such novel goal.

Then question comes where does these Stem cells are available? These cells are primarily found in embryonic stage of human beings and also in adult’s bone marrow, adipose tissue cells, spleen etc. Based on their origin stem cells are of two different types namely, *Embryonic stem cells* which are found in mammalian embryos only and another type is *Adult stem cells* which are available in adult mammalian organs like spleen and bone marrow. Embryonic stem cells divides and differentiate to form organs for developing baby whereas adult stem cells have the repair and maintenance function for damaged or injured organ tissues. Recently umbilical cord blood is preserved as it contains the embryonic stem cells which can be used in future for that baby. Now let us know what are the characteristics of stem cells that differentiate it from other cells? First, they are unspecialized cells capable of renewing themselves through cell division, sometimes after long periods of inactivity. Second, under certain physiologic or experimental conditions, they can be induced to become tissue- or organ-specific cells with special functions. In some organs, such as the gut and bone marrow, stem cells regularly divide to repair and replace worn out or damaged tissues. In other organs, however, such as the pancreas and the heart, stem cells only divide under special conditions.

Stem cells are being considered for a wide variety of medical procedures, ranging from cancer treatment to heart disease and cell-based therapies for tissue replacement. Thus stem cells accessed from the sources like bone marrow and umbilical cord blood is used for therapeutic purposes. Stem cells can now be artificially grown and transformed (differentiated) into specialized cell types with characteristics consistent with cells of various tissues such as muscles or nerves through cell culture. Embryonic cell lines and autologous embryonic stem cells generated through therapeutic cloning have also been proposed as promising candidates for future therapies. Recently a *stem cell gel* developed by scientists can regenerate broken spinal cord nerves. The gel is applied to the site of spinal cord injury in rats and it produced astonishing

result with regeneration and growth of nerve cells. Animals treated with this gel which were previously paralysed experienced significant functional improvement and were able to move all the joints of their affected legs. Researches are going on to treat diseases with stem cells like *Parkinson's disease, stroke, epilepsy, diabetes, blood cancer, spinal cord injuries, heart disorders, deafness, thalassemia* are a few to be mentioned. The basic principle for such treatment is to introduce stem cells taken from the patient body (autologous stem cells) to the affected site and to regenerate or replace the damaged cells or tissues from the stem cells introduced by using the property of stem cells to regenerate and differentiate into organ tissues. Considerable success rates have been achieved in these areas but there are some ethical issues that are being addressed during the research and development of stem cell. Recently stem cell banks are emerging which stores human stem cells from umbilical cord blood, adipose tissue cells and from other sources for future therapeutic use. Thus, in the limited arena of this page it can be possible to say now that stem cell research is the future of medicine and is a fast growing field with huge potential to contribute in healing the medical problems of human beings.

[ *The author used books and various websites related to stem cell biology as reference* ]