Potential Of Stem Cell Research

A single human body has roughly around 200 different types of cells which are organised into organs and tissues to provide certain required functions around the body such as reproduction. There are various ways where stem cell has potential use for example, through research and clinic. The aim is to analyse how certain undifferentiated stem cells become differentiated cells that form the structures of tissues and organs. Furthermore, scientist noticed that turning a series of genes on and off is the central process. For instance, serious medical condition like cancer and birth defects are the outcome from abnormal cell division or differentiation. Therefore, providing an integral understanding of the genetic and molecular regulation of these processes would gain increase of information about certain diseases and advocate new approach of therapy. Early stem cell research provides three different types of tissues: for instance, epidermis which consist of rapid turnover of differentiated cells for example, the brain. Another example is the liver which cells are divided to produce two daughter cells that has equivalent functions (Hall and Watt 1989). Stem cells potential took its time to become an established research field because scientist took highly excessive amount of time and energy in trying to characterise stem cells and dispute if a distinct cell was truly a stem cell (Watt, 1999).

One of the oldest stem cell therapy and most widely available use for treatment is Haemopoietic stem cell transplantation (Perry and Linch, 1996). It works by stem cells from the bone marrow, cord blood or peripheral blood is engrafted on the patient's own cells. Two substantial benefit of Haemopoietic stem cell therapy, there is no need to expand the cells in culture. Similarly, the use of limbal stem cells have been used successfully to retrieve vision from patients suffering from due to chemical destruction of the cornea (De Luca et al, 2006). Nevertheless, a new method called allogenic stem cell transplantation is now more common for treating bone marrow failure and haematological malignancies such as leukaemia. Another procedure is where scientist use donor stem cells to fix up in patients that underwent radiation and/or chemotherapy. In the UK, the scheme that's been delegated specifically for bone marrow transplantation has expanded which covers the use of other organs and tissues (Austin et al, 2008). Studies over the past couple of decades propose that stem cells transplantation can also be helpful as a method therapy for neurodegenerative diseases. Clinical trials have devised a method using graft brain tissues from aborted foetuses into patients with Parkinson's disease and Huntingdon's disease (Wright and Barker, 2007). Stem cells therapies can also be referenced to gene therapy. There has been some interesting case where gene and stem cell therapy are combined. For example, a patient suffering due to an epidermal blistering received an autologous graft of cultured epidermis in which ex vivo was used in order to correct the defective gene (Mavilio et al, 2006). The procedures mentioned above are prime examples in which stem cells are used in clinical research and treatments. This suggest that stem cells provide astounding potential to treat human diseases and to reconstruct damage tissues due to injury or aging.

There has been major progress made in characterising epigenetic modifications associating with pluripotency. This area of research is rapidly increasing due to modern technology advances in DNA sequencing technology and computational biology (Mathur et al., 2008). For instance, chromatin immunoprecipitation with the supplement of DNA sequencing is used to analyse transcription factor-binding sites and techniques such as bioinformatics has been established to strengthened the data obtain by the different approaches. Furthermore, there is a substantial interest on how pluripotency is transformed in adult stem cells. The reason behind this is that certain cells are more promptly to be reprogrammed into Induce Pluripotent stem cells (iPS) than others (Aasen et al., 2008). Furthermore, by comparing each transcriptional profiles of ES cells, neural and haemopoietic stem cells allowed scientist to make a comparison (Ramalho-Santos et al,.2002). For instance, by analysing the gene expression of each stem cells (ES/iPS derived and adult stem cells) and brain tumour stem cells, there is a possibility to certify the use of ES- derived stem cells to repair a brain damage and also to pinpoint the root of brain tumour initiating cells.

Moving onto the future applications of stem cell research, there is no doubt that the potential of stem cell can treat countless of human diseases, such as diabetes, cancer and neurodegeneration. However, it is still important to be practical within sight of time and the process required to allow new methods of therapies into the clinic. For example, the ability to activate ES cells to differentiate into cardiomyocytes into a culture dish. Even though it is a plausible treatment, it is still a minor step regarding effects on cardiac repair. Furthermore, there are far more treatments waiting to be unveiled and discovered in which to be used in clinical research. An example of this is the discovery on how the pluripotent state can be efficient and controlled by treating cells using pharmacologically active compound instead of using genetic manipulation is a critical objective. Moreover, recent research suggests that pancreatic exocrine cells in adult mice can be adjusted to operate more sufficiently by insulin-producing beta cells expressed from transcription factors that controls pancreatic development (Zhou et al., 2008). Also, the wide use of biomaterials is currently in clinical use to repair damage tissues specifically defects in cartilage and bones (Kamitakahara et al., 2008). Breakthroughs in tissue engineering gives rise to brand new opportunities to control and manipulate the stem niche and to facilitate differentiation of endogenous stem cells.

In conclusion, there are concrete evidence that over the next few decades our understanding regarding stem cells will radically impact and benefit the medicinal world. As well as, discovering breakthroughs the stem cell industry is interchanging and versatile. This is due to the fact that it brings together variety of researchers ranging from biological across to physical sciences which enhances a strong relationship between academics and pharmaceutical industries