Introduction and Review of Literature

Stem cells are characterized by their ability to undergo a symmetric cell division resulting in one undifferentiated daughter cell and one committed daughter cell. The undifferentiated daughter cell can maintain a population of stem cells by continual self renewal. Stem cells are characterized according to their plasticity, or number of different cell types they can become ***(Mezey et al., 2003).***

Regenerative medicine applies the basic stem cell knowledge to develop specific cell or tissue to replace the original cell or tissue which have been degenerated, injured or damaged by different processes. This is the basic concept of the promising cell and tissue based therapy that would have a potential to make many chronic diseases to be curable such as diabetes mellitus type one, myocardial infarction and others ***(Seale et al., 2006).***

Stem cells have been viewed as a potential source of cells for any tissue due to their supposed capacity to give rise to virtually any type of cells. Among stem cells, stromal stem cells can be obtained from the bone marrow and induced to undergo differentiation to a variety of adult tissues. These cells have been indicated as mesenchymal stem cells (MSCs) which can proliferate extensively in vitro, and differentiate under appropriate conditions into bone, cartilage, and other mesenchymal tissues ***(Brazelton, 2000).*** In the nervous tissue upon its injury, MSCs have been shown to

migrate to the damaged brain, where they could provide an ideal cell source for repair of injured organs including the central nervous system (CNS) ***(Li et al., 2002)***.

Mesenchymal stem cells have an important role in regenerative processes of human tissues. Cells phenotypically identical to MSCs had been found circulating in physiological number in normal subjects, but in significantly higher amounts during acute injury. MSCs have therapeutic agents to treat a broad spectrum of diseases, including spinal cord injury ***(McDonald et al., 1999)***, stroke ***(Jin et al., 2001)*** and myocardial infarction ***(Toma et al., 2001 and Beltrami et al., 2003)***.

Encephalomyelitis is a general term for inflammation of the brain and spinal cord, describing a number of disorders, and was used as an animal model of Multiple sclerosis (MS) ***(Poser, 1994).*** MS is an inflammatory demyelinating and neurodegenerative disease of the CNS. It is the most common demyelinating disease in young adults ***(Bjartmar and Trapp, 2001)***. The onset of MS typically occurs in people in their 20 and 30 years and is the principle cause of non-traumatic neurological disability in young adults. MS affects over two million people worldwide, with women being affected twice as frequently as men ***(Keegan and Noseworthy, 2002).***

Available methods for the treatment of MS are only partially effective, due to inadequate control of self-reactive lymphocytes in one hand and ineffective remyelinating regenerating mechanisms in the other hand, which results in cumulative disability and irreversible axonal/neuronal damage ***(Steinman, 2001 and Karussis et al., 2006).***