INTRODUCTION

Within just a few years, the possibility that the human body contains cells that can repair and regenerate damaged and diseased tissues have gone from unlikely proposition to a virtual certainty. Adult stem cell (SC) have been isolated from numerous adult tissues. Umbilical cord, and other non embryonic sources, have demonstrated a surprising ability for transformation into other tissues and cell types for repair of damaged tissues. The term adult stem cell is misnomer; because the cells are present even in infant and similar cells exist in umbilical cord and placenta. So more accurate terms have been proposed, such as tissue SC, somatic SC, or postnatal SC however became of common usage ***(Monitoring stem cell research January, 2004).***

During the last decade, there has been a new developing medical science; *Regenerative Medicine*. 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 "curable" such as diabetes mellitus type one, myocardial infarction and others. ***(Seale et al., 2006).***

The concept of "stem cell" is linked with growth via the multiplication rather than the enlargement of cells. Various schemes for classifying tissues according to their mode of growth have been proposed, one of the earliest of which is that of ***Bizzozero (1894).*** This classification, which relates to the situation in the adult rather than in the embryo, recognizes three basic types of tissues: renewing, expanding, and static. Obvious examples of the first are intestinal epithelium and skin, and of the second, liver. The third category was held to include the central nervous system, although recent studies have shown that neurogenesis does continue in adulthood, for example, with regard to production of neurons that migrate to the olfactory bulbs ***(Gage, 2000).*** There are various problems with such schemes of classification including, for instance, assignment of organs like the mammary gland which, depending on the circumstances of the individual, may engage in one or more cycles of marked growth, differentiation, and subsequent involution. Nonetheless, certain attributes can be assigned to particular cells in both developing and adult multicellular organisms that serve to distinguish stem cells from the remaining cells of the tissues to which they belong. Most obviously, these cells retain the capacity to self-renew as well as to produce progeny that are more restricted in both mitotic

potential and in the range of distinct types of differentiated cells to which they can give rise. However, kinetic studies support the notion that in many tissues a further subpopulation of cells with a limited and, in some cases, strictly circumscribed self-renewal capacity, so-called "*transit amplifying*" cells, can stand between true stem cells and their differentiated derivatives. This mode of cell production has the virtue of limiting the total number of division cycles in which stem cells have to engage during the life of an organism. Unlimited capacity for self-renewal is therefore not normally demanded of stem cells in vivo and, indeed, in practice, the distinction between stem and transit amplifying cell may be difficult to make. "Stem cell" like many other terms in biology, has been used in more than one context since its initial appearance in the literature during the 19th century ***(Gage, 2000).***

Definition of stem cell

To define a cell as stem cell, scientists have used four criteria. *First*, stem cell undergoes multiple, sequential self renewing cell division, a prerequisite for sustaining the population. *Second*, single stem cell derived daughter cells differentiate into more than one cell type. Examples include hematopoietic cells (HSC) that give rise to all hematopoietic cells, Neural stem cells (NSC) that give rise to neurons, astrocytes, oligodenrocytes, and mesenchymal stem cells that differentiate into fibroblast, osteoblast and chondroblast. Some adult stem cells may give

rise to only a single mature cell type, such as the corneal stem cell. *Third*, stem cell functionally repopulates the tissue of origin when transplanted in damaged recipient, which has been shown extensively for HSC and more recently for liver progenitors and NSC. *Fourth*, less well established, is that stem cell contributes differentiated progeny in vivo even in the absence of tissue damage ***(Catherine et al., 2002).***