

## Stem cells : Prospectus and future

N.S. SONAWANE, M. S. LOTANKAR, M.O.LOKHANDE AND B.A.AGLAVE

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### Key words :

**M**orph into virtually every kind of tissue, including nerves to replace those destroyed by spinal injuries and cardiac muscle to fill in for cells lost in a heart attack. Scientists see as the key to a new era of regenerative medicine.

This is the saga of the stem cells.

Research on stem cells advancing knowledge about how an organism develops from a single & how healthy cells replace damaged cells in adult organism. This promising area of science is also leading scientists to investigate the possibility of cell-based therapies to treat disease, which is often referred as regenerative/reparative medicine.

Stem cells are one of the most fascinating areas of the biology today. These have two important characteristics that distinguish them from other types of cells:

- they are unspecialized cells that renew themselves for long periods through cell division
- under certain physiological/experimental conditions, they can be induced to become cells with special functions such as beating cells of heart muscle/insulin producing cells of the pancreas.

Scientists discovered ways to derive stem cells from early mouse embryos more than 20 yrs ago. Many years of detailed study of the biology of mouse stem cells led to the discovery in 1998, of how to isolate stem cells from human embryos and grow the cells in the lab. These are called human embryonic stem cells. Research in the stem cells grew out of findings by two Canadian scientists Ernest A. McCulloch & James E. Till in the 1960s.

The two broad types of mammalian stem cells are:

- embryonic stem cells that are found in blastocysts, and
- adult stem cells that are found in adult tissues.

In a developing embryo, stem cells can differentiate into all of the specialized embryonic tissues. In adult

organisms, stem cells and progenitor cells act as a repair system for the body, replenishing specialized cells, but also maintain the normal turnover of regenerative organs, such as blood, skin or intestinal tissues.

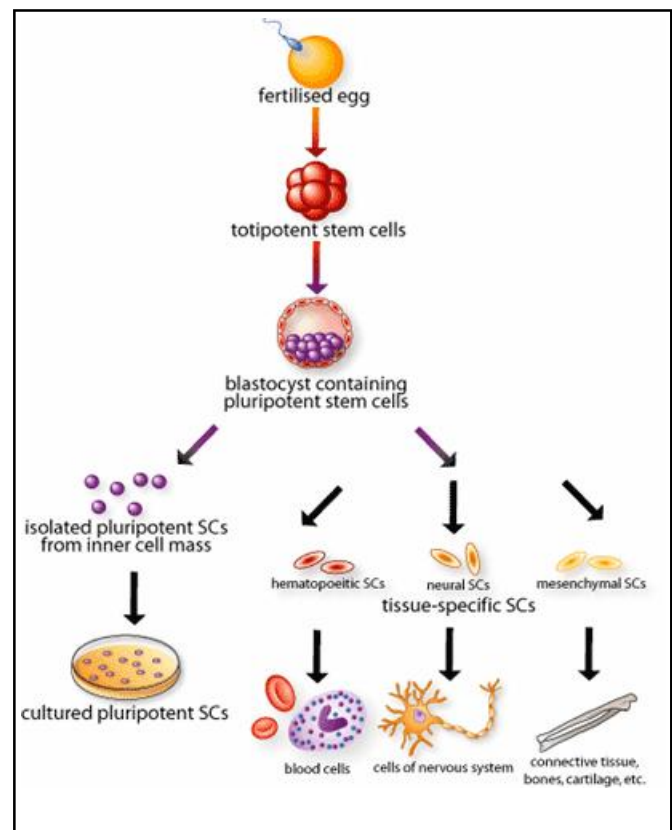
### Properties:

The classical definition of a stem cell requires that it possess two properties:

- *Self-renewal* : the ability to go through numerous cycles of cell division while maintaining the undifferentiated state.
- *Potency* : the capacity to differentiate into specialized cell types.

In the strictest sense, this requires stem cells to be either totipotent or pluripotent – to be able to give rise to any mature cell type, although multipotent or unipotent progenitor cells are sometimes referred to as stem cells.

- *Stem cells give rise to specialized cells*: when unspecialized give rise to the specialized cells, the process is called as differentiation.



### Correspondence to:

B.A. AGLAVE, Department of Biotechnology, Institute of Life Sciences, H.P.T. Arts and R.Y.K. Science College, NASHIK (M.S.) INDIA

### Authors' affiliations:

N.S. SONAWANE, M.S. LOTANKAR AND M.O. LOKHANDE, Department of Biotechnology, Institute of Life Sciences, H.P.T. Arts and R.Y.K. Science College, NASHIK (M.S.) INDIA