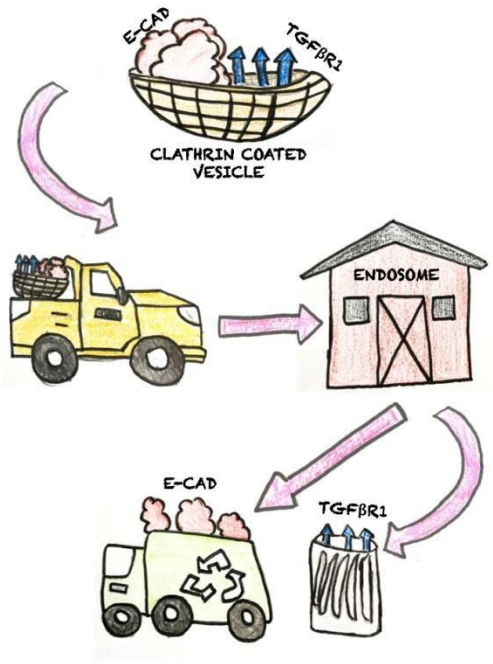
**DBT/National Centre for Cell Science (NCCS), Pune**

# NCCS researchers identify novel cellular mechanism that could aid stem cell therapy

By Sunderarajan Padmanabhan

New Delhi, February 17: Stem cells are special cells in the body that have the ability to develop into many different types of cells, from brain cells to muscle cells. Embryonic stem cells (ESCs) are derived from the early mammalian embryo. These cells possess the capacity to form all the cell types present in the organism and are said to be "pluripotent". They are therefore of great importance in the context of regenerative medicine. Cell replacement therapy is hugely dependent on stem cells. Stem cells can be differentiated into specific cell types, which can then be transferred or transplanted into patients. In order to achieve proper and complete differentiation, it is critical to understand how certain factors can regulate the fate of stem cells. Understanding how cellular processes such as endocytosis play a role in regulating the pluripotency of embryonic stem cells is important towards safer and more efficient cell-based therapies.Endocytosis is the process by which molecules are brought into the cell through specific compartments.

Research carried out at the National Centre for Cell Science (NCCS) in Pune, by Dr. Deepa Subramanyam and her group, now shows that a specific pathway regulating the movement of molecules from the membrane to within the cell, called clathrin-mediated endocytosis, is critical for maintaining the stem cell state of embryonic stem cells. A number of molecules are internalized in mouse ESCs through clathrin-mediated endocytosis. Studies at NCCS have helped identify two opposing molecules, namely E-cadherin and TGFβR1, which are both internalized, but undergo different fates in ESCs. E-cadherin, a molecule that works by promoting the adhesion of cells, is internalized via clathrin-mediated endocytosis in stem cells, followed by its recycling back to the membrane. TGFβR1 on the other hand, is a molecule that drives the differentiation of ESCs, and undergoes degradation post internalization in mouse ESCs. Loss of clathrin-mediated endocytosis was found to result in an imbalance in the signalling outputs down-stream of these two molecules, resulting in the differentiation of mouse ESCs. These studies thus highlight yet another mechanism by which the fate of embryonic stem cells can be finely regulated. These studies have relevance to stem cells-based therapy, since regulating molecular trafficking through specific endocytic pathways may present a novel method to fine-tune and improve targeted differentiation of stem cells.

| | |
|---|---|
| The molecules, E-cadherin and TGFβR1, both internalized by clathrin-mediated endocytosis, undergo different fates in ESCs. |  |

**Link related to this story -**
**Research article:** https://www.sciencedirect.com/science/article/pii/S2213671118304879

**Contact Person & Contact Details -**
**Scientist who led this research:** Dr. Deepa Subramanyam (deepa@nccs.res.in)
**Communication coordinator:** Jyoti Rao (jyoti@nccs.res.in)

---