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Research Interest

- Rapid Prototyping Technology
- Biomaterials
- Tissue Engineering
- Stem Cells
- Bioenergy
- Polymeric Composites
- Nanomaterials
- Food Technology


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Sheik Mohideen Mohamed Nainar, Shahida Begum, M. N. M. Ansari, Md. Enamul Hoque, S. Sharen Aini, M. H. Ng, B. H. I. Ruszymah. Effect of compatibilizers on in vitro biocompatibility of PLA-HA bioscaffold. Bioinspired, Biomimetic and Nanobiomaterials (Published online on 07 August 2014); DOI: 10.1680/bbn.14.00014
STEM CELLS
The body is made up of about 200 different kinds of specialised cells such as muscle cells, nerve cells, fat cells and skin cells etc.

All cells in the body come from stem cells.

A stem cell is a cell that is not yet specialised.

The process of specialisation is called differentiation.

Once the differentiation pathway of a stem cell has been decided, it can no longer become another type of cell on its own.
Why are Stem Cells Special?

Stem cells can:

- self-renew to make more stem cells
- differentiate into a specialized cell type

Stem cells that can become many types of cells in the body are called **pluripotent**

Stem cells that can become only a few types of cells are called **multipotent**

Embryonic stem cells (pluripotent)

Tissue stem cells (multipotent)
A Life Story...
Stem Cell History

1998 - Researchers first extract stem cells from human embryos

1999 - First Successful human transplant of insulin-making cells from cadavers

2001 - President Bush restricts federal funding for embryonic stem-cell research

2002 - Juvenile Diabetes Research Foundation International creates $20 million fund-raising effort to support stem-cell research

2002 - California ok stem cell research

2004 - Harvard researchers grow stem cells from embryos using private funding

2004 - Ballot measure for $3 Billion bond for stem cells
A cell that has the ability to continuously divide and differentiate (develop) into various other kind(s) of cells/tissues
# Kinds of Stem Cells

<table>
<thead>
<tr>
<th>Stem Cell Type</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totipotent</td>
<td>Each cell can develop into a new individual cell</td>
<td>Cells from early (1-3 days) embryos</td>
</tr>
<tr>
<td>Pluripotent</td>
<td>Cells can form any (over 200) cell types</td>
<td>Some cells of blastocyst (5 to 14 days)</td>
</tr>
<tr>
<td>Multipotent</td>
<td>Cells can form only a few types of cells</td>
<td>Fetal tissue, cord blood, and adult stem cells</td>
</tr>
</tbody>
</table>
This cell can form the Embryo and placenta.

This cell can just form the embryo.

Totipotent

Pluripotent

Multi-potent

Fully mature

hematopoietic SCs
neural SCs
mesenchyme

blood cells
cells of nervous system
connective tissue, bones, cartilage, etc.

tissue-specific SCs

blastocyst containing pluripotent stem cells

totipotent stem cells

fertilised egg
Kinds of Stem Cells

Embryonic stem cells
- five to six-day-old embryo
- Tabula rasa

Embryonic germ cells
- derived from the part of a human embryo or fetus that will ultimately produce eggs or sperm (gametes).

Adult stem cells
- undifferentiated cells found among specialized or differentiated cells in a tissue or organ after birth
- appear to have a more restricted ability to produce different cell types and to self-renew.
Embryonic Stem Cells

Mainly from IVF
Pluripotent Stem Cells – More potential to become any type of cell
Multipotent stem cells – limited in what the cells can become
Stages of Embryogenesis

- cleavage
- 8-cell stage
- blastocyst
- Blastocyst inner mass cells
Approved By

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