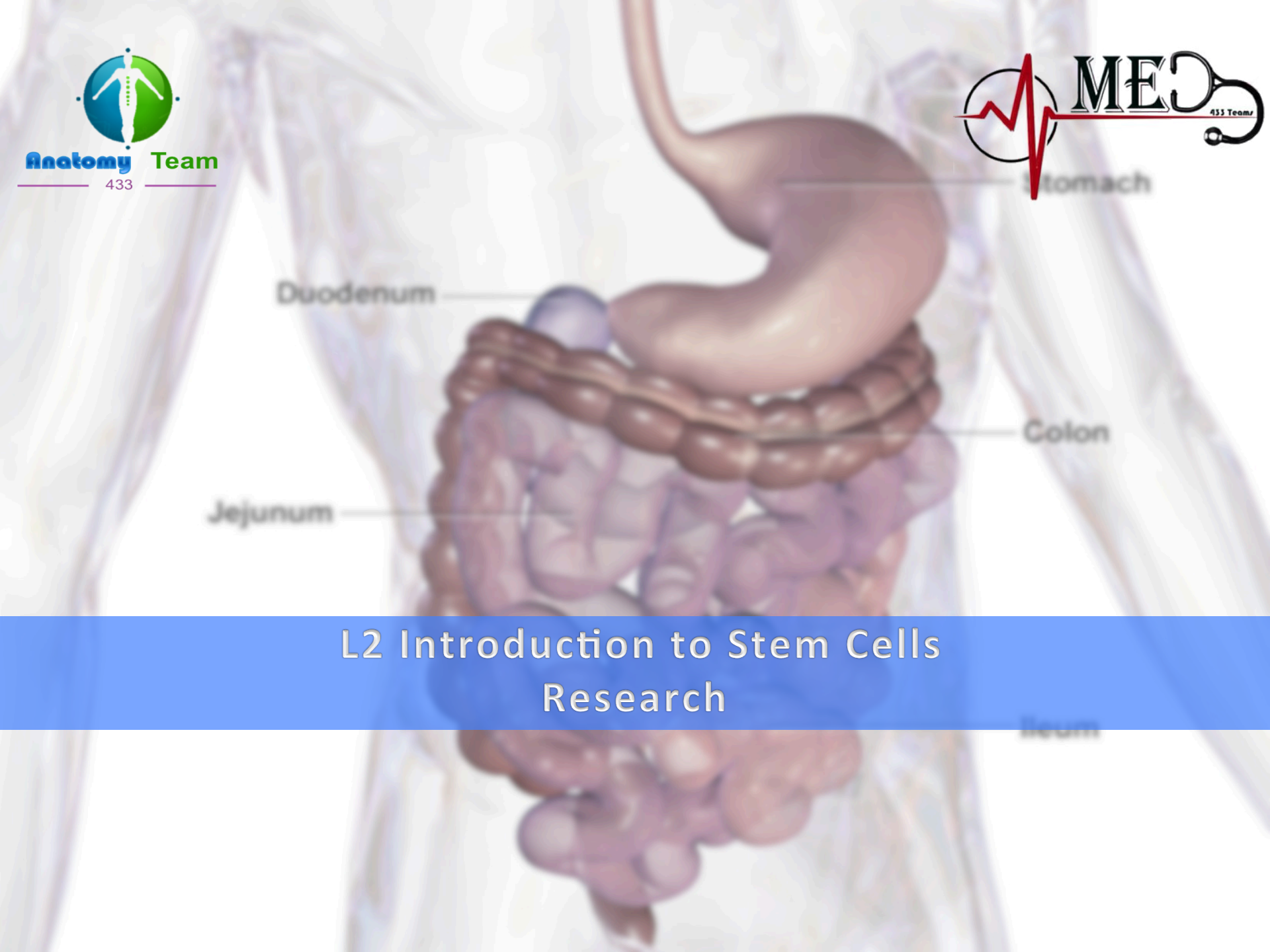
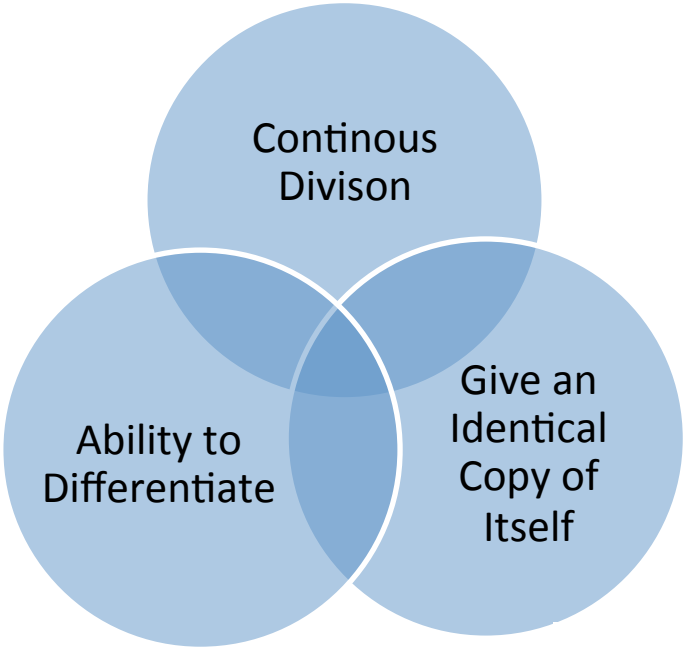
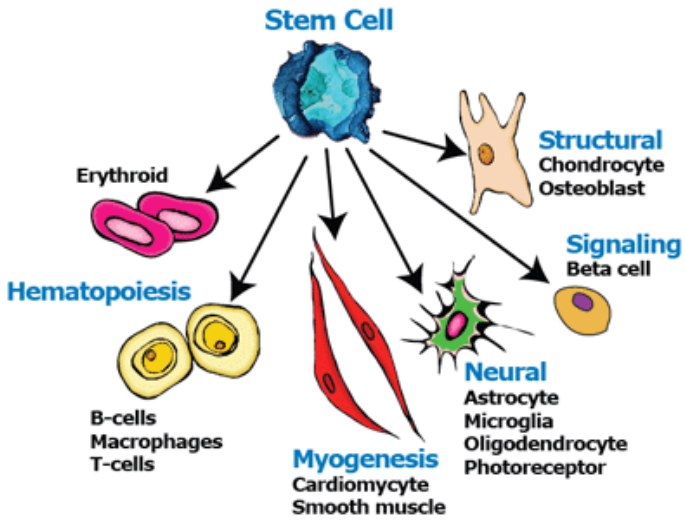


L2 Introduction to Stem Cells Research

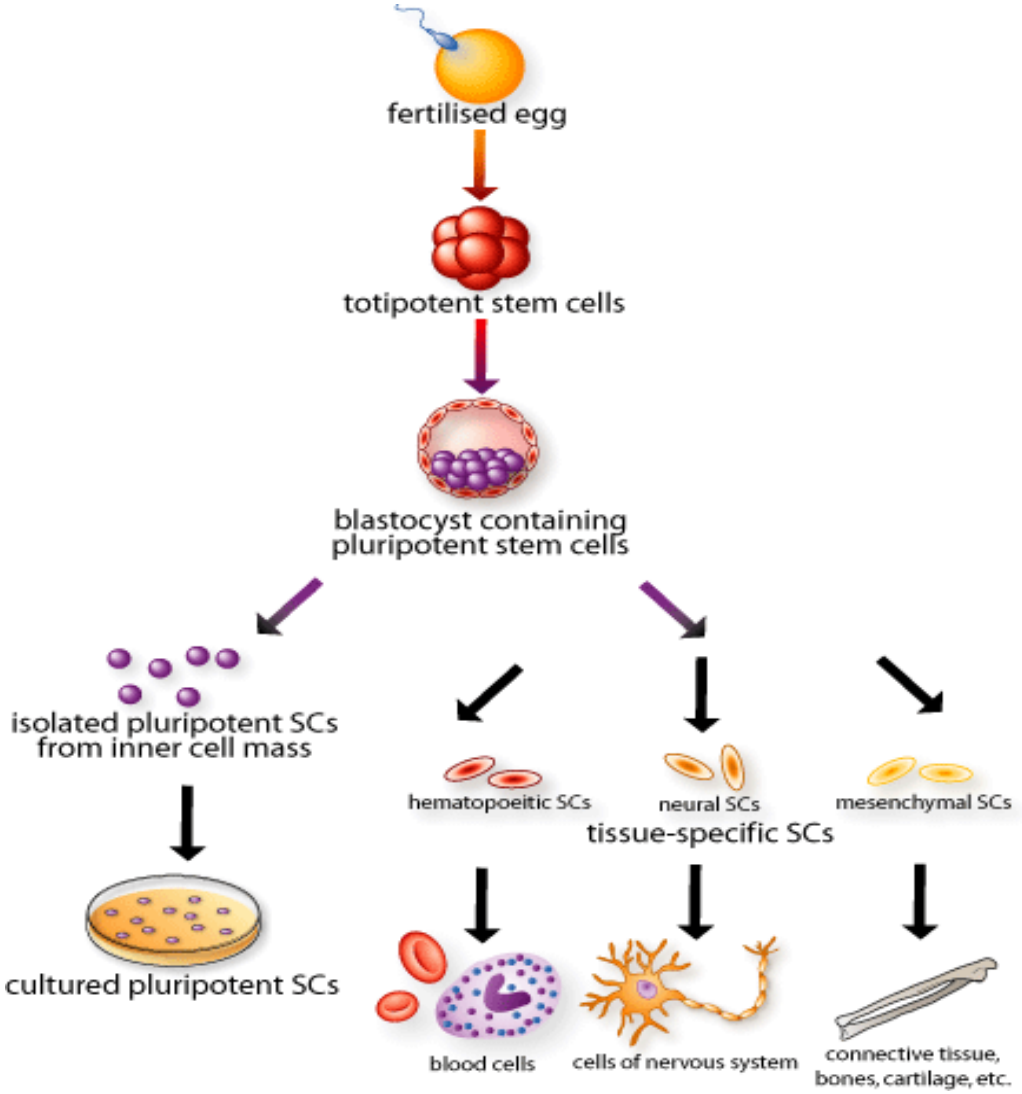
CHARACTERISTICS OF STEM CELLS



Stem cells divide to new cell that has the potential to either remain a stem cell or become another type of cell with a more specialized function as cells of the blood, heart, bones, skin, muscles, brain etc, serving as a sort of repair system for the body.



CLASSIFICATION OF STEM CELLS



CLASSIFICATION OF STEM CELLS

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Totipotent Stem Cells
Embryo &extra embryonic cell

extra embryonic cell: placenta & umbilical cord

Pluripotent Stem Cells
Embryo Only

Multipotent Stem Cells
Differentiate into related cells

Adult stem cells are multipotent

Hematopoietic SCs
Differentiate into all types of blood cells

Neural SCs
Neurons and glial cells

Mesenchymal SCs
Differentiate into Osteoblasts, Chondrocytes and Adipocytes.

cartilage – bones & connective tissue .

FULLY MATURE

Challenges in the Therapeutic applications of Stem Cells

INDUCED PLURIPOTENT STEM CELLS

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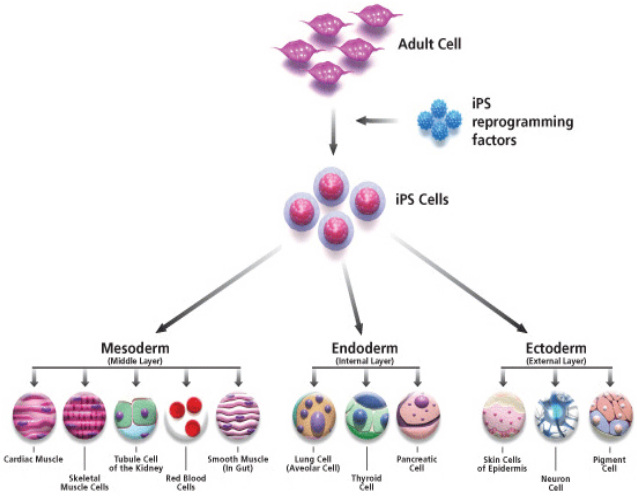
Induced pluripotent cells (iPSC), are differentiated cells taken usually from the skin and are exposed to a special mixture of:

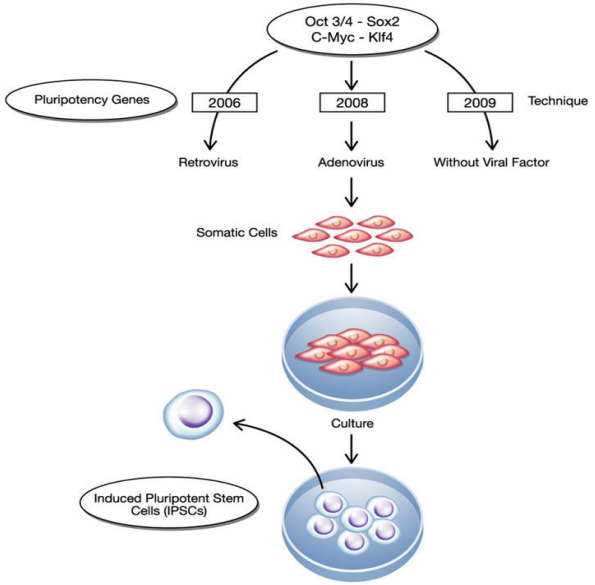
- **Chemicals**
- **Viruses that are designed to insert specific pieces of DNA inside the cells.**

The pieces of DNA inserted carry the sequences of the following four genes:

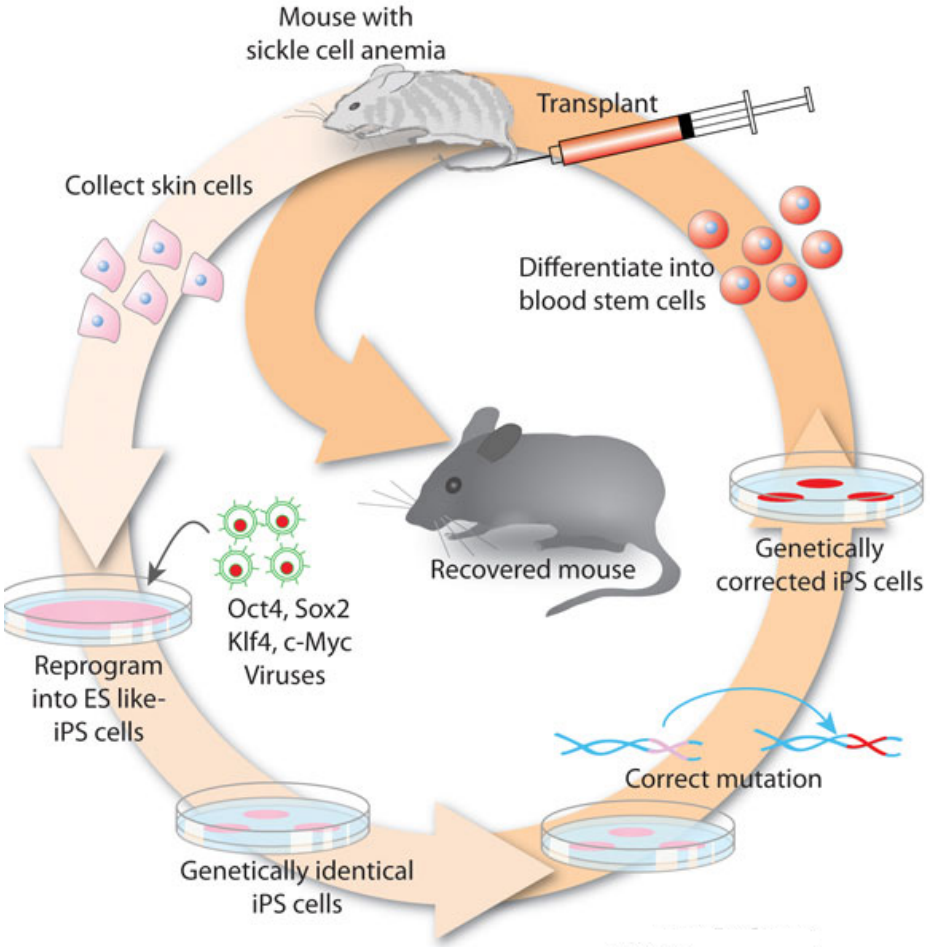
- **Oct8**
- **Sox2**
- **c-Myc**
- **Klf4**

These genes code for specific transcription factors and are already found in our genome, but are added to increase or induce their transcription. These gene then work on inducing and inhibiting other genes that cause the cell to reverse back in its lineage to its embryologic pluripotent stem cells (Dedifferentiation). These cells are then used for research mainly.





INDUCED PLURIPOTENT CELLS (IPSC)



SOURCES OF STEM CELLS

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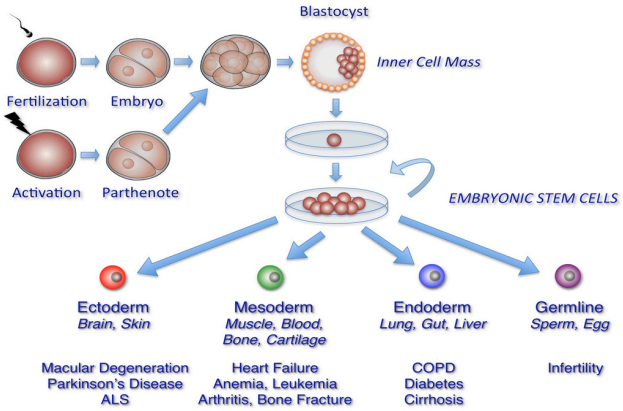


1. In Vitro Fertilization

- Produce all cell types
- Abundant in IVF clinics
- Egg can be tricked of being fertilized by an electric shock.

- Limited cell lines.
- Could produce teratomas

- Requires consent.
- Destroys Blastocyst.

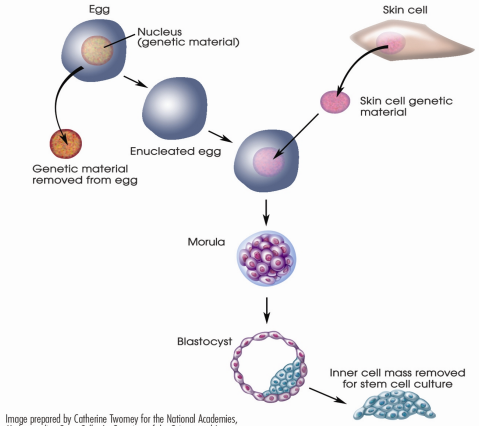


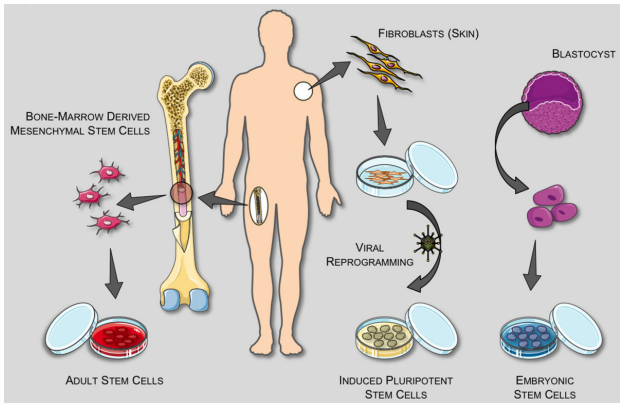
Image prepared by Catherine Twomey for the National Academies, *Understanding Stem Cells: An Overview of the Science and Issues* from the National Academies, http://www.nationalacademies.org/stemcells. Academic noncommercial use is permitted.

2. Nuclear Transfer

- Produce all cell types
- Abundant in IVF clinics
- Genetic matching to specific patients.

- Not available for Humans
- Could produce teratomas.

- Requires consent.
- Destroys Blastocyst.



3. Adult Stem Cells

- Genetic matching to patients.
- Shows promise in therapies.

- Limited cell types.
- Difficult to isolate.
- Not found in all tissues.

Advantages

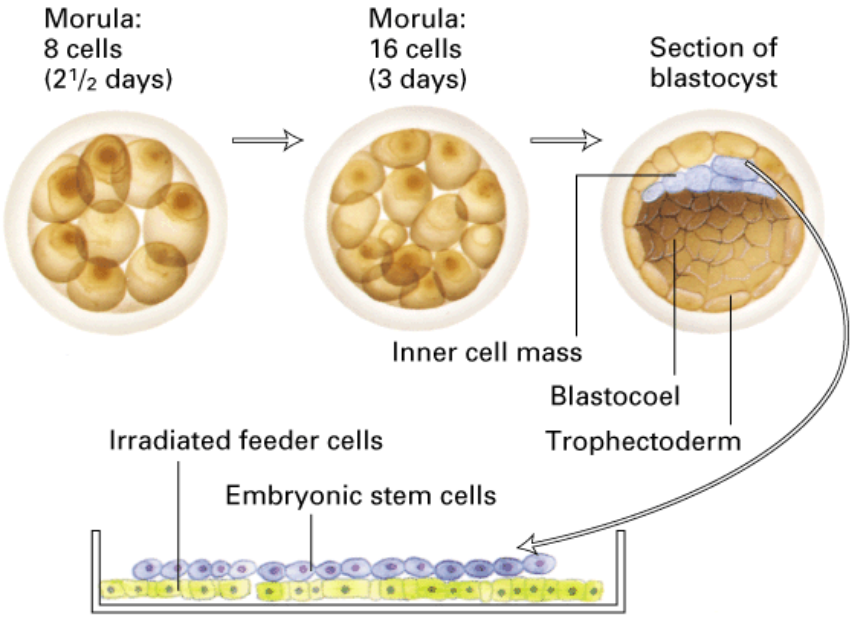
Disadvantages

Ethical Issues

CULTURING STEM CELLS IN THE LAB

- After the extraction of SCs from their site or preparing them as iPSCs, they need to be place in special medias that mimic their microenvironment. So, they are usually grown above special differentiated cells called "Feeder Cells."

Generation of embryonic stem cells



Therapy Goal

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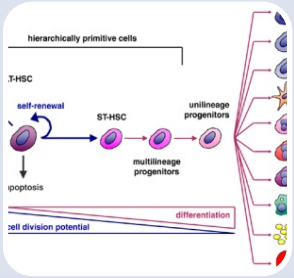
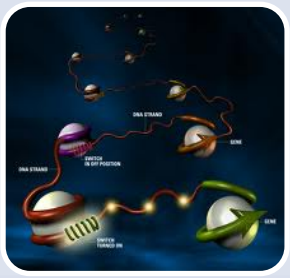
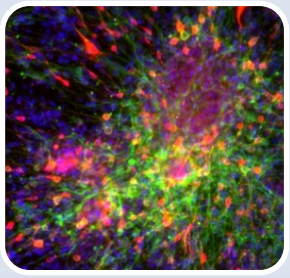
Replacing the cells of organs and tissues that cannot replace cells by its own.

Potentials of Stem Cells







Research on cell differentiation

Research on gene control

Testing Drugs on the patient's tissue

Understanding birth defects and how to prevent and treat them

Replacing lost organs or tissues

MCQs

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1. Which of the following is a source of adult stem cells?

A. Morula
B. Placenta
C. Bone Marrow
D. Nuclear Transfer

2. Which of the following can be used in therapy at the moment?

A. Embryonic stem cells
B. Hematopoietic stem cells
C. Induced pluripotent stem cells.
D. Pluripotent stem cells.

3.Which of the following is true about induced pluripotent stem cells?

A. They are obtained from IVF clinics.
B. They have shown therapeutic effects in humans.
C. They are induced by electrical shocks.
D. They are dedifferentiated cells.

4 . Totipotent stem cells gives :

A- embryo.
B- placenta.
C- brain .
D- A & B .

5.: Adult stem cells are :

A- totipotent .
B- Multipotent .
C- unipotent .
D- tripotent .

1. C 2. B 3. D 4. D 5. B

YouTube http://www.youtube.com/watch?v=i-QSurQWZo0
http://youtu.be/evH0I7Coc54

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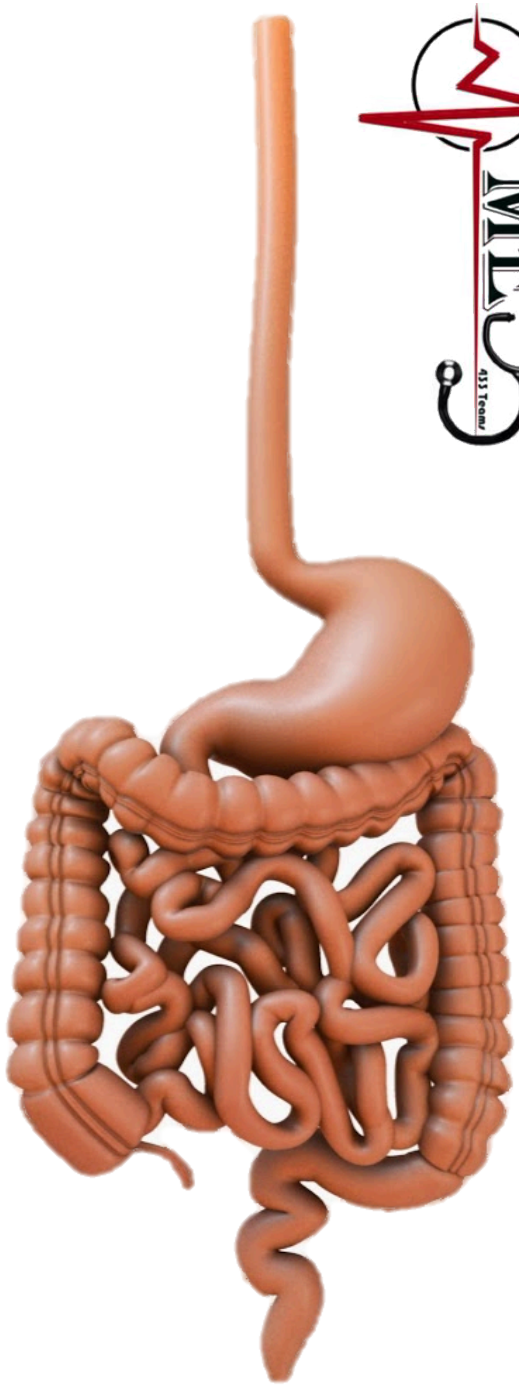
433

GOOD LUCK

DONE BY:
HUSSAIN ALSALMAN
REVISED BY:
SHAHAD ALMUHAIDEB .



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