

# STEM CELLS



# What are stem cells?

- ▣ They are special cells that have the ability to do 2 key things;
- ▣ 1) divide for indefinite periods
- ▣ 2) give rise to specialized cells (muscle cells, red blood cells, brain cells)

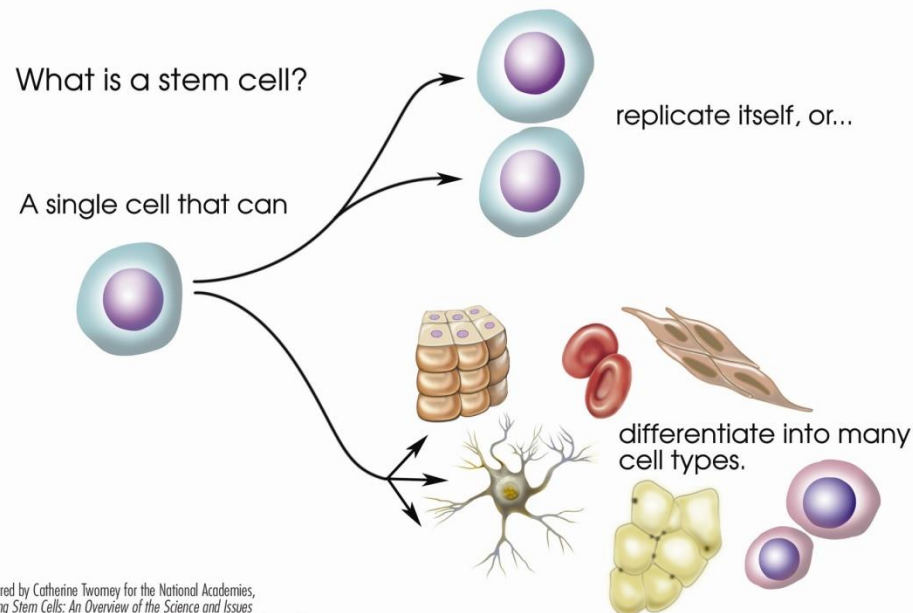
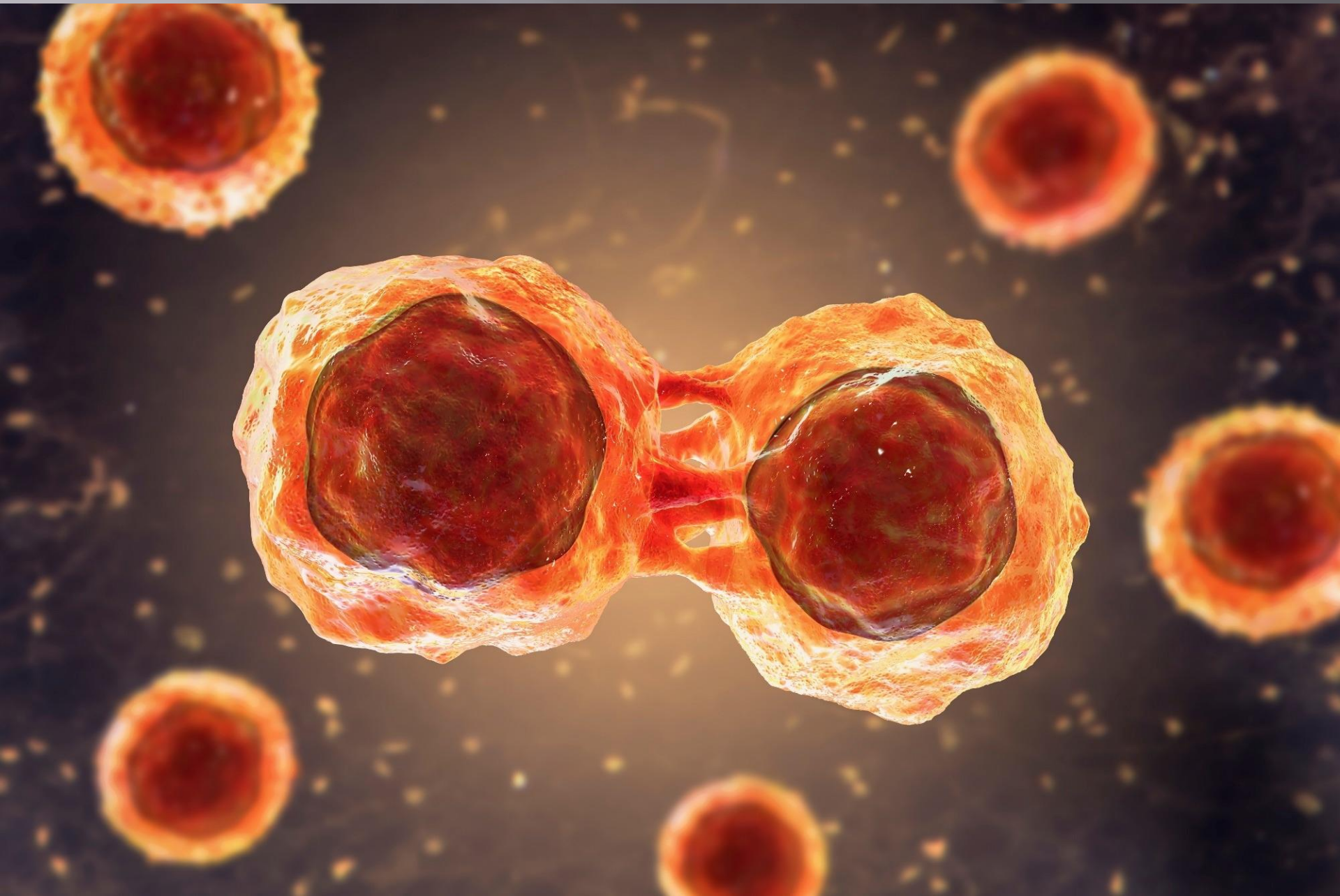


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# Stem Cell Dividing



# What are the 3 major potential applications of stem cell research?

## The Promise of Stem Cell Research

Studying Drug  
Toxicity



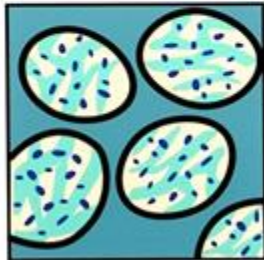
Cultured Pluripotent  
Stem Cells



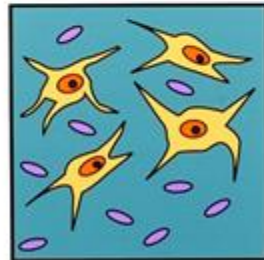
Disease Prevention by  
Studying Cell Differentiation  
and Genetics



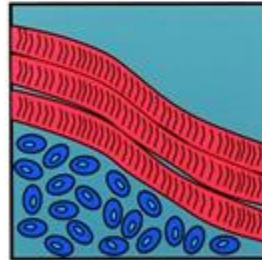
Medical Purposes - Tissue, Cell and maybe  
even one day Organ Transplantation



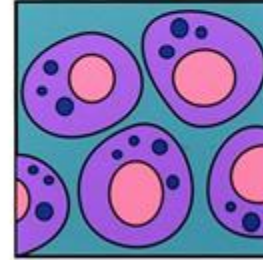
Bone marrow  
for leukemia  
& chemotherapy



Nerve cells  
for Parkinsons  
& Alzhiemer's  
disease



Heart muscle  
cells for  
heart disease

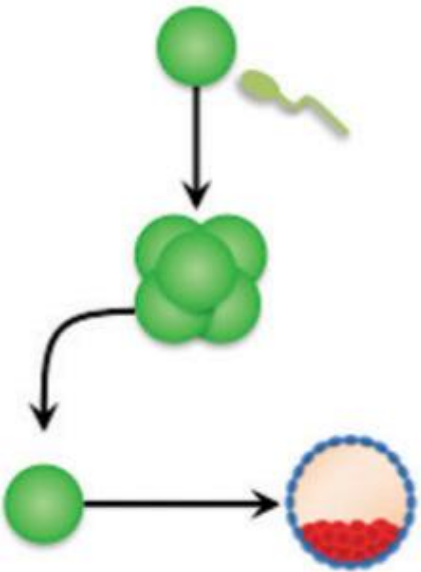


Pancreatic  
islet cells  
for diabetes

# The Different Types of Stem Cells

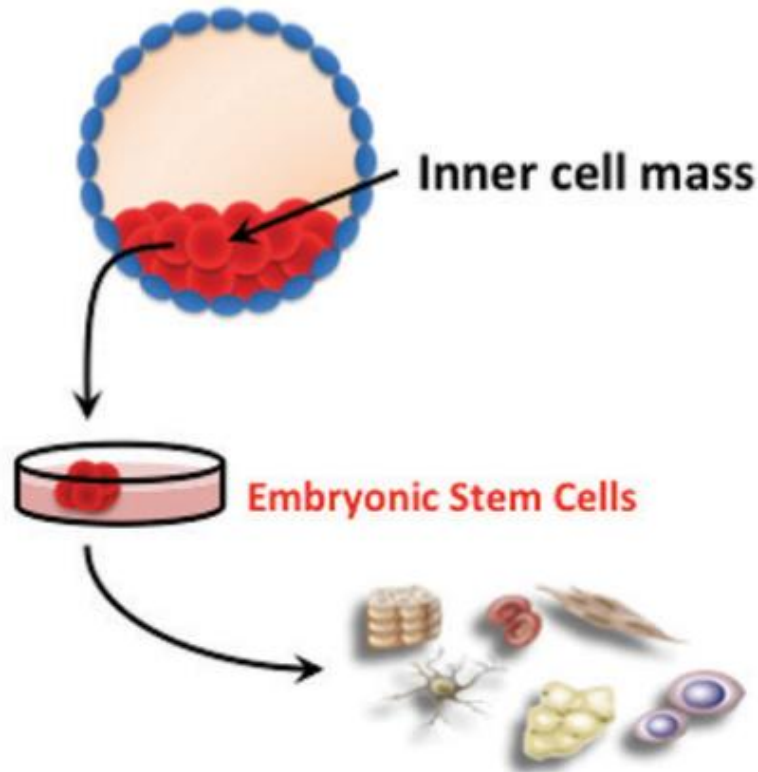
## Totipotent

“Toti-” = whole



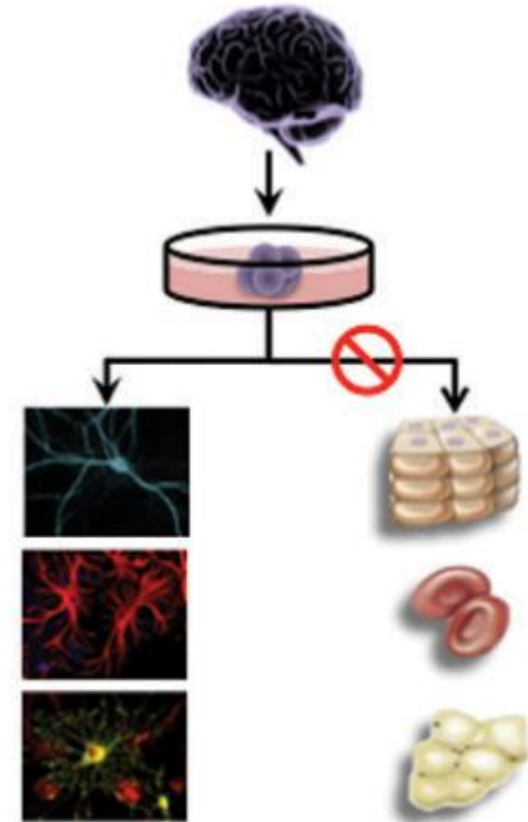
## Pluripotent

“Pluri-” = many



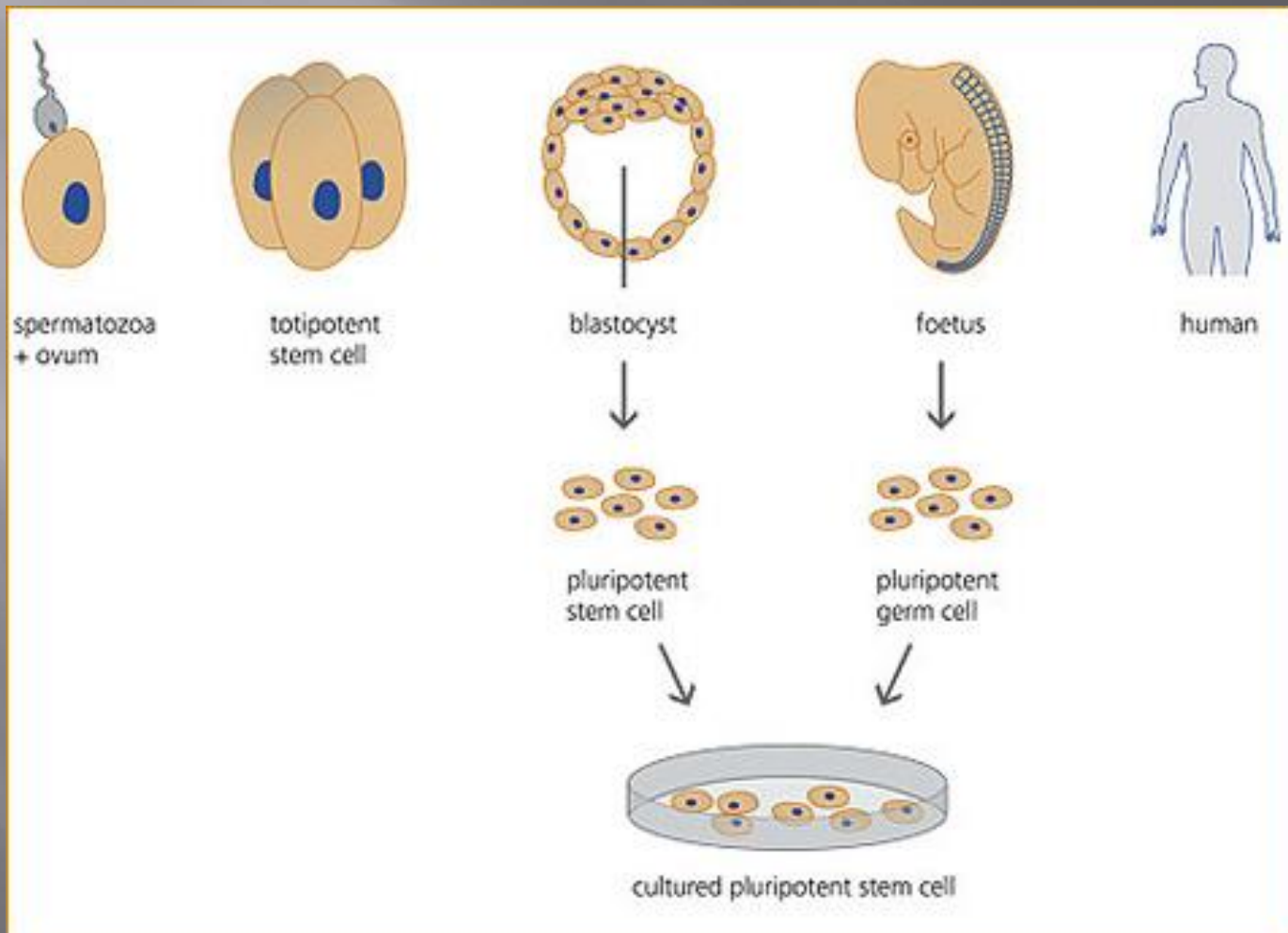
## Multipotent

“Multi-” = several

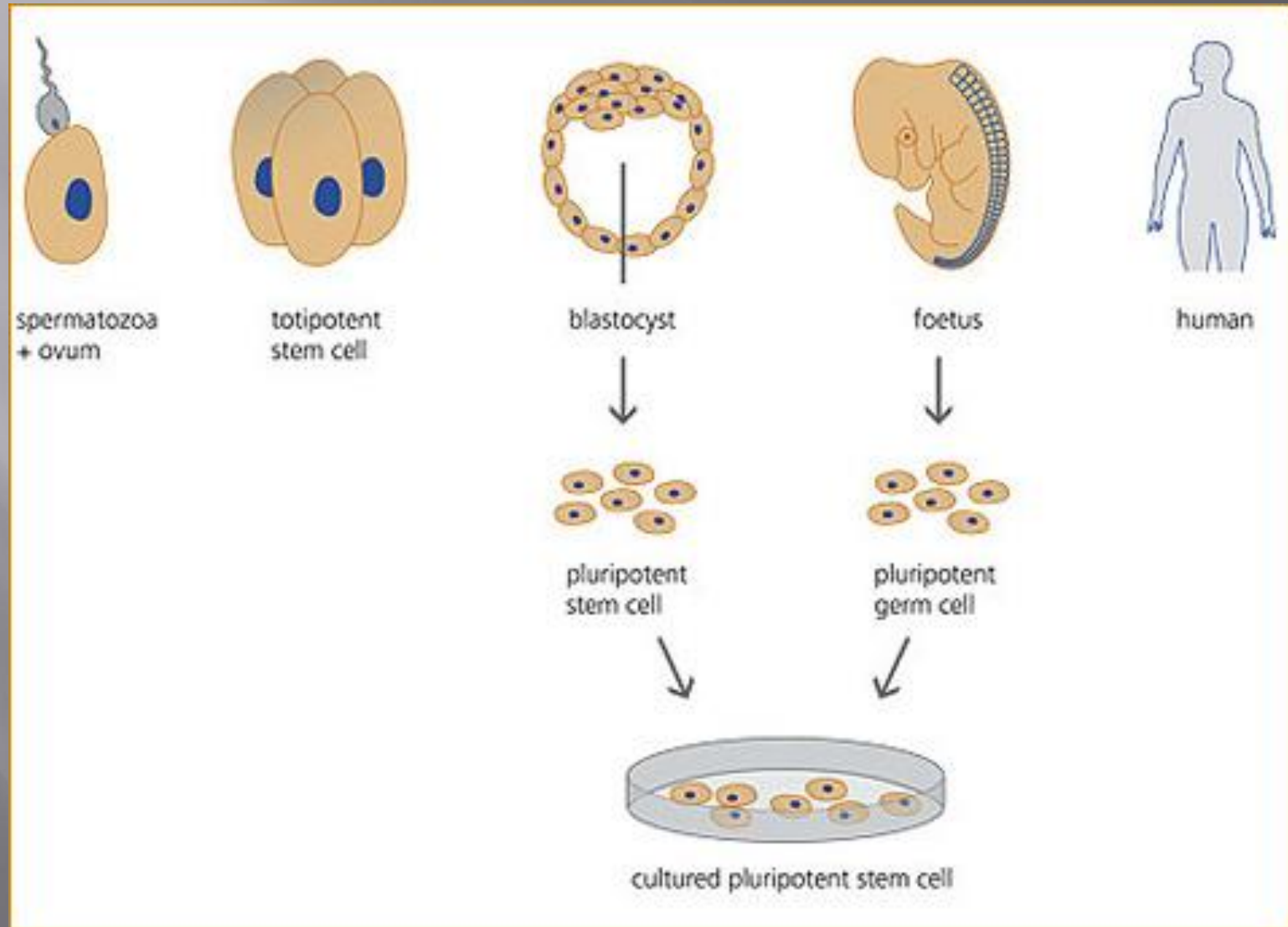


# How are stem cells obtained?

- 1. From the inner cell mass of human embryos from IVF (In Vitro Fertilization).



## 2. From the fetal tissue obtained from terminated pregnancies.



### 3. Somatic Cell Nuclear Transfer (SCNT)

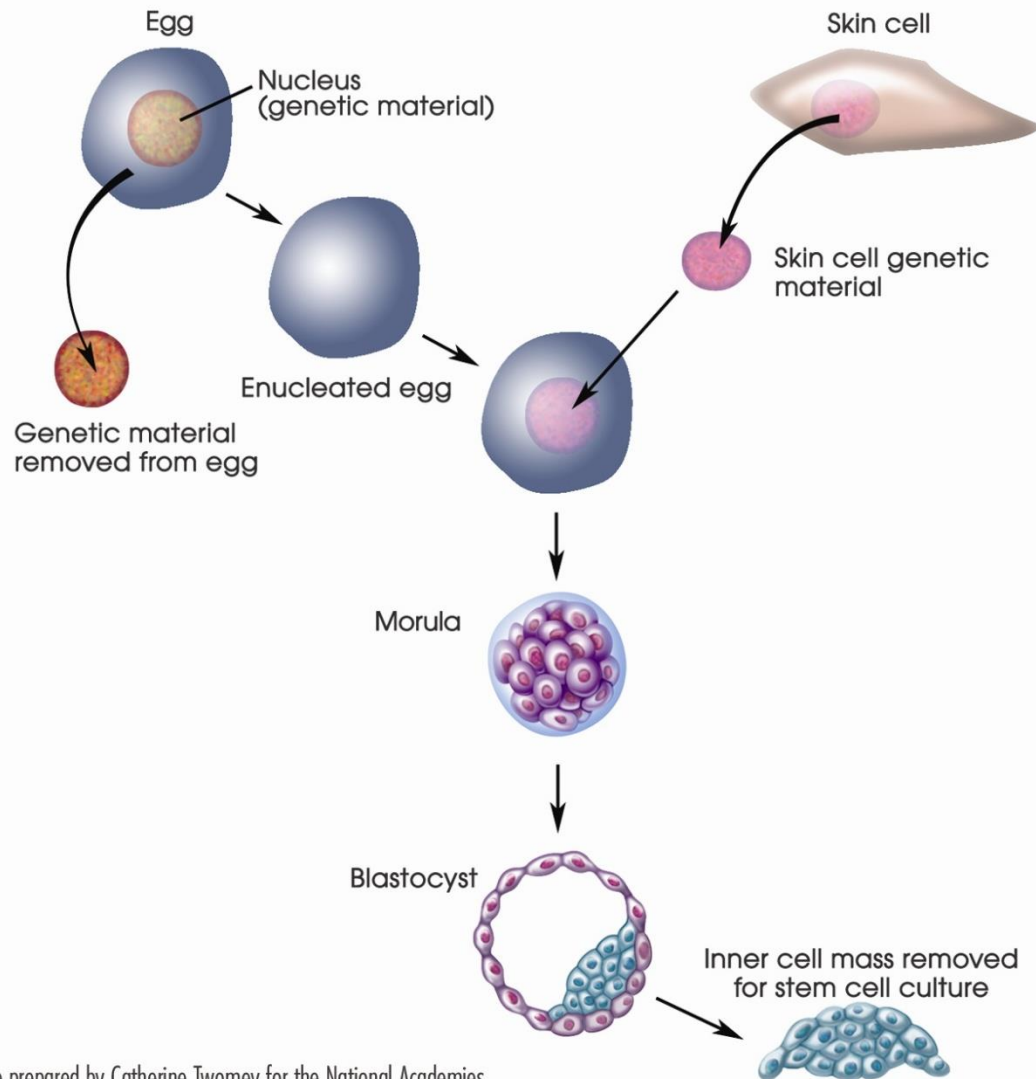
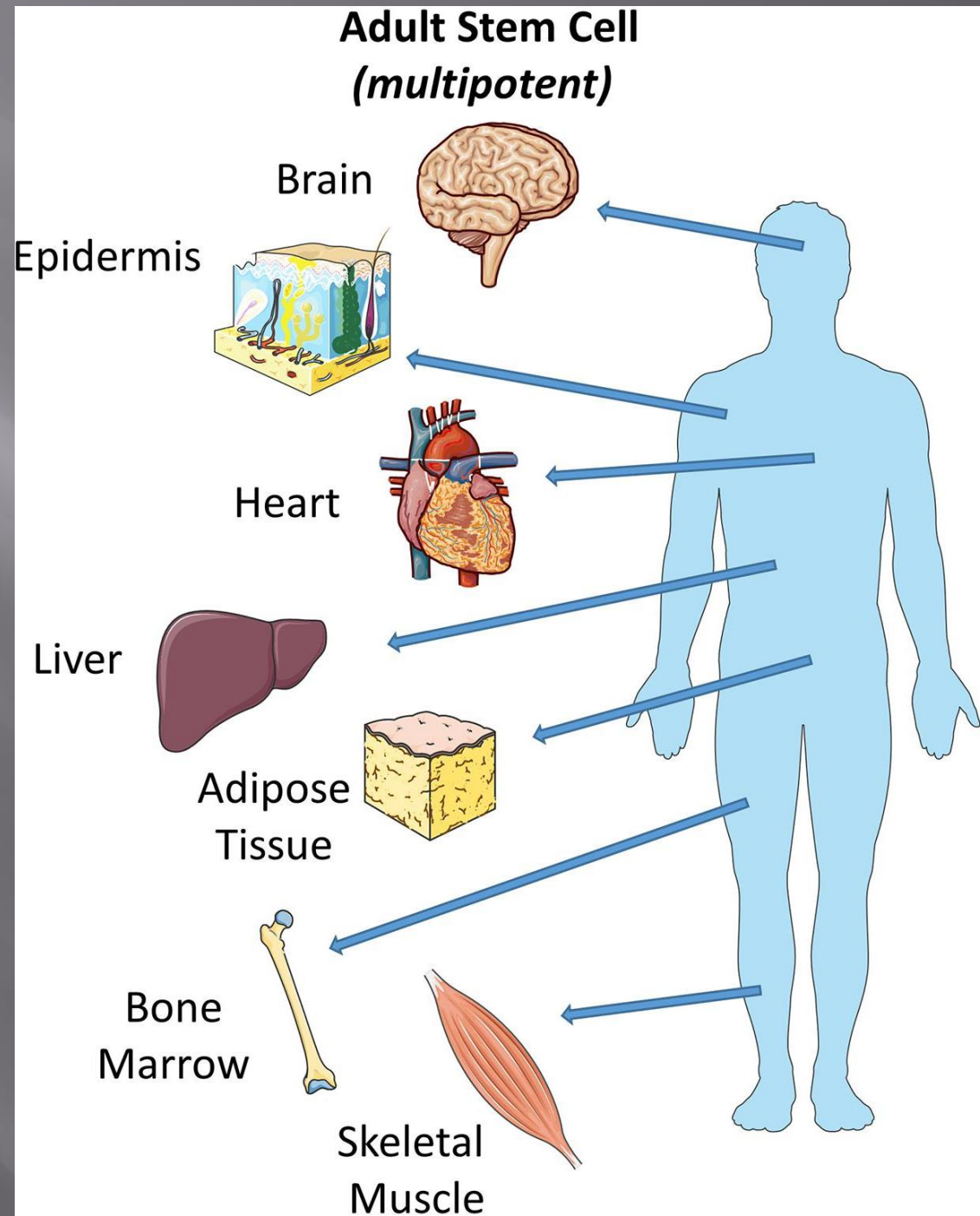


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## 4. Adult Stem Cells

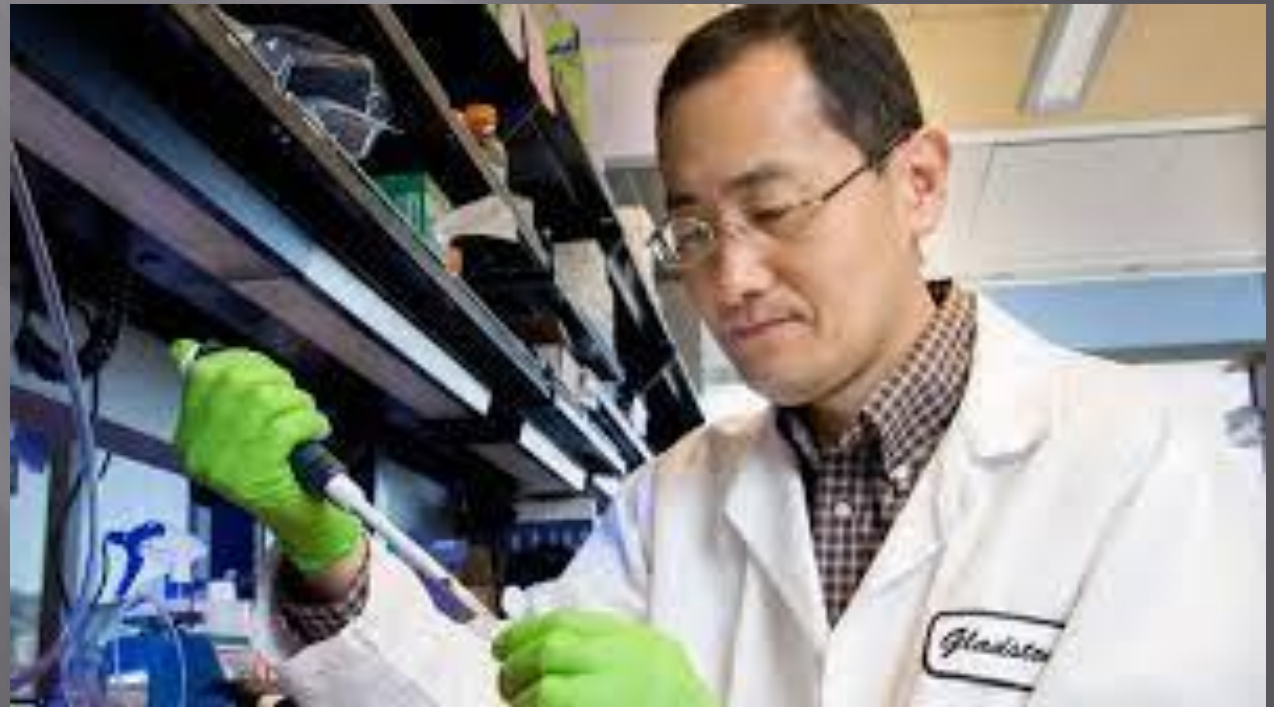


# The Obstacles to overcome with adult stem cells.

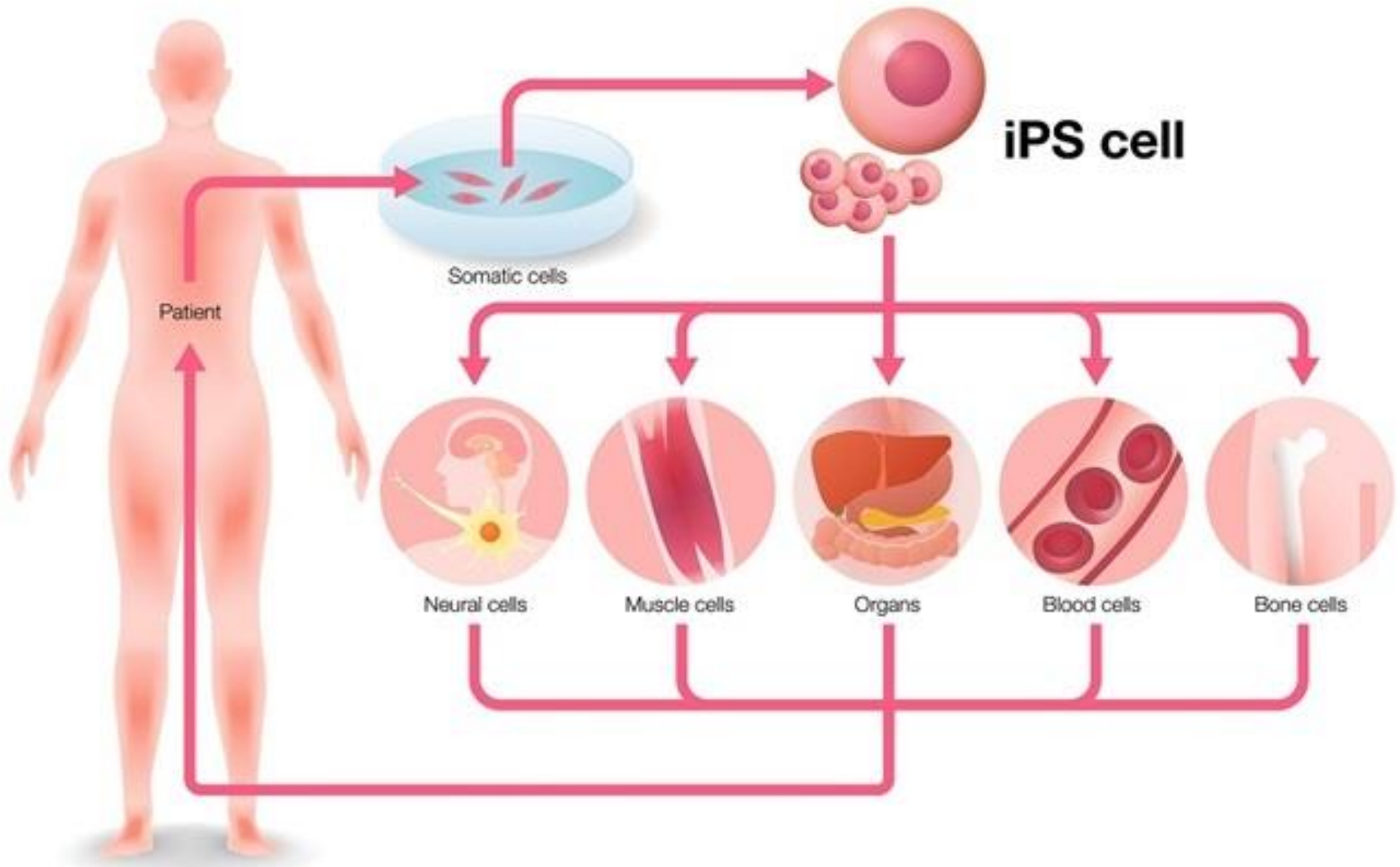
- ▣ stem cells from adults have not been isolated for all tissues of the body
- ▣ adult stem cells are often present in only minute quantities, are difficult to isolate and purify, and their numbers may decrease with age
- ▣ for some acute disorders, there may not be enough time to grow enough cells to use for treatment
- ▣ adult stem cells may contain more DNA abnormalities or the genetic defect that caused the disorders

# Induced Pluripotent Stem Cells iPSC

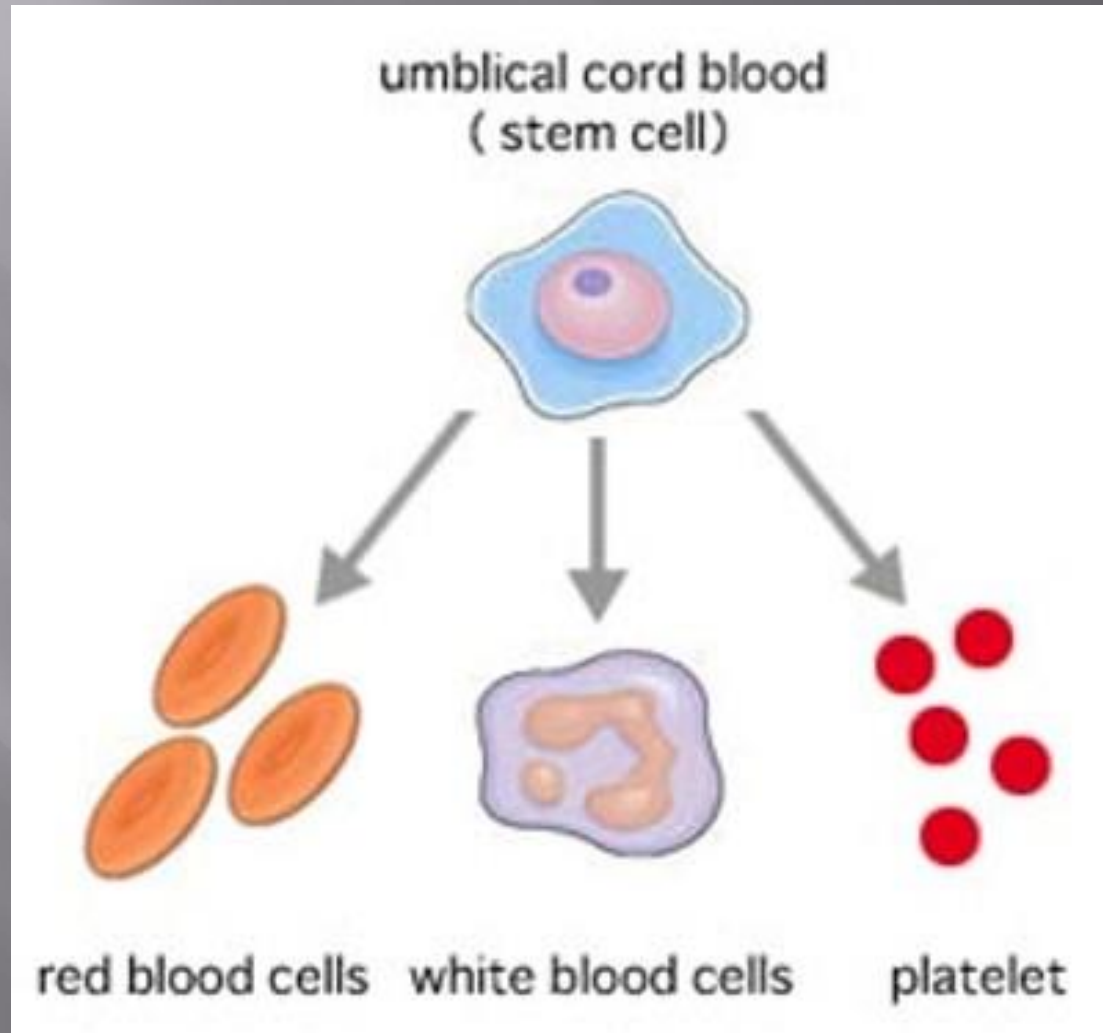
- ▣ Shinya Yamanaka - Japanese Scientist
- ▣ Won Nobel prize in 2012 for his work in Induced Pluripotency - discovery that mature cells can be reprogrammed to become pluripotent.



# Induced Pluripotent Stem Cells iPSC



# Umbilical Cord Stem Cells?



# Placenta Stem Cells?

