

# Stem Cells

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# Stem cell Terminology

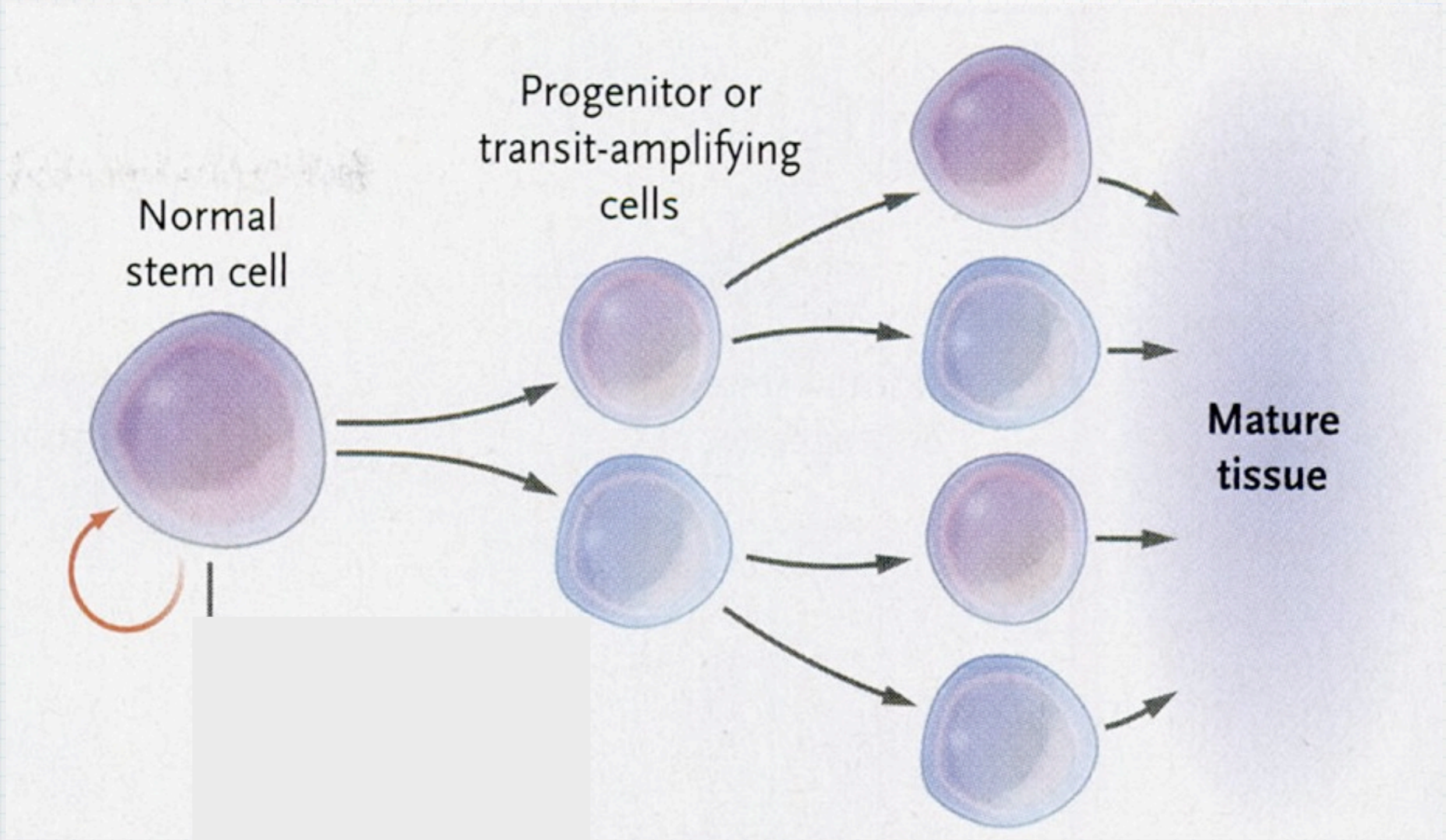
- \* Differentiation - cell specialization that occurs at the end of the developmental pathway.

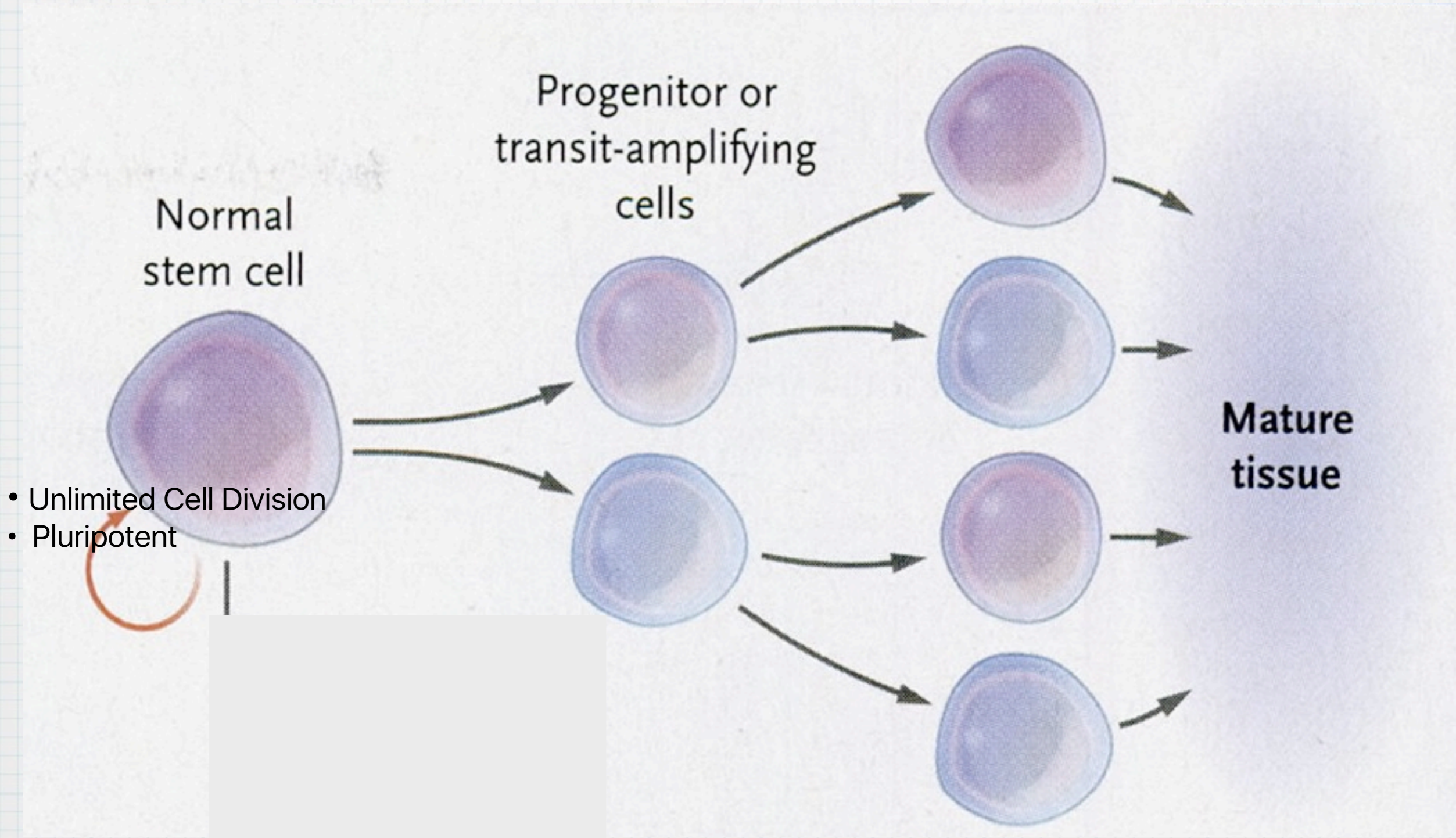
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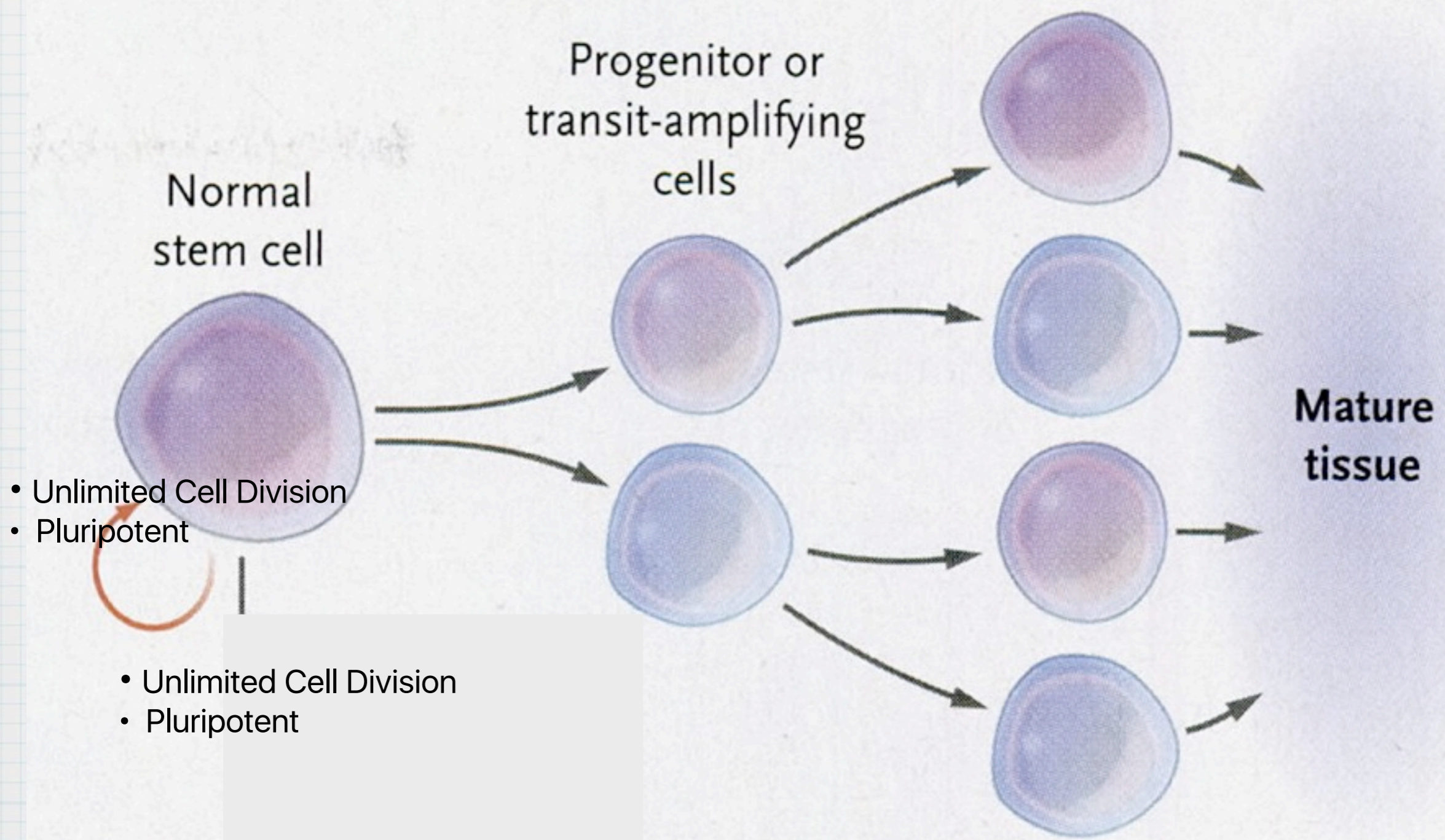
- \* Totipotent - a cell capable of giving rise to any of the cell types in the adult. In humans, the fertilized egg is totipotent until the eight-cell-stage.

# Stem cell Terminology

- \* **Multipotent - can give rise to several other cell types, but those types are limited in number. An example is a blood stem cell that can develop into several types of blood cells, but cannot develop into brain cells.**

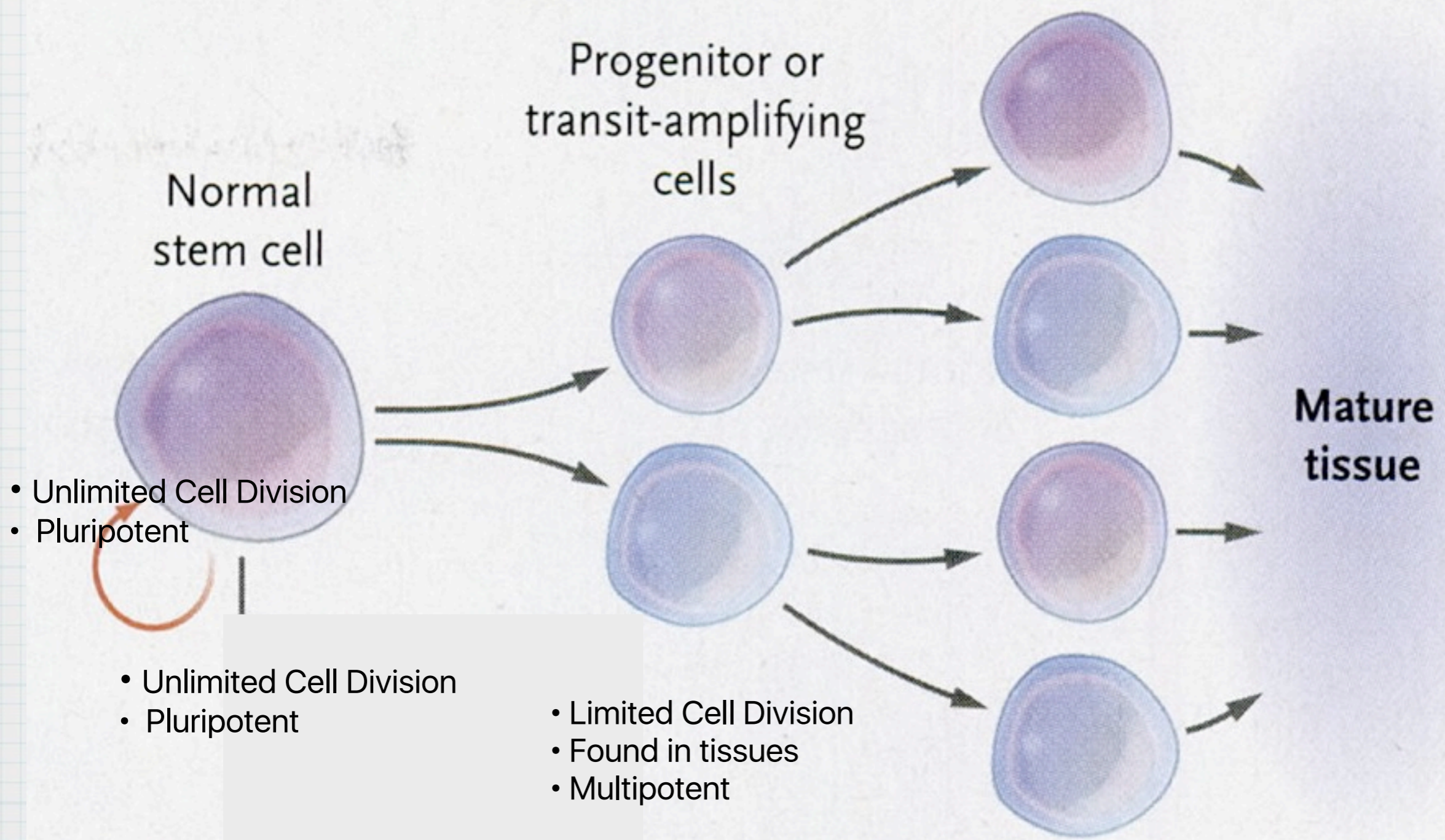




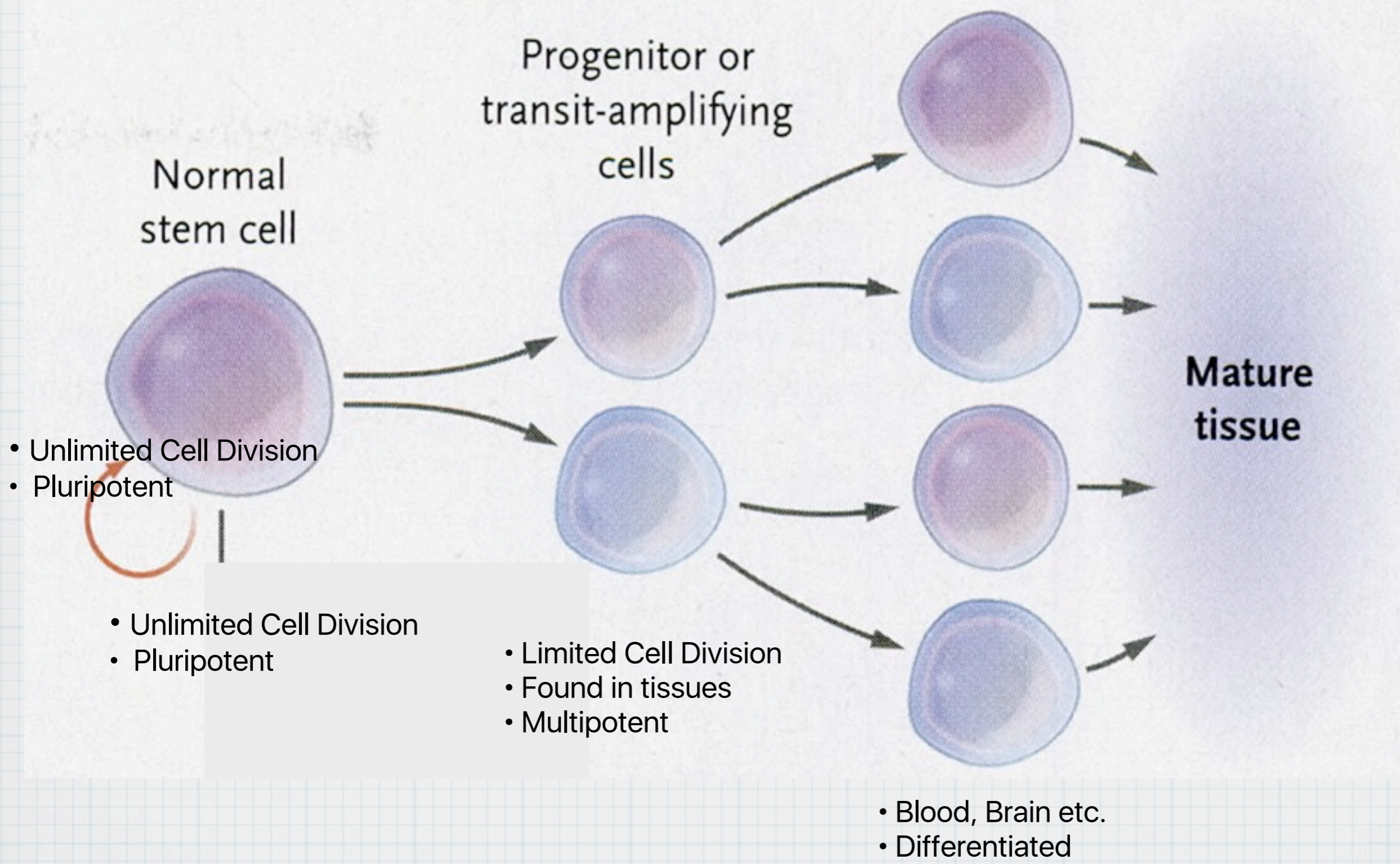


- Unlimited Cell Division
- Pluripotent

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- Pluripotent

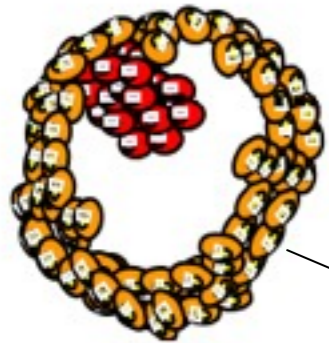








# What is a Stem Cell?

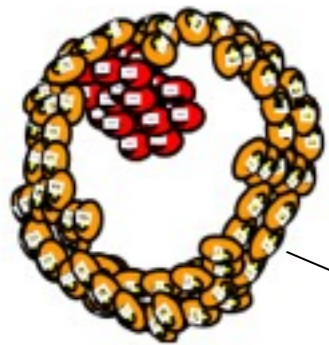
- \* Unspecialized cells
- \* Able to self-renew without differentiating for extended periods of time
- \* Types of stem cells
  - \* Embryonic stem cells
  - \* Adult stem cells
  - \* Umbilical cord stem cells



Placenta cell   
Stem cell 

Scientific manipulations entice stem cells to become specialized tissues (blood, muscle, neuron, etc.).





Blastocyst



Placenta cell

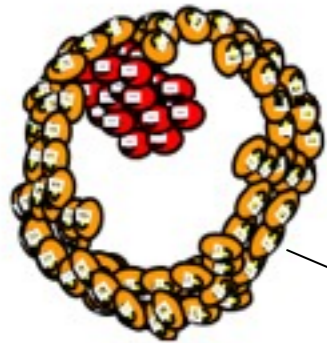


Stem cell



Scientific manipulations entice stem cells to become specialized tissues (blood, muscle, neuron, etc.).





Blastocyst



Cultured laboratory stem cells

Placenta cell

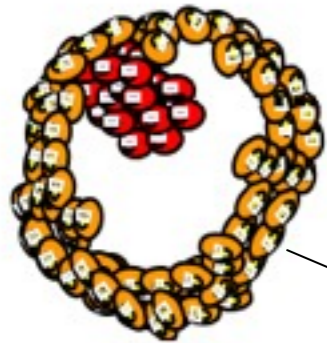


Stem cell



Scientific manipulations entice stem cells to become specialized tissues (blood, muscle, neuron, etc.).





Blastocyst



Cultured laboratory stem cells

Placenta cell



Stem cell

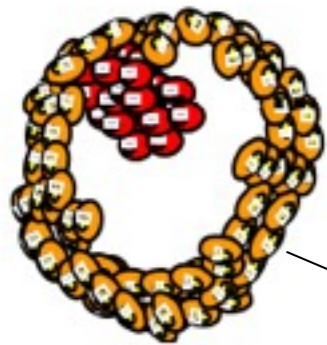


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Blood cells





Blastocyst



Cultured laboratory stem cells

Placenta cell



Stem cell



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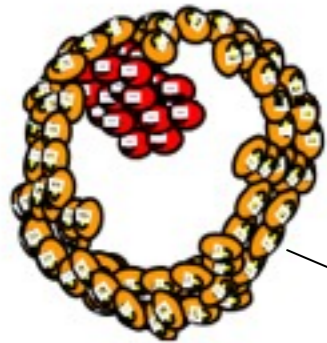


Blood cells



Muscle cells





Blastocyst



Cultured laboratory stem cells

Placenta cell



Stem cell



Scientific manipulations entice stem cells to become specialized tissues (blood, muscle, neuron, etc.).



Blood cells



Muscle cells



Neuron (brain) cells



# Adult Stem Cells

- \* Have two characteristics:
  - \* Self-renewal.
  - \* They can give rise to differentiated mature cells
- \* Found in the brain, spinal cord, blood, muscle, the digestive system, retina, liver and pancreas.

# Umbilical cord stem cells

- \* This blood is rich in cord blood stem cells that can be used to generate blood cells and cells of the immune system.
- \* Can be used to treat a range of blood disorders such as leukaemia or sickle cell anaemia.

# What Diseases Could Be Impacted

- \* Millions of people suffer from diseases which might be alleviated by stem cell transplantation technologies.
- \* Examples include cardiovascular disease, autoimmune disease, diabetes, osteoporosis, cancer, Alzheimer's disease and Parkinson's disease.
- \* Stem cell treatment could potentially help patients with severe burns, spinal cord injuries, or birth defects.

