



Apoptosis
Hyperplasia
Neoplasia
Repair
Atrophy
Cytokines
Inflammation
PATHOLOGY
Immunity
Cell
Hypertrophy
Necrosis
Proliferation
ROS
Virchow
Metaplasia

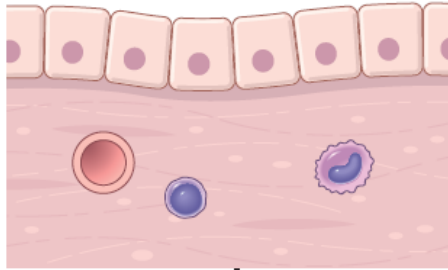
Repair

Dr. Mazin Al-Salihi

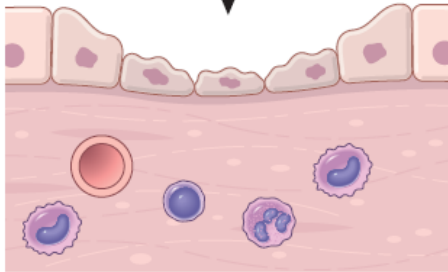


Tissue Repair

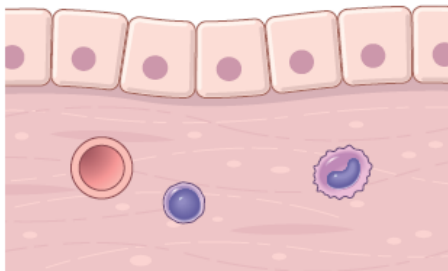
NORMAL



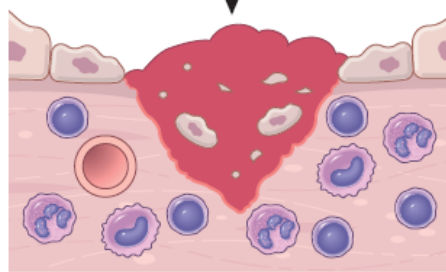
Mild, superficial injury



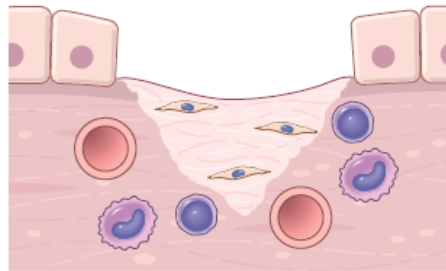
REGENERATION



Severe injury



SCAR FORMATION



Repair/Healing

Restoration of tissue architecture & function

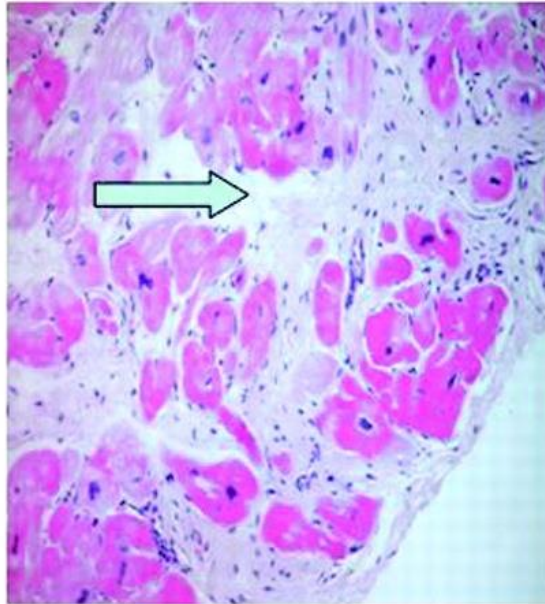
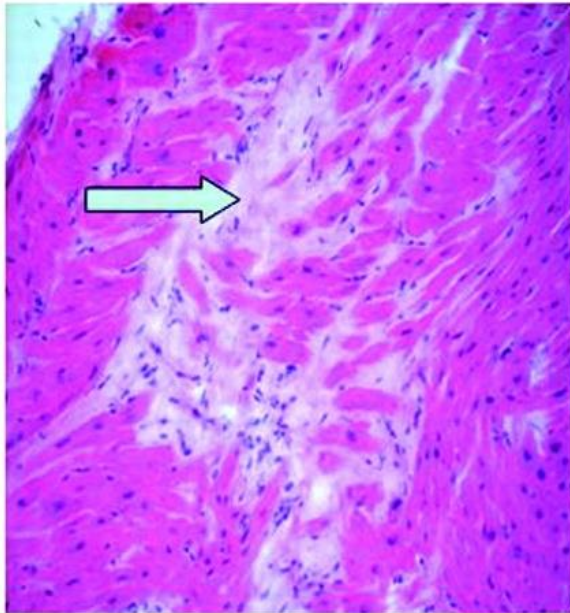
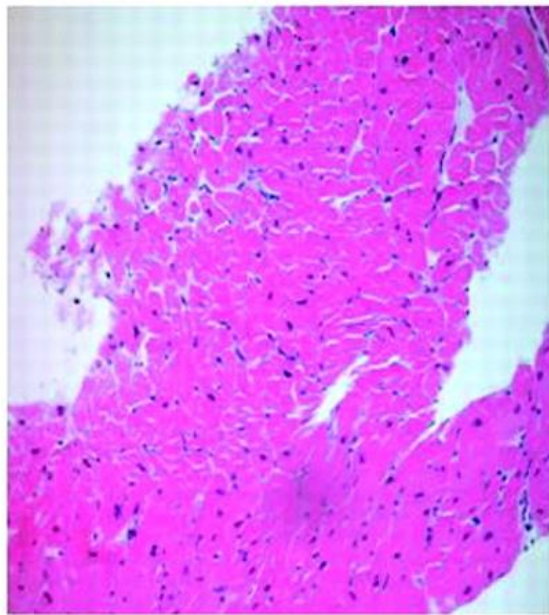
Regeneration:

- Same cell replacement
- Proliferative ability
- Function maintained
- Architecture restored

Scar formation:

- Fibrous tissue (CT) replacement
- Potential loss of function
- Architecture somewhat restored

Cardiac biopsies
showing fibrosis

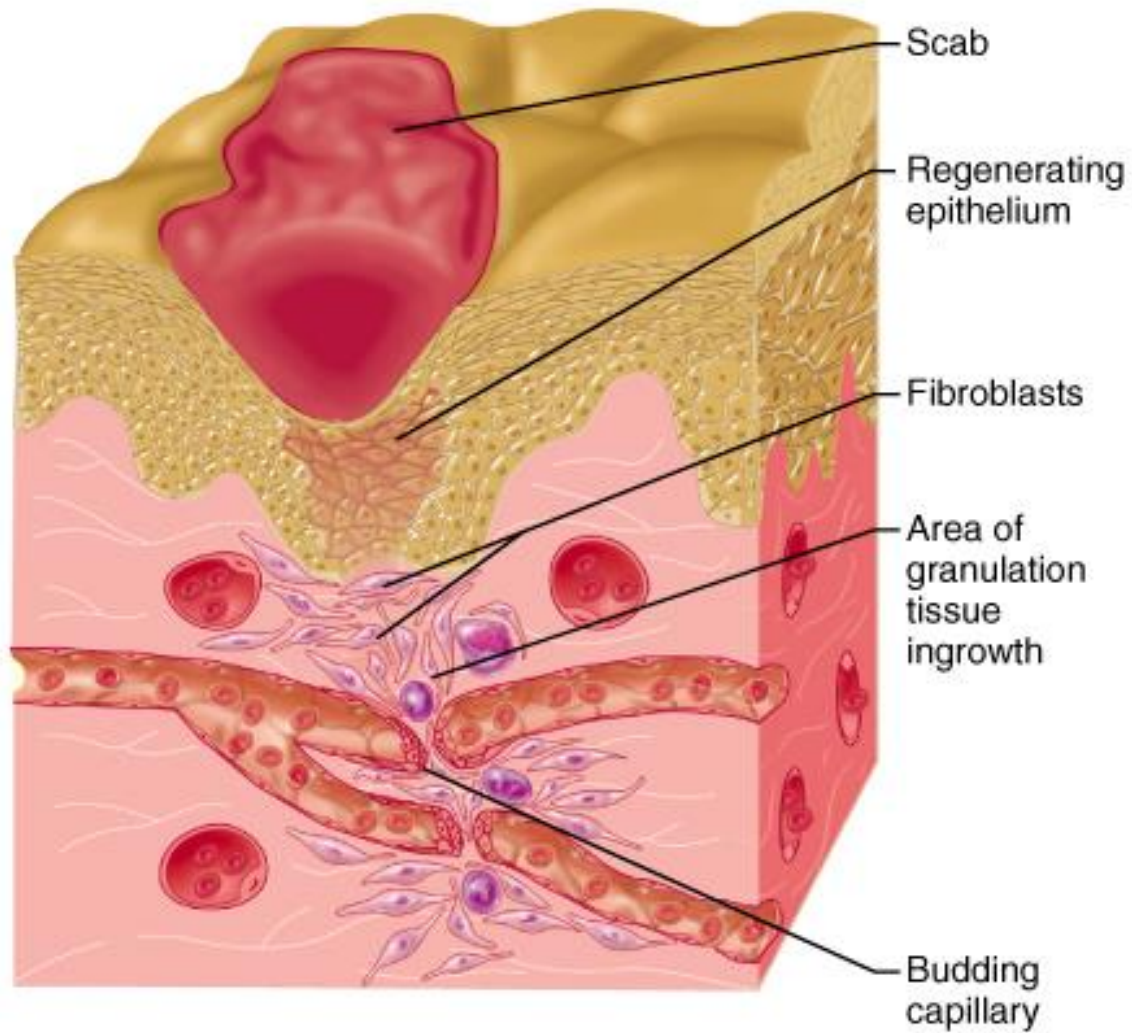


Fibrosis

Extensive deposition of collagen in organs (e.g. liver, lung, kidney, heart)

- Idiopathic
- Chronic inflammation
- MI

Deposition in a tissue space containing inflammatory exudate = organization

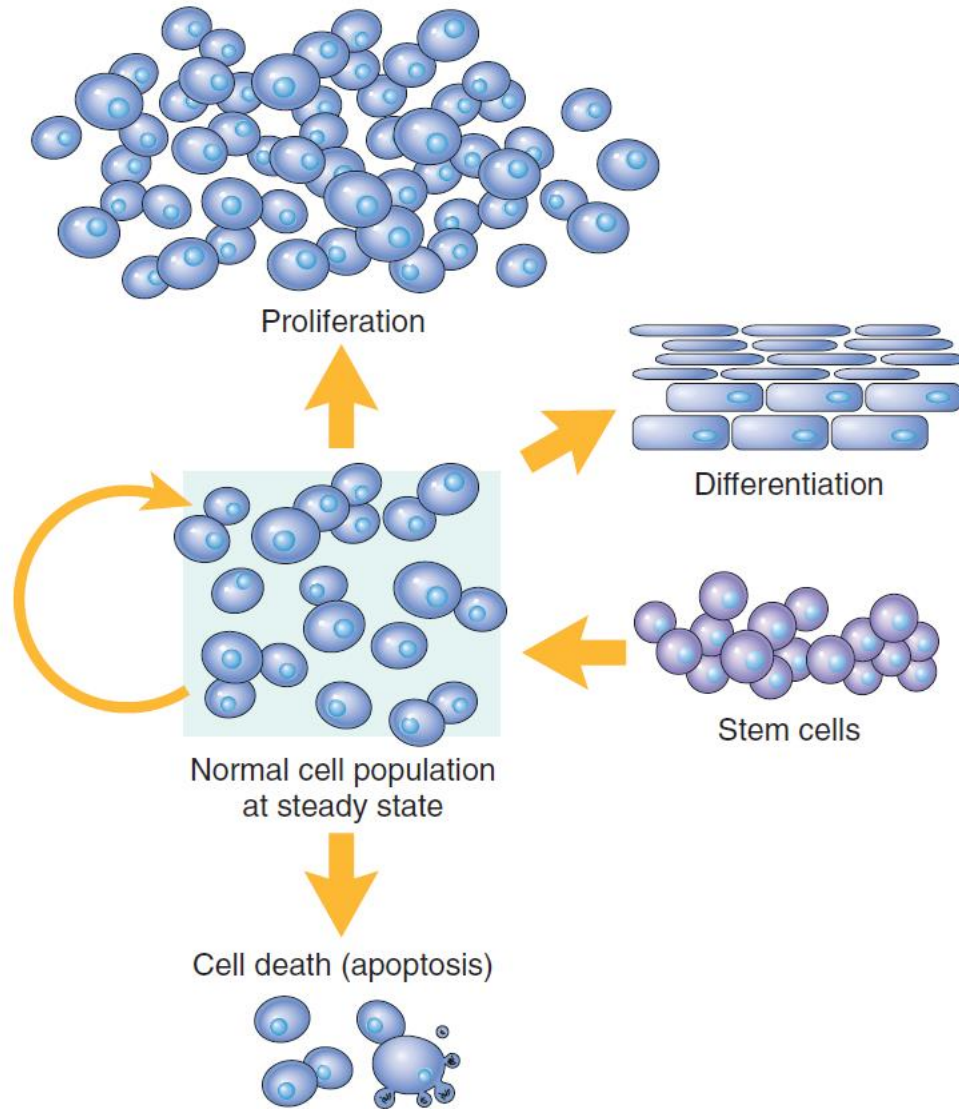


Requirements

1. Cell proliferation
2. Interaction with the ECM



Cell proliferation



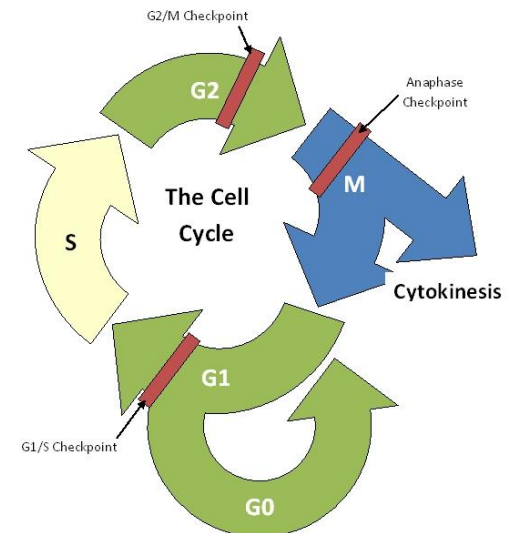
Proliferation control

Cell cycle control


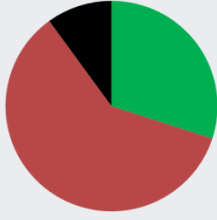
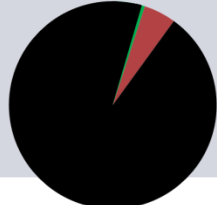
Response to growth factors

Differentiation

Apoptosis



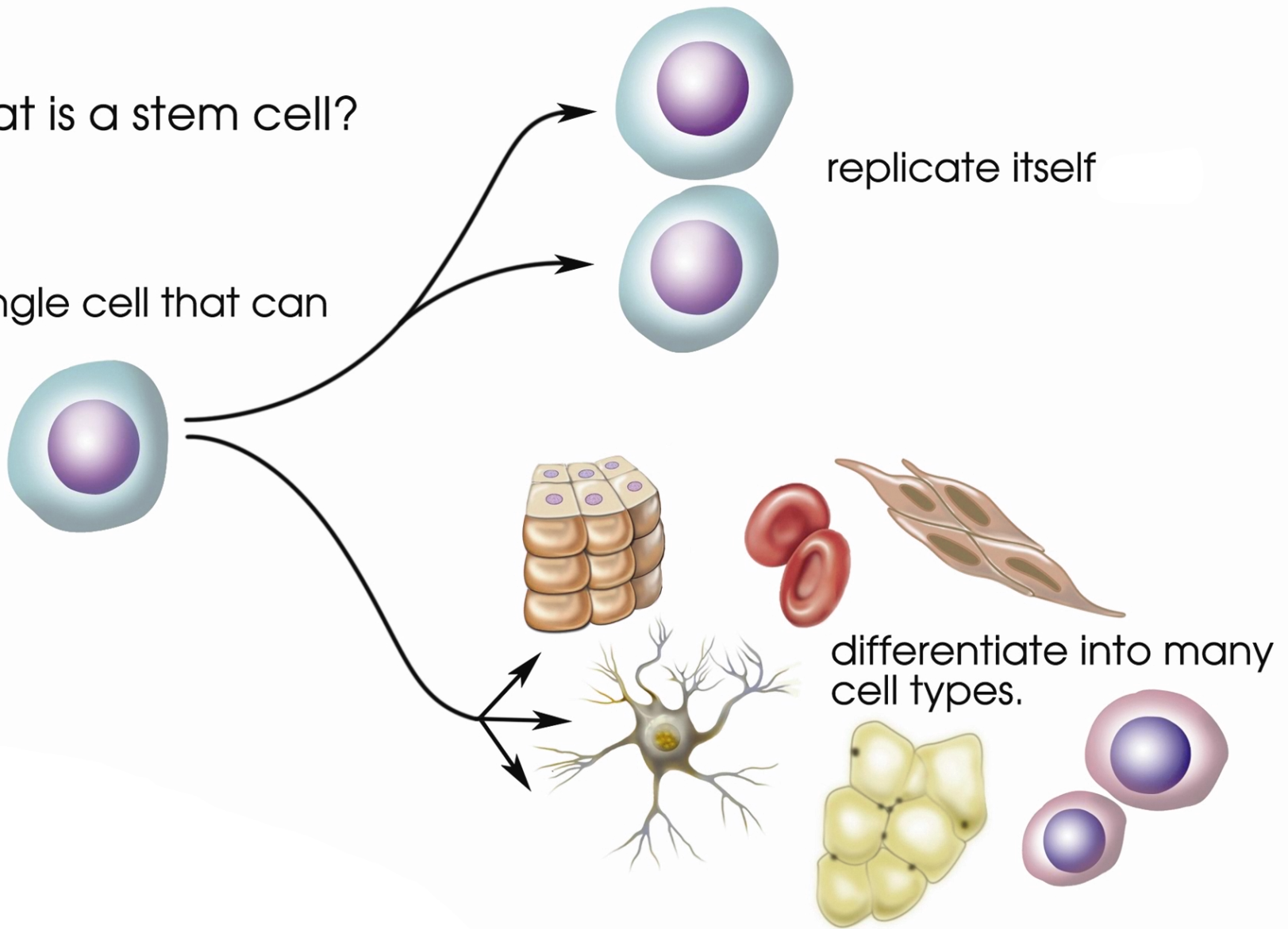
Proliferation capacity

Tissue	Characteristics	Examples	%distribution
Labile	<ul style="list-style-type: none"> Continuously dividing mature & stem cells Can regenerate if stem cells are intact 	<ul style="list-style-type: none"> BM Surface epithelia 	
Stable	<ul style="list-style-type: none"> Quiescent Minimal replicative activity normally Capable of proliferating if/when needed Limited regeneration capacity* 	<ul style="list-style-type: none"> Solid tissue parenchyma* Endothelium Fibroblasts Smooth Muscles 	
Permanent	<ul style="list-style-type: none"> Terminally differentiated and non-proliferative Limited stem cell replication and differentiation = no regeneration 	<ul style="list-style-type: none"> Neurons Cardiac & skeletal muscle 	

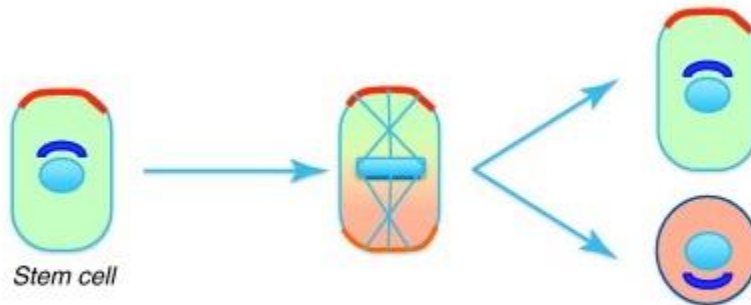


What is a stem cell?

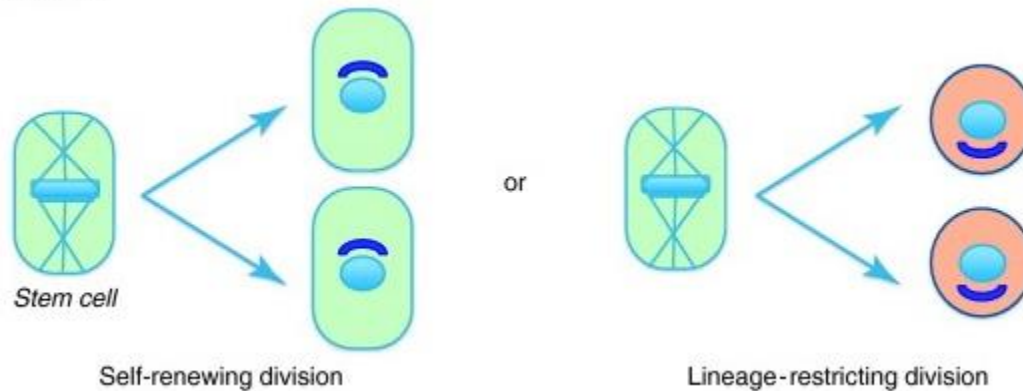
A single cell that can



(a) Asymmetric division



(b) Symmetric division



Stem cells

- Self Renewal
- Asymmetric replication

2 types:

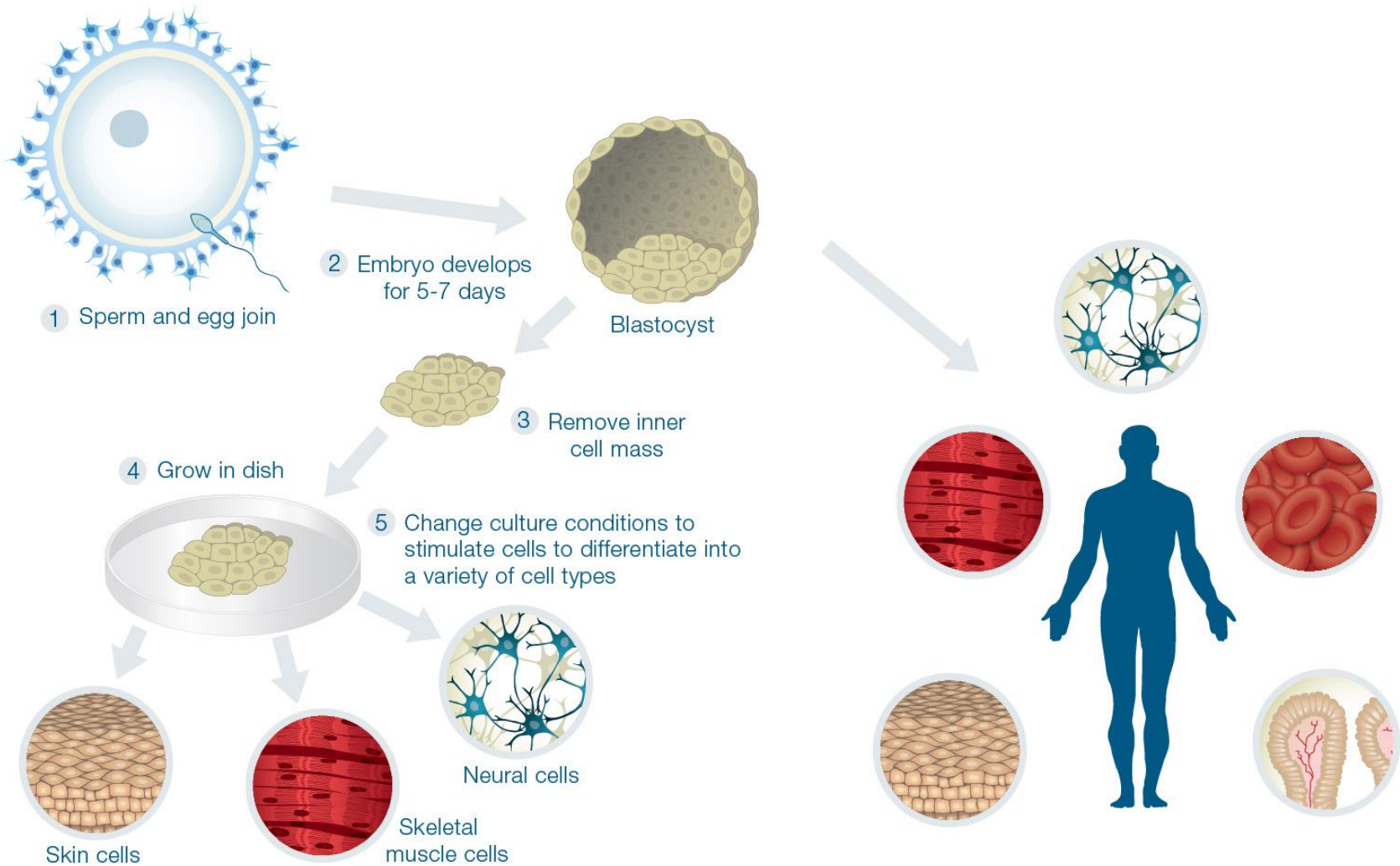
Embryonic

- Self renewal
- Unlimited differentiation
- Organism creation

Adult/Tissue

- Limited self renewal
- Limited differentiation
- Tissue homeostasis

Embryonic stem cells



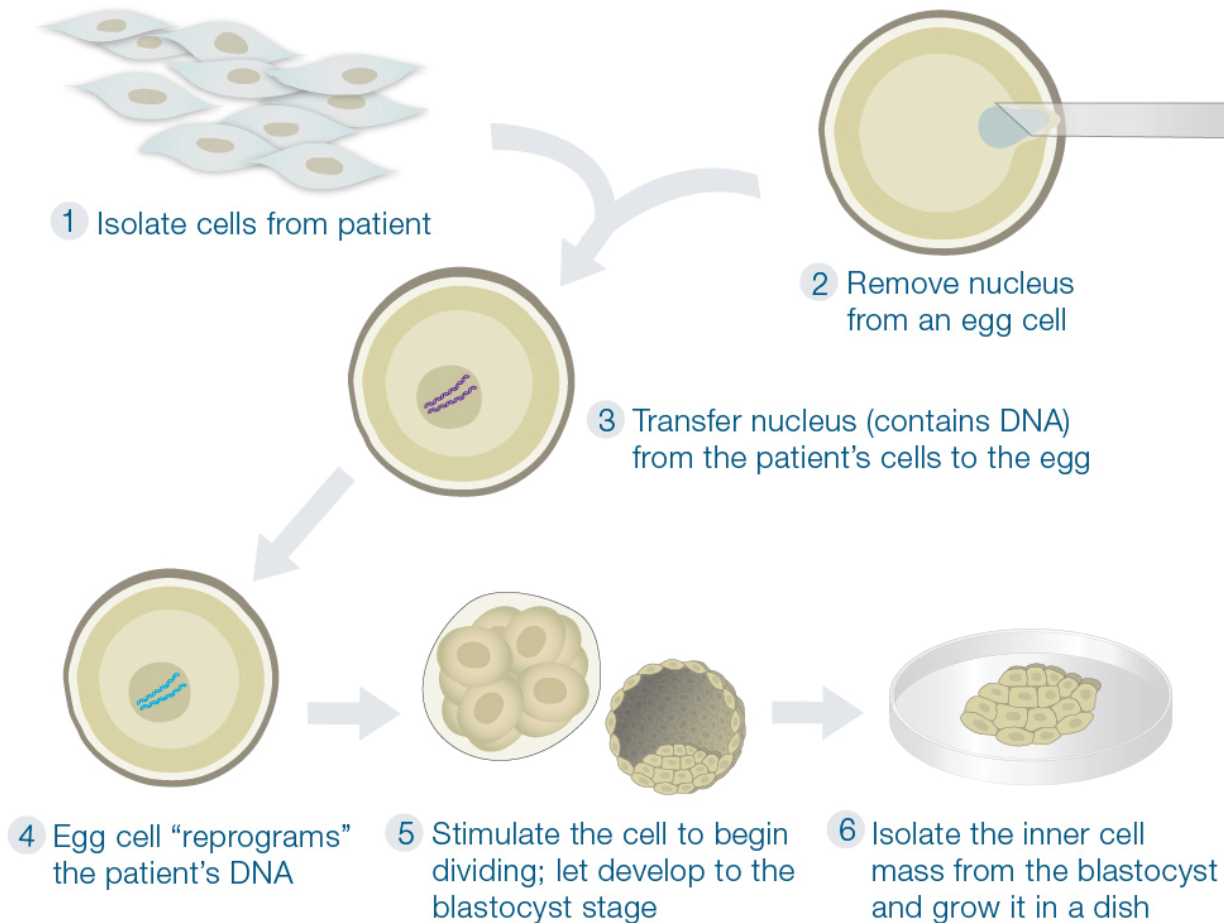
Pitfalls & Ethics of ES use

Graft rejection

Embryo destruction



Creating **ES cells** through therapeutic cloning (somatic cell nuclear transfer)



Therapeutic cloning

No graft rejection

Time consuming, inefficient,
and expensive

Achieved in 2013

Ethical considerations?