

## Chapter 5.3

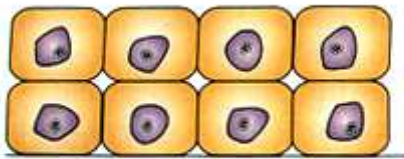
# Tissue Growth and Change



Normal Cell



Atrophy

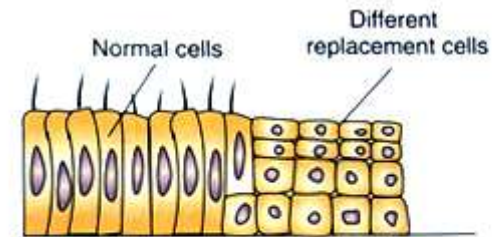
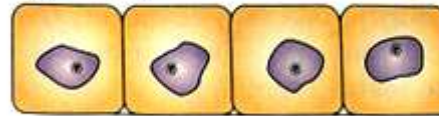


Hyperplasia

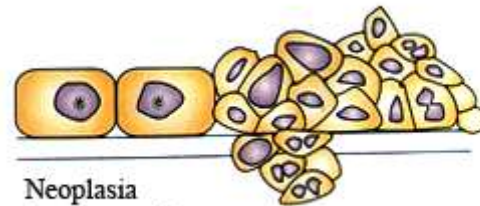


Dysplasia

Hypertrophy



Metaplasia



Neoplasia  
(malignancy)

# Tissue Growth & Differentiation

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- **Tissue growth may include**
  - increasing the number of cells
  - increase the size of the existing cells
  - reduce size of existing cells
  
- **Tissue Differentiation**
  - un-specialized tissues of **embryo** change into specialized mature cell types
  - example: embryonic mesenchyme cells become muscle

# How Tissue May Change

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- **Hypertrophy**
  - enlargement of preexisting cells
  - e.g. muscle grow through exercise
- **Hyperplasia**
  - tissue growth through cell multiplication
  - e.g. endometrium during sexual cycle
- **Atrophy**
  - shrinkage of a tissue through a loss in cell size or number
  - **senile atrophy** through normal aging
  - **disuse atrophy** from lack of use (astronauts)
- **Neoplasia**
  - development of a tumor (**neoplasm**)
  - maybe benign or malignant
  - composed of abnormal, nonfunctional cells

# Tissue Shrinkage and Death

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- **Metaplasia**

- changing from one type of **mature** tissue to another type of mature tissue
- E.g. / simple cuboidal tissue lining vagina before puberty will change to stratified squamous after puberty // note: the hormone estrogen will cause this change
- E.g. / pseudostratified columnar epithelium of bronchi of smokers to stratified squamous epithelium // note: toxins in smoke is the cause for this metaplasia

# Abnormal Cell Growth

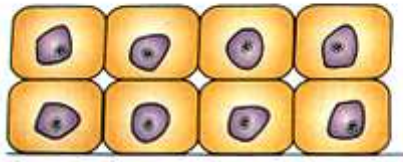
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Normal Cell



Atrophy

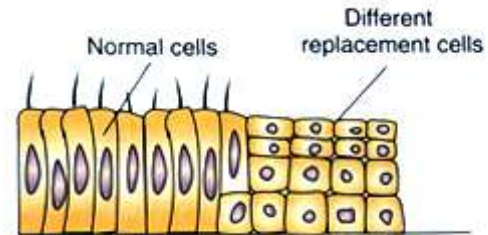
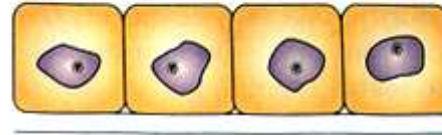


Hyperplasia

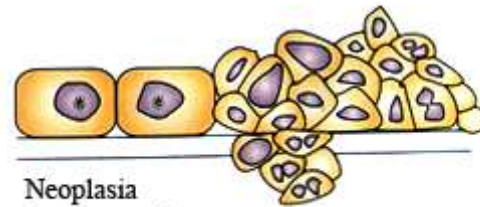


Dysplasia

Hypertrophy



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# Tissue Death

## (Necrosis VS Apoptosis)

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- **Necrosis**

- premature, pathological death of tissue due to trauma, toxins, or infections
- Always associated with **inflammation (results in more extracellular fibers being produced – i.e. scar tissue)**
- **infarction** – sudden death of tissue when blood supply is cut off
- **gangrene** – tissue necrosis due to insufficient blood supply
- **decubitus ulcer** – bed sore or pressure sore /// pressure reduces blood flow to an area - a form of dry gangrene
- **gas gangrene** - anaerobic bacterial infection /// bacterial growth produces gas

# Tissue Death

## Necrosis VS Apoptosis

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- **Apoptosis**

- programmed cell death / appropriate
- normal death of cells that occur after cells have completed their function
- best serves the body by dying so as to get out of the way
- **not associated with inflammation**
- Examples
  - loss of plasma cells and cytotoxic T cells after infection eliminated
  - menses – loss of endometrium following sexual cycle

# Abnormal Cell Growth

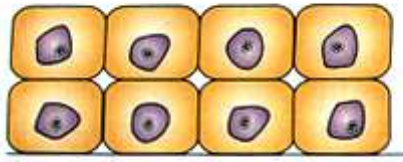
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Normal Cell



Atrophy

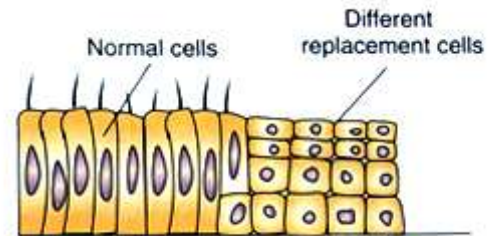


Hyperplasia

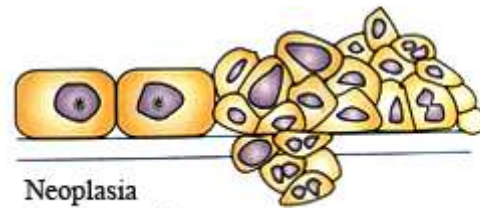


Dysplasia

Hypertrophy



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# Stem Cell Controversy

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- Embryonic stem cells research may lead to treatments for many type of diseases caused by loss of functional cell types // ESC are the “most plastic of all stem cell types”
  - ESC most likely to form new cardiac muscle cells, injured spinal cord, insulin-secreting cells
- skin and bone marrow stem cells have been used in therapy for years
- **adult stem cells** have limited developmental potential /// difficult to harvest and culture

# Stem Cells

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- **stem cells** - undifferentiated cells that are not yet performing any specialized function
  - have potential to differentiate into one or more types of mature functional cells
- developmental plasticity – diversity of mature cell types to which stem cells can give rise
- **embryonic stem cells**
  - totipotent - have potential to develop into any type of fully differentiated human cell // source - cells of very early embryo
  - pluripotent – can develop into any type of cell in the embryo // source - cells of inner cell mass of embryo

# Stem Cells

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- **adult stem cells**

- undifferentiated cells of a tissue type in adults
- **multipotent** - bone marrow producing several blood cell types
- **unipotent** – most limited plasticity (e.g. producing only epidermal cells)