

Chapter 4.3

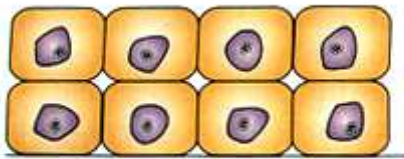
Tissue Growth and Change



Normal Cell



Atrophy

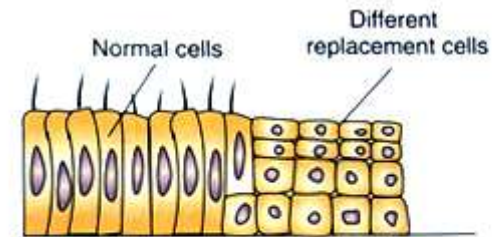
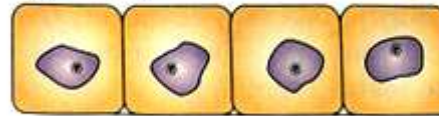


Hyperplasia

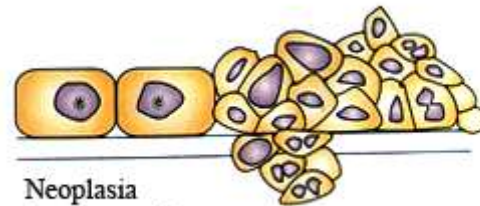


Dysplasia

Hypertrophy



Metaplasia



Neoplasia
(malignancy)

Tissue Growth & Differentiation

- **Tissue growth**
 - increasing the number of cells
 - Increasing the size of the existing cells
 - Reduce size of existing cells
- **Differentiation**
 - unspecialized tissues of **embryo** change into specialized mature cell types
 - example: embryonic mesenchyme cells become muscle

How Tissue May Change

- **Hypertrophy**
 - enlargement of preexisting cells
 - muscle grow through exercise
- **Hyperplasia**
 - tissue growth through cell multiplication
- **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

- **Metaplasia**

- changing from one type of **mature** tissue to another type of mature tissue
- E.g. / simple cuboidal tissue of vagina before puberty changes to stratified squamous after puberty
 - hormone estrogen causes metaplasia
- E.g. / pseudostratified columnar epithelium of bronchi of smokers to stratified squamous epithelium
 - toxins in smoke causes metaplasia

Tissue Death

Necrosis VS Apoptosis

- **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

- **Apoptosis**

- programmed cell death / appropriate
- normal death of cells that have completed their function
- best serve the body by dying and getting 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

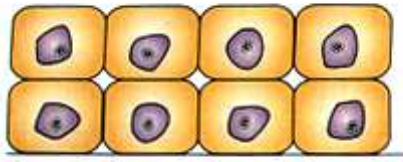
Abnormal Cell Growth



Normal Cell



Atrophy

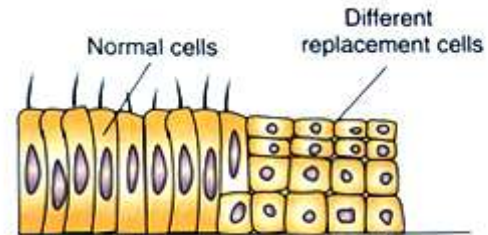
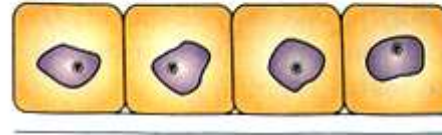


Hyperplasia

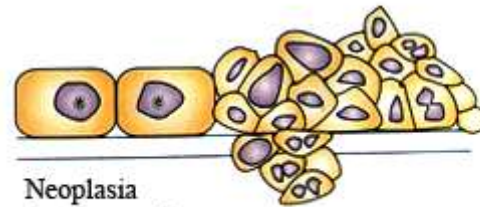


Dysplasia

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Stem Cell Controversy

- 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

- **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

- **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)