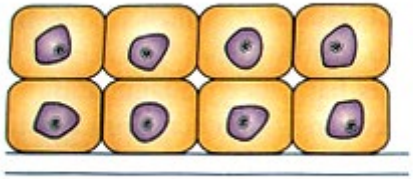
Chapter 5.3

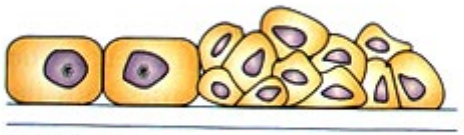
Tissue Growth and Change

Normal Cell

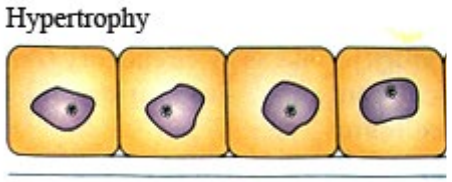
Atrophy



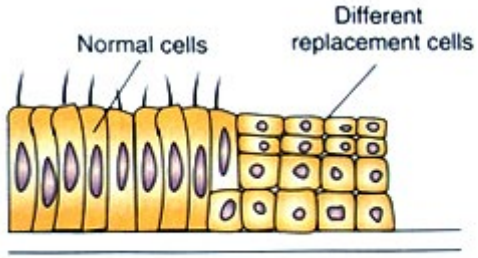
Hyperplasia



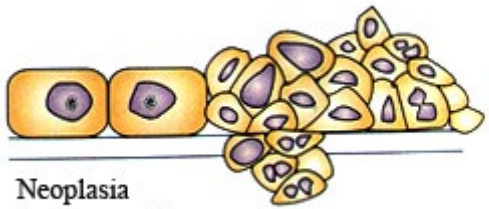
Dysplasia



Hypertrophy



Metaplasia



Neoplasia (malignancy)

Tissue Growth & Differentiation

- **Tissue growth may include**
  - –increasing the number of cells
  - –increase the size of the existing cells
  - –reduce size of existing cells

- **Tissue Differentiation**
  - –specialized tissues of **embryo** change into specialized mature cell types
  - –example: embryonic mesenchyme cells become muscle

How Tissue May Change

- **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

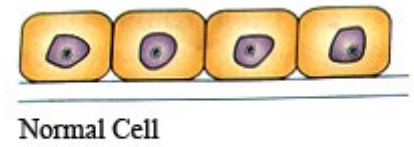
- **Metaplasia**

–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



Normal Cell

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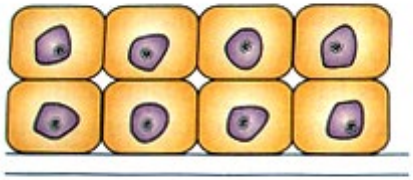
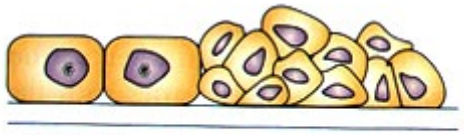
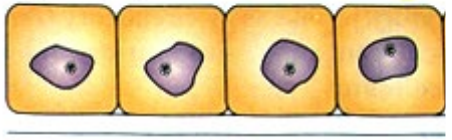


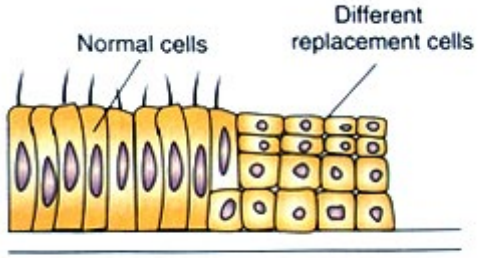
Hyperplasia



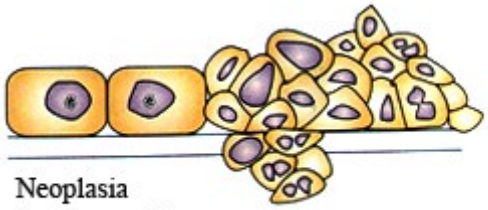
Dysplasia

Hypertrophy





Metaplasia



Neoplasia (malignancy)

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 occur after cells have completed their function

–best serves the body by dying so as to get out of the way

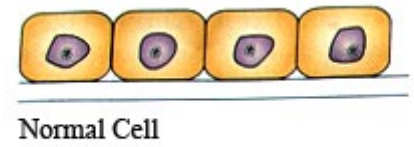
–not associated with inflammation

–Examples

- loss of plasma cells and cytotoxic T cells after infection eliminated

- mensis – loss of endometrium following sexual cycle

Abnormal Cell Growth



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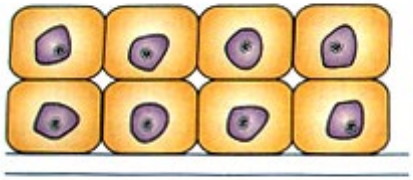
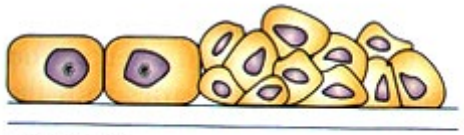


Hyperplasia



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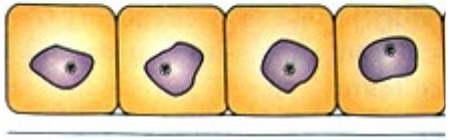
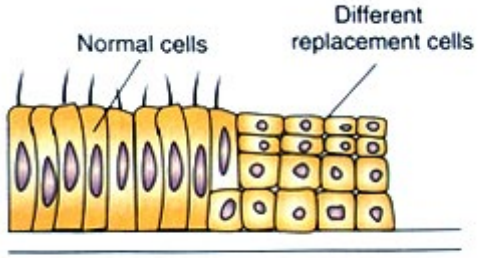
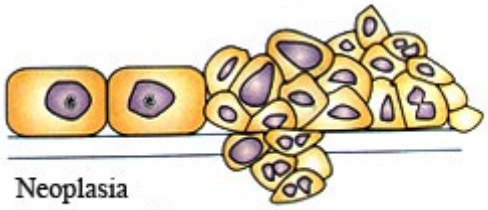




Metaplasia



Neoplasia (malignancy)

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)