TRANSPLANTATION

- Transplantation is the transfer (engraftment) of cells, tissues or organs from a donor to a recipient with the aim of restoring function(s) in the body.
- **Autotransplantation (Autograft)**
- **Allotransplantation (Allograft)**
- **Syngenic transplantation (Isograft)**
- **Xenotransplantation (Xenograft)**

AUTOTRANSPLANTATION

- **Autotransplantation** is the transplantation of organs, tissues, or even particular proteins from one part of the body to another **in the same person.**

ALLOTRANSPLANTATİON

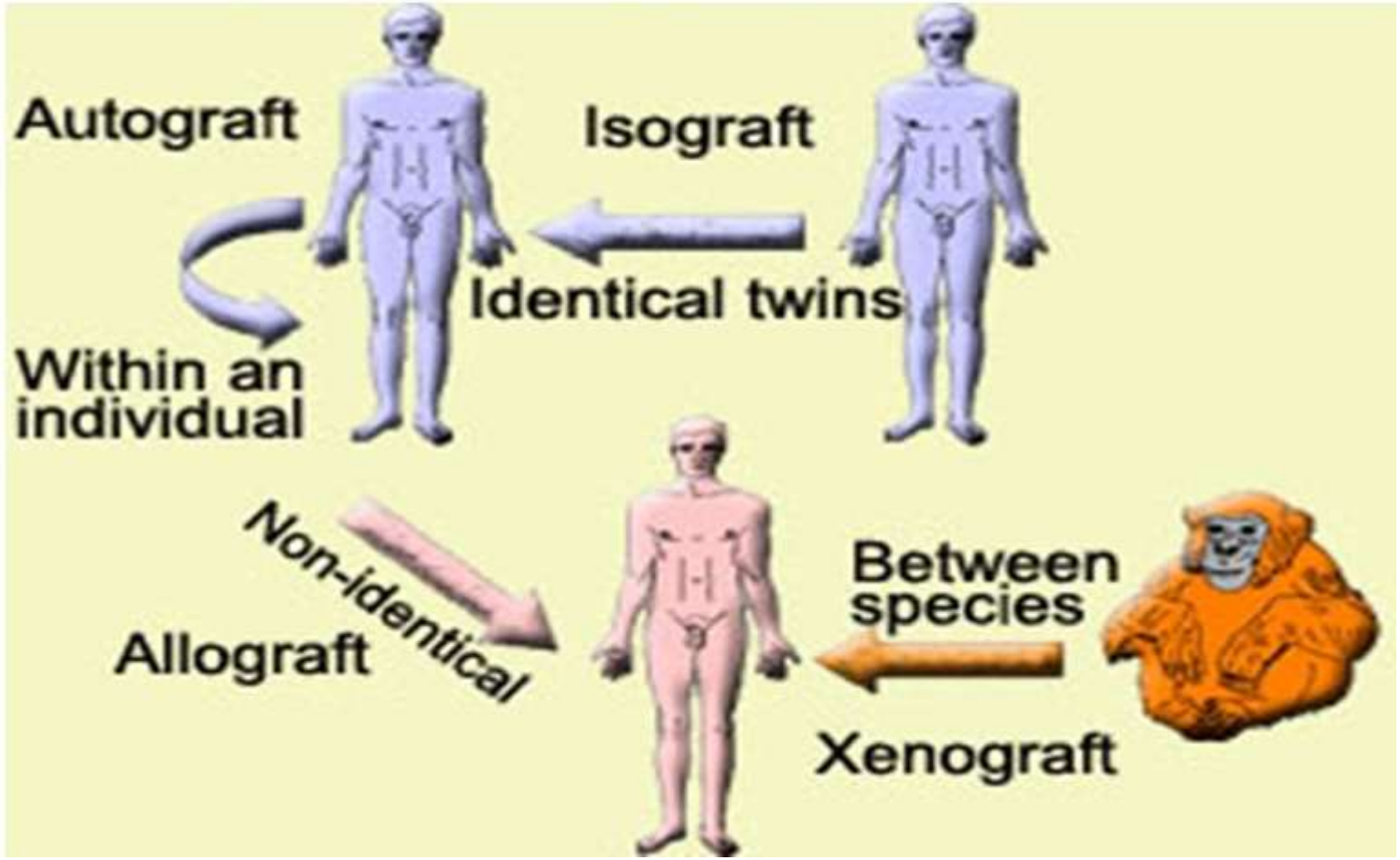
- **Allotransplantation** is the transplantation betwe nple; human to human or animal to animal.

SYNGENEİC TRANSPLANTATİON

- **Syngeneic transplantation** is the transplantation between two **genetically identical individuals of the same species**.
- Example; monozygotic or identical twins.

XENOTRANSPLANTATION

- **Xenotransplantation** is the transplantation of living cells, tissues or organs from **one species to another.**
- Example; from human to animal (chimpanzee-to-human kidney transplantations,…)


Autograft
Isograft
Identical twins
Within an individual
Non-identical
Allograft
Between species
Xenograft

DISTURBANCES OF GROWTH AND DIFFERENTIATION OF TISSUES

Prof. Dr. Sevil Atalay Vural

APLASIA (AGENESIS)

- Agenesis : congenital disturbance in which the tissue or organ did not develop and there is complete absence of growth of the organ.
- Aplasia: congenital disturbance in which there exists only primitive and usually small structures representative of the organ.

✓ Aplasia is commonly seen in paired organs such as the kidneys, gonads and adrenals.

✓ If the organ is a single vital organ, the fetus dies.

✓ Segmental aplasia is the aplasia of a segment of an organ.

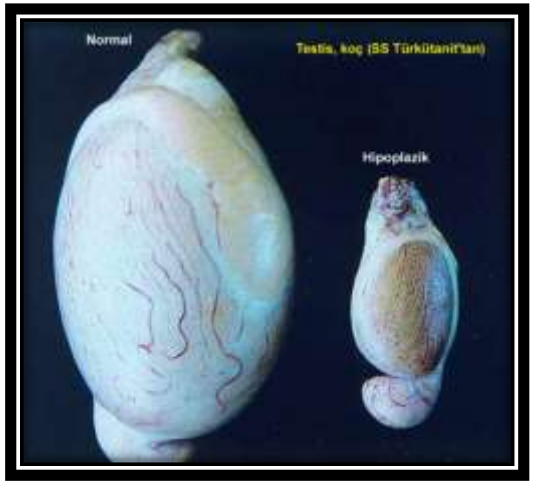
✓ e.g. Uterus

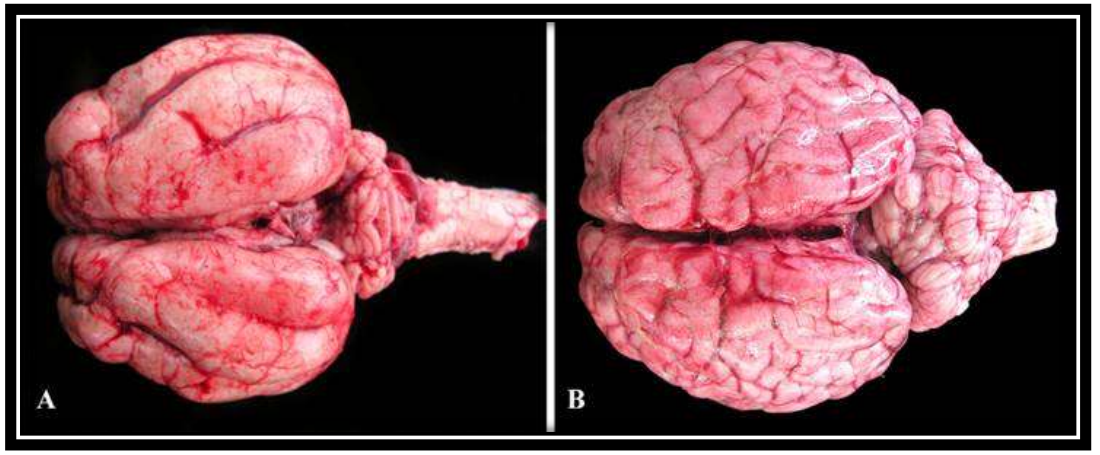
APLASIA (AGENESIS)

- Hereditary defects
- Accidental death of a cell at some critical point in the development of the individual
- Diseases like viruses or poisoning during intrauterine life like *Veratrum Californicum*

HYPOPLASIA

- Incomplete development of a tissue or an organ. The organ is congenitally small.
- The major causes of hypoplasia are **genetic defects**, **infectious agents** and certain **poisonous agents** which induce congenital abnormalities in intrauterine life.
- Observed in all organs (vital and paired organs)
- Hypoplasia of the cerebellum is frequently observed in kittens, lambs and calves due to intrauterine viral infections during gestation. e.g.(blue tongue, Panleukopenia,..)





ATROPHY

- Atrophy is the decrease in the mass of a tissue or organ due to decreased size and/or number of cells after it has reached its normal size.

- Decrease in cell size = volumetric atrophy

Decrease in cell number = Numeric atrophy

Decrease in cell size and number = atrophy

- Atrophy can be physiologic and pathologic, systemic and local.

- Physiological atrophy is a function of the *growth changes* of an organism.

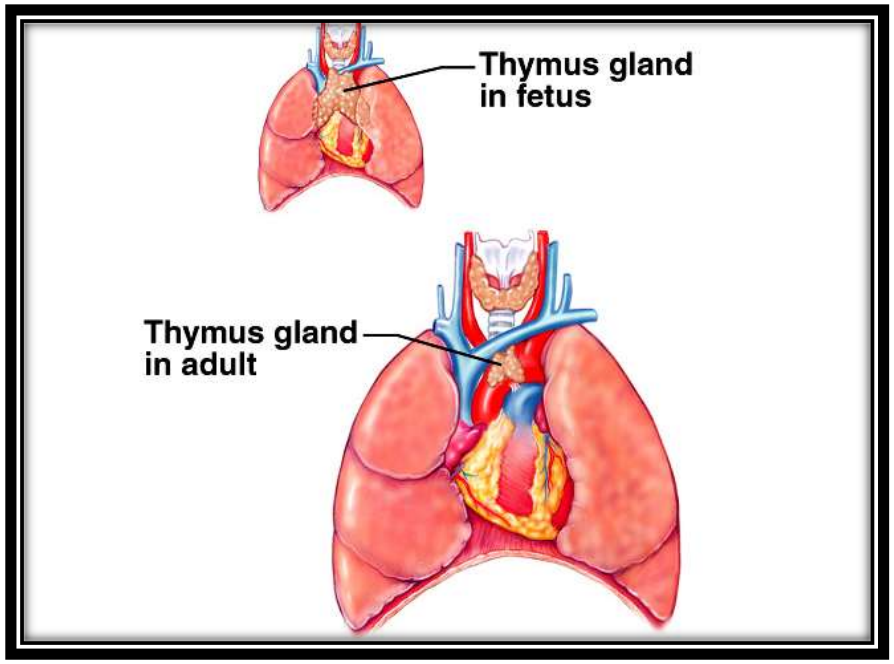
ATROPHY

- ✓ Atrophic organs are smaller than normal. Because the cells are smaller, the microscopic field may appear to be more cellular.
- ✓ Atrophic parenchymal cells, particularly in the heart and liver, may progressively accumulate a yellow, granular, lipid containing pigment (lipofuscin). Lipofuscin is derived from progressive oxidation of lipids. It is found within the cytoplasm of cells.
- ✓ In atrophic organs parenchymal elements may be partially replaced by connective tissue.
- ✓ Microscopically vessels may appear prominent and increased in number but it is actually due to the parenchyma decrease.

PHYSIOLOGICAL ATROPHY

Local physiological atrophy

- Atrophy of the thymus during puberty
- Atrophy of uterus after parturition takes place.



Systemic physiological atrophy

Senile atrophy

- Atrophy of the sex glands, skin, and bones in old people

PATHOLOGICAL ATROPHY

Local pathologic atrophy

- Can be caused by:

✓ Decreased workload (disuse atrophy)

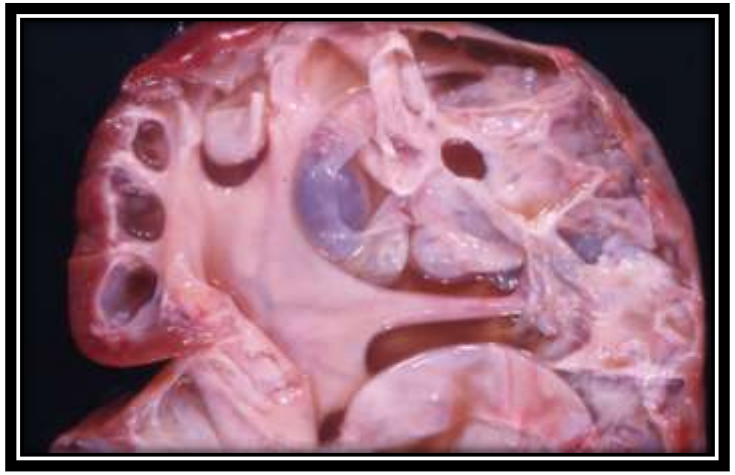
✓ Insufficient supply of blood (e.g., atrophy of the brain cortex during atherosclerosis of the blood vessels of the brain)

✓ Loss of hormonal stimulation (e.g. atrophy of the adrenals due to destruction of pituitary glands)

✓ Denervation (especially in skeletal muscles),

✓ Compression (e.g., neoplasms, or distended body cavities).

✓ Exhaustion (prolonged overwork of an organ may be followed by atrophy)

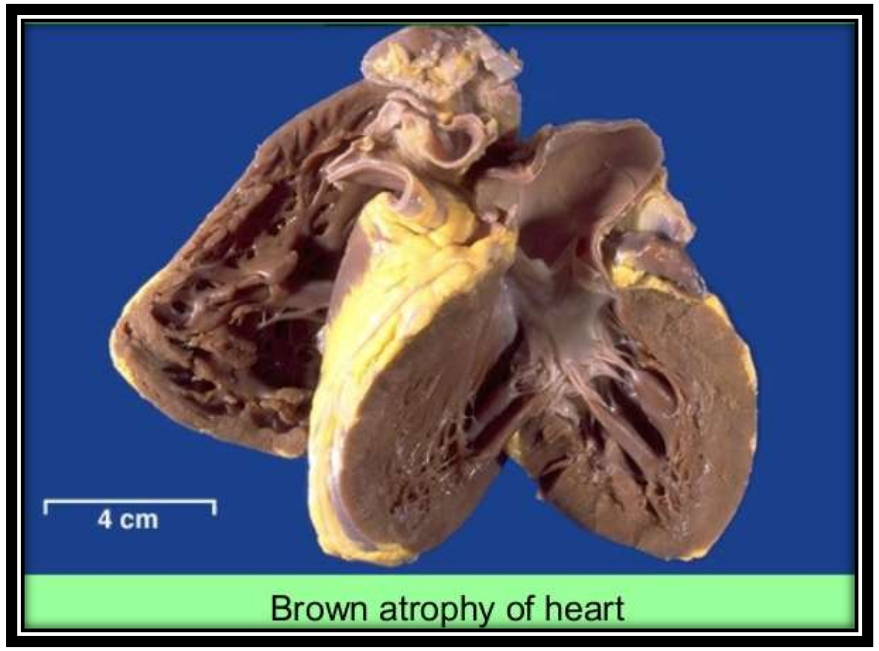


Systemic pathologic atrophy

- Appears in cases of:
- ✓ Insufficient nutrition,
- ✓ Chronic infection or intoxication
- ✓ Disorders of the endocrine glands or of the central nervous system

Atrophy results

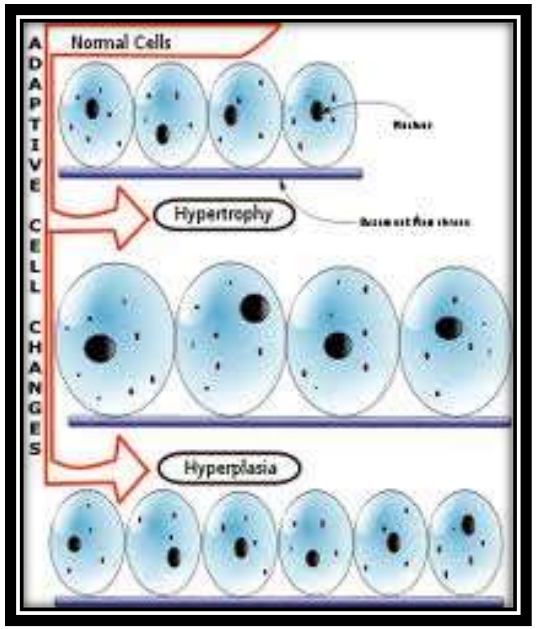
1. **Fibrosis** ; when parenchymal elements are replaced with connective tissue
2. **Pseudotrophy:** when parenchymal elements are replaced with adipose tissue. The organ may look bigger than normal.
3. **Serous atrophy:** fat cells are atrophic and replaced by proteinaceous fluid which converts the fat depots to gelatinous masses.
4. **Brown atrophy**: atrophic parenchymal cells, particularly in the heart and liver, accumulate lipofuscin pigment.



HYPERTROPHY AND HYPERPLASIA

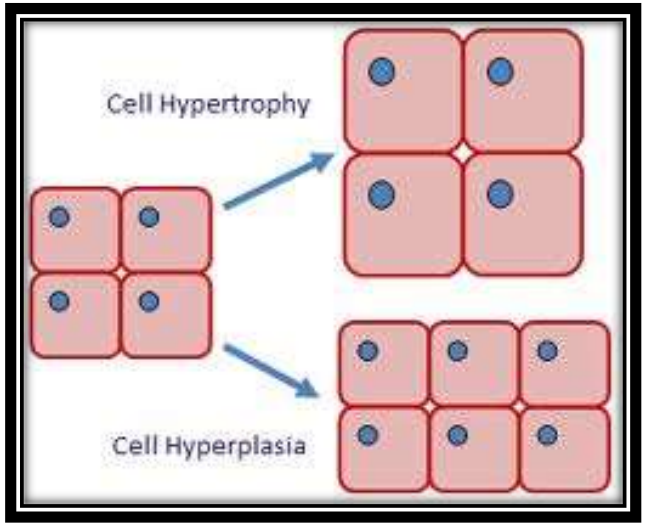
Hypertrophy

- Increase in the size of a tissue or organ by enlargement of the existing cells.



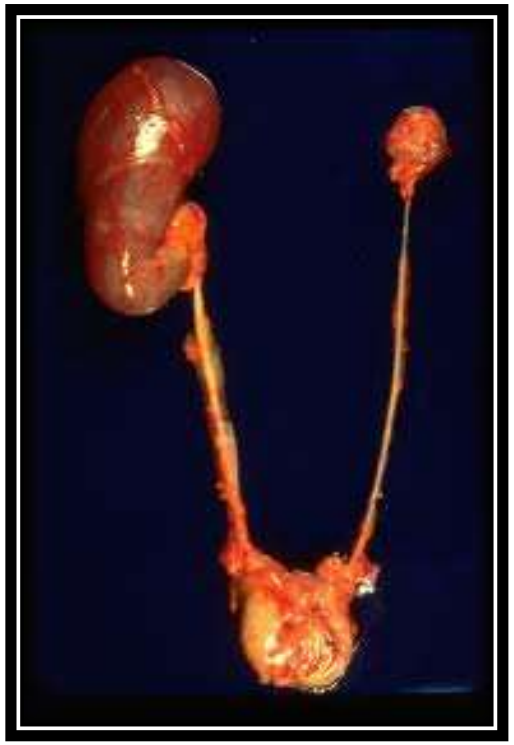
Hyperplasia

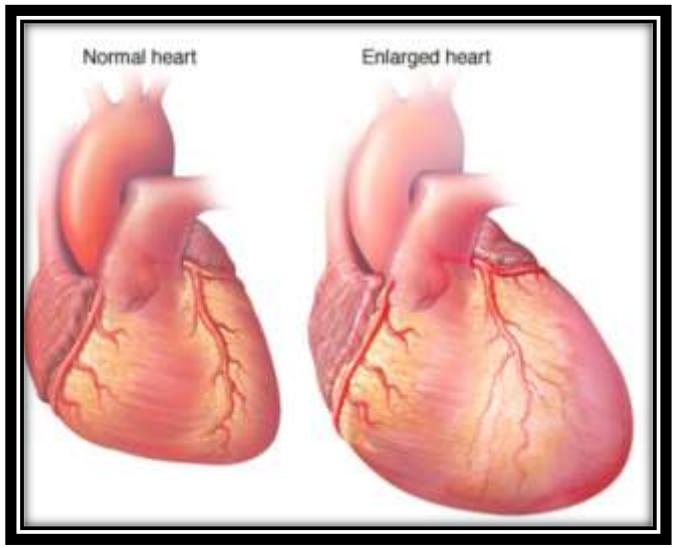
- Increase in the size of a tissue or organ as a result of an abnormal increase in the number of cells.



ETIOLOGY OF HYPERTROPHY

- Hormonal hypertrophy (e.g. Hypertrophy of the muscles due to the effect of testosterone)
- Compensatory hypertrophy (Increase in the size of an organ or volume of a tissue following loss or malfunction of the paired organ.





ETIOLOGY OF HYPERPLASIA

- Physiologic hyperplasia

- Hormonal hyperplasia; e.g. estrogen-dependent uterine cells undergo hyperplasia and hypertrophy following pregnancy.
- Compensatory hyperplasia; e.g. liver mass restoration after being resected

- Pathologic hyperplasia

- Hormonal imbalances; e.g. estrogen-progesterone imbalance leading to endometrial hyperplasia in female dog.
- Chronic irritation (e.g. Cutaneous hyperplasia, hyperplasia of the bile ducts in coccidiosis of the rabbit.
- Chronic infections

ETIOLOGY OF HYPERPLASIA

Nodular hyperplasia

Encountered commonly in certain organs (e.g., liver, pancreas, or spleen).

Especially in older dogs.

https://www.vetbook.org/wiki/dog/index.php/Splenic_nodular_hyperplasia

METAPLASIA

- The transformation of **fully differentiated** normal adult tissue into another related type of differentiated adult tissue.
- The change occurs only to cell types from the **same germ layers** and is an alteration from a **less specialized** cell type to **more specialized** cell types.
- Metaplasia occurs in **epithelial** and **connective** tissue.

METAPLASIA

Metaplasia in epithelial tissue

Tissue	Normal	Metaplasia
Airways	Pseudostratified columnar epithelium	Squamous epithelium
Esophagus	Columnar epithelium	Squamous epithelium
Urinary bladder	Transitional epithelium	Squamous epithelium
Cervix	Glandular epithelium	Squamous epithelium

METAPLASIA

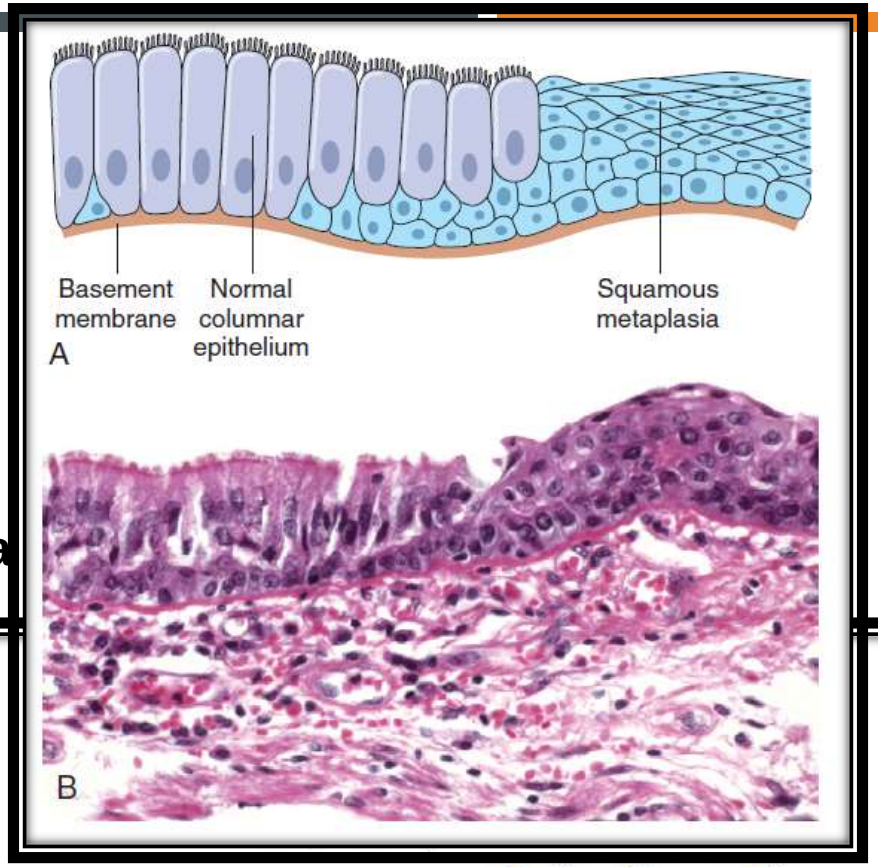
Metaplasia in connective tissue

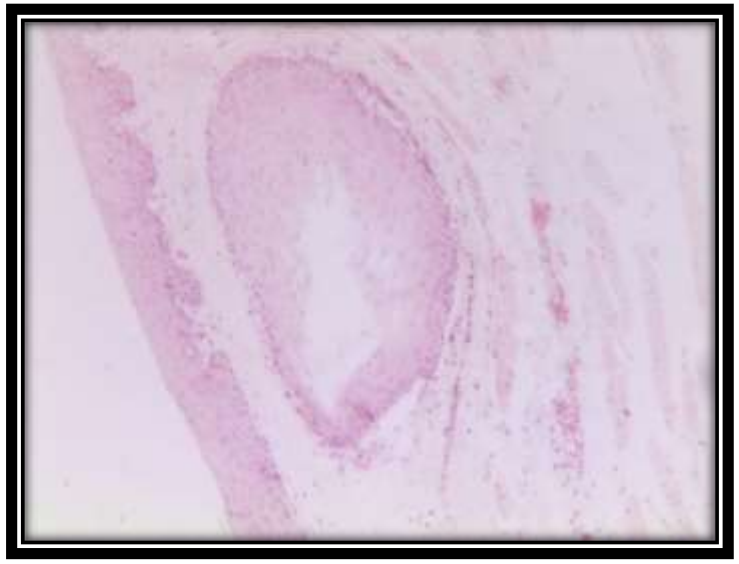
These changes are specially seen in mixed tumours, mammary gland tumours of bitches, tendinitis, etc.

CAUSES OF METAPLASIA

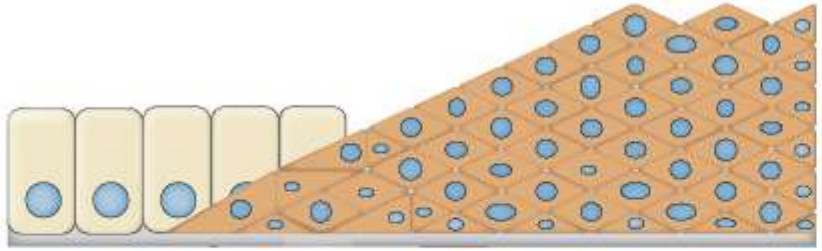
- Vitamin A deficiency (Vitamin A is *necessary for normal differentiation of stratified squamous epithelium*, deficiency or absence of Vit A leads to Squamous metaplasia of the epithelial lining of the glands and ducts)
- Chronic irritations (e.g. the respiratory epithelium lining the trachea, bronchi and bronchioles replaced by stratified squamous epithelium)
- Chronic infections (Metaplasia can occur under the influence of toxins secreted by microorganisms)
- Hormonal imbalance (e.g. estrogen-induced squamous metaplasia in the prostate gland)
- Chronic inflammation (e.g. mammary ducts in chronic mastitis)
- Function changes (Cells are replaced by more resistant ones. e.g. ossification of cartilage and tendons)

Metaplasia of normal columnar to squamous epithelium in a bronchus

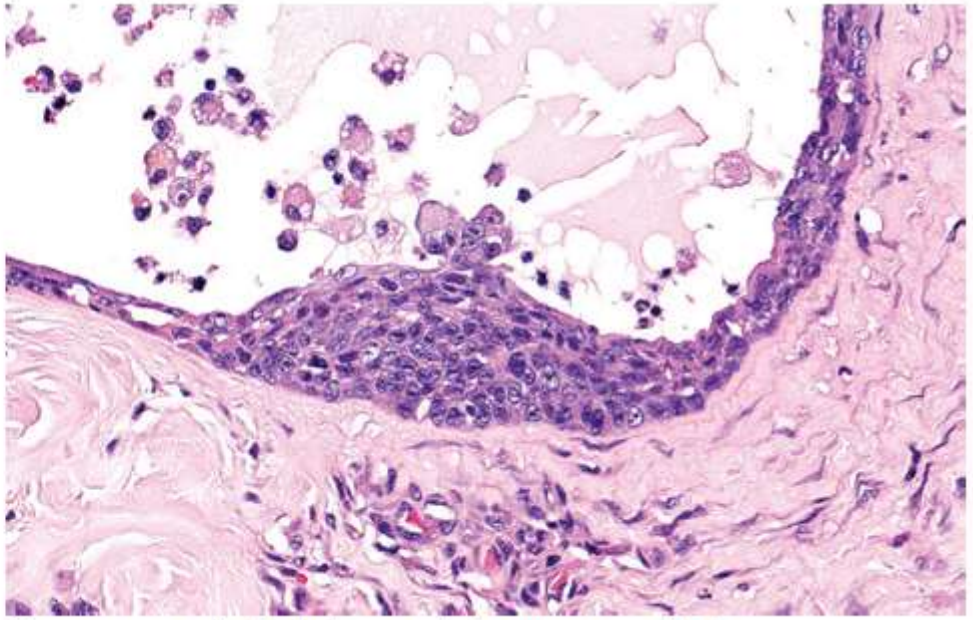




Hypovitaminosis A, oesophagus, chicken



Healing after mastitis
(low columnar → squamous)



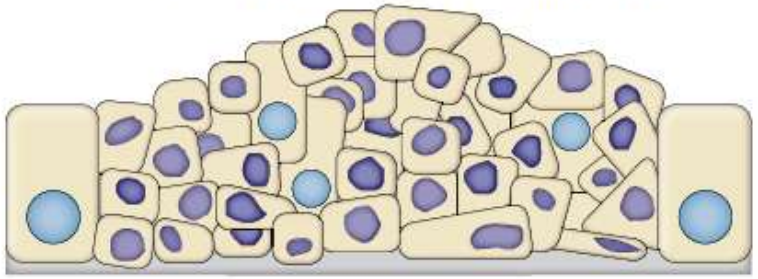
Squamous metaplasia in an ectatic mammary duct

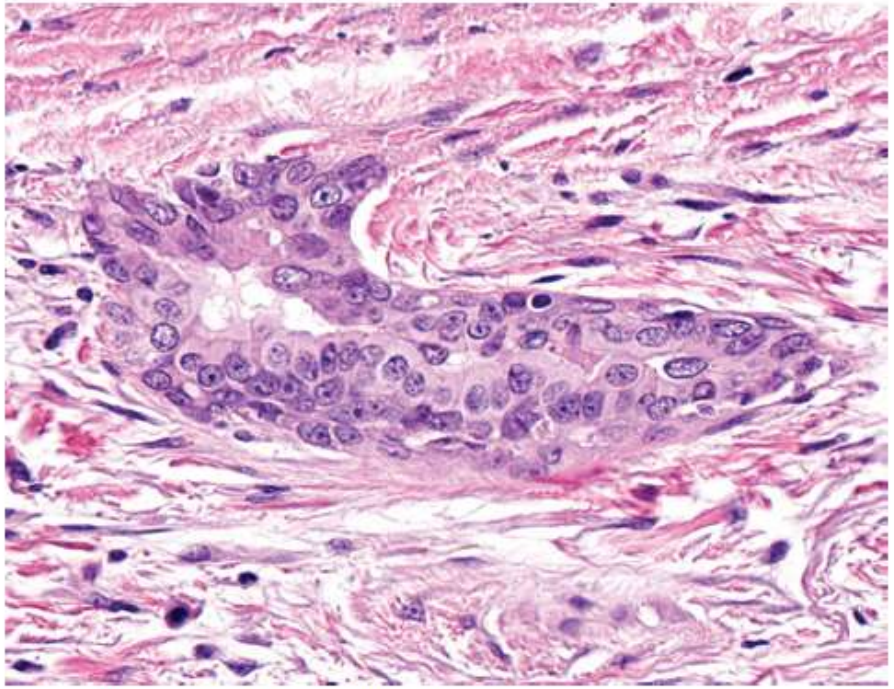
DYSPLASIA

- Dysplasia implies an abnormality in formation of a tissue. For example, *renal dysplasia* is the abnormal formation of the kidney.
- Refers to a loss of architectural orientation of cells or *loss in uniformity* of individual cells or both.
- Microscopically, dysplastic epithelial cells have atypical features, such as abnormal variation in size (anisocytosis) and shape (poikilocytosis), hyperchromatic nuclei, increased nuclear size (karyomegaly), and increased number of mitotic figures.
- Dysplasia is associated with chronic irritation and inflammation but may be due to nutritional disorders.

DYSPLASIA

Dysplasia (abnormal pattern of tissue growth, disorderly arrangement of cells within epithelium)





Dysplasia (atypical ductal hyperplasia)