CELL PATHOLOGY AND AGEING

CELLULAR RESPONSE

Stimuli

1. Altered Physiologic stimuli OR Non-Lethal Stimuli } → CELLUR ADAPTATION
   Eg : i) Atrophy
   ii) Hypertrophy
   iii) Hyperplasia
   iv) Metaplasia
2. Lethal Stimuli - Transient : Reversible Cell injury
   Lethal Stimuli - Persistent : Irreversible injury
   ↓
   Cell death
   ↓
   MORPHOLOGICAL CHANGES : NECROSIS, APOPTOSIS, NECROPTOSIS, PYROPTOSIS
3. Chronic Injury Stimuli : Intracellular accumulation
   Eg: Fats, Glycogen, Proteins
   ⇒ Calcification
4. Sublethal Stimuli : Persistent : Induce Cellular ageing

CELLULAR ADAPTATIONS

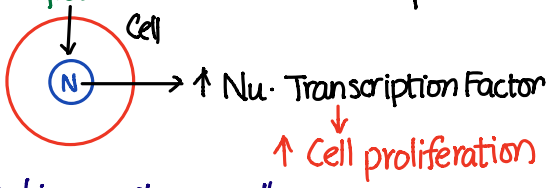
- Stimuli → Cell → Change in their Number, Size, Phenotype, functions
  ↓
  Removal → Come back to (N) State
  ∴ CELLULAR ADAPTATIONS ARE REVERSIBLE
- These are both Physiologic & Pathologic
  ↓ ↓
  Pregnant Uterus, Barrett's Esophagus

HYPERTROPHY

- definition : Size of cell ↑ but Number of cell same
- Mechanism : ↑ in synthesis of cellular protein
- Is also both Physiological & Pathological
  ↓ ↓
  Eg: Pregnant uterus (both hypertrophy & hyperplasia)
  Eg : Cardiac Enlargement d/t Valvular defect.

HYPERPLASIA

- def : No. of cell Increased. But size of cell remains same
- Mechanism : i) ↑ Growth Factor : Most important mechanism



ii) ↑ tissue stem cells
↓
↑ no. of cells

- Both Physiologic & Pathological

Physiologic:
- Pregnant uterus
- Pregnant Breast
- Compensatory Hyperplasia
  - Liver regeneration after Liver Resection

Pathological:
- ↑↑ Estrogen on the endometrium
  ↓
  Endometrial Hyperplasia

ATROPHY

- def : Size & no. of cell are decreased.
- Mechanisms : i) ↓ protein synthesis
  ii) Ubiquitin Proteasome Degradation pathway ⟷ iii) Autophagy
  ↓ Self ↓ Eating

INTRACELLULAR PROTEIN DEGRADATION PATH WAY

Ubiquitin-Ligase activation
⇓
Ubiquitin
+
Target protein
↓

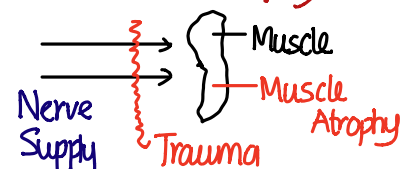
⊕ Activate proteasome (organelle)
⇓
degradation of Ubiquitin + Tar. protein
⇓
ATROPHY

These are taken in to
Double membrane bound Autophagosome
(Contain Ubi + Tar. pro)
↓
Combine with Lysosome
⇓
Degradation of Protein

- Both Physiologic & Pathological

Physiologic → during fetal development ⇓ loss of notochord & Thyroglossal duct

Pathological → Denervation atrophy



- Endometrial Adenocarcinoma a/w BOTH HYPERPLASIA & ATROPHY

HYPERPLASIA a/w Type-1 Endometrial Adenocarcinoma → Good Prognosis

ATROPHY a/w Type-2 Endo Adenocarcinoma → Poor prognosis

∴ Both are precancerous lesion

METAPLASIA

- def : 1 mature cell replaced by another type of mature cell
- Mechanism : CYTOKINE/GF → Alteration of tissue-stem cell Reprogramming
- Both Physiologic & Pathologic

Physiologic → In cervix (during menustruation) Squamous metaplasia at squamo columnar junction

Pathologic → EPITHELIAL / CONNECTIVE TISSUE/MESENCHYMAL META.

Eg : Myositis ossificans
Trauma → Mus. inj → Bone within muscle

• MC Type :

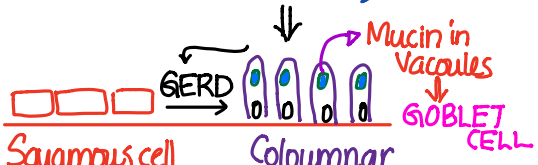
Smoking → Stress → ⊕ Tissue stem cell → Reprogramming → Squamous cell

Columnar Stem cell

Squamous Metaplasia of Resp. Tract
(MC Type of metaplasia)
d/t Vitamin A deficiency
Vitamin A excess

• BARRETT'S EOSOPHAGUS

- MCC : Gastro eosophageal Reflux Disease (GERD)



Columnar Metaplasia

- d/t to the presence of GOBLET CELL
aka INTESTINAL METAPLASIA
(Hallmark of Barrett's E.)
- Stain for GOBLET CELL :
Alcian Blue Stain : pH = 2.5 (acidic)
for intestinal Goblet : pH = alkaline