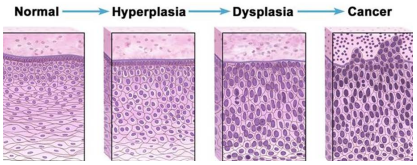
L28: NEOPLASIA

- cancer: a group of diseases, when homeostasis goes wrong
- baseline cell pop/cell no = proliferation ⇌ cell death (apoptosis)
  ↳ tissue function & architecture [differentiation, growth rate, local invasion, metastasis]
- neoplasia cells: transformed (loss reg & control), continue to replicate, regardless of envm
- neoplasm = tumour
- oncology: study of tumours
- hyperplasia: ↑ cell no in organ/tissue, normal under microscope, maybe no effect
- dysplasia: disordered growth, histologic change in neoplasm
  - loss cell uniformity & architectural organisation, mild-severe, abnormal (~ metaplasia) but ✗ cancer, antedate (precede) tumour dvlp, may/may not → cancer
- cancer: ✗ tissue function & architecture
  - anaplastic cells proliferate without control, invade nearby tissues, spread/metastasise via blood/lymphatic
- benign tumour = normal, hyperplasia, dysplasia
  - innocent behaviour, localised lesion, ✓ remove via surgical resection, patient typically survive (sometimes morbidity/lethal)
- malignant tumour = cancer
  - aggressive, invade & destroy adjacent tissues, ✓ spread (metastasis), not all cancers are deadly



Tumour

- neoplasic proliferating cells form parenchyma
  - originate from 1 transformed progenitor cell (parenchymal cells closely resemble 1 another)
  - determines tumour behaviour & name
- stroma: survival & proliferation of parenchymal cells (O2, nutrients, GF)
  - connective tissue, blood vessel, inflam cells (macrophage, lymphocytes), fibroblast
- benign vs malignant: differentiation, local invasion, metastasis

Cell of Origin	Benign	Malignant
gland epithelium	adenoma	adenocarcinoma
lining epithelium	papilloma	squamous cell carcinoma
fibroblast	fibroma	fibrosarcoma
osteoblast	osteoma	osteosarcoma
chondrocyte	chondroma	chondrosarcoma
lipocyte	lipoma	liposarcoma
smooth muscle	leiomyoma	leiomyosarcoma
skeletal muscle	rhabdomyoma	rhabdomyosarcoma

epithelial origin (carcinoma)

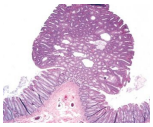
connective tissue / mesenchymal origin (carcinoma)

Mixed Tumours

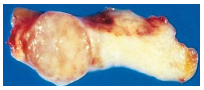
- monoclonal origin
- progenitor cells differentiate into several diff lineages → divergent differentiation
- ovary (ovarian cystic teratoma): hair, sebaceous material, tooth
- salivary gland mixed tumour

Benign Tumours

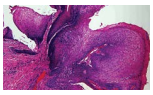
- well differentiated
- slow growing
- resemble tissue of origin
- localised to site of origin (well circumscribed, capsulated)
- ✗ spread to other sites
- amenable to local surgical removable
- ✗ risk to patient (unless interfere normal function of organs/affect vital organ)



colonic adenomatous polyp
polyp (project above mucosal surface to form visible structure)

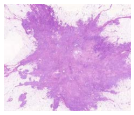


fibroadenoma of breast
encapsulated, ✗ spread

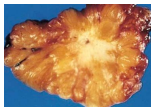


squamous cell papilloma (human papillomavirus HPV)
papilloma (project above mucosal surface to form finger-like projections)
on upperlip, palate, tongue, left nasal cavity

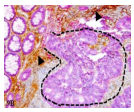
Malignant Tumours (Cancers)
- poorly/✗ differentiated (anaplastic)
- fast growing (abnormal nuclear morphology/cell size/shape, hyperchromatic - blue)
- invade & spread to surrounding tissues
  - remodel surrounding ECM
  - disrupt BM (E, MMPs, collagenase), GF, ECM protein
  - loosen/break ECM, synthesise new ECM/scaffold
- metastasis
  - spread of tumour cells to distant organs that's physically discontinuous from 1° tumour
  - metastasis tumour/2° tumour = same type of cancer as 1° tumour
- 1/2 patients ✓ cachexia (involuntary loss of lean body mass)
  - anorexia + loss adipose tissue & skeletal muscle mass
  - affect quality of life, ↓ survival
  - poor response to chemotherapy



invasive breast cancer
irregular infiltrative border
without capsule
intense stromal reaction



invasive ductal carcinoma of breast
retracted lesion, infiltrate surround breast,
stony hard on palpation (necrotic centre)



colorectal adenocarcinoma
tumour invade submosa

Metastasis
- 90% cancer death related to metastasis to vital organs
- 30% patients with solid tumour (excluding skin cancer other than melanomas) → metastases
- 20% hidden metastasis during diagnosis
- very rare metastases: basal cell carcinoma, brain tumour
- ↑ tendency to metastasize: melanomas, colorectal cancer, breast cancer
- blood cancers (leukaemia, lymphomas)
  - blood-forming cells travel to distant site via blood ⇨ disseminated disease, always malignant

Pathway of Spread
- circulatory system (blood, hematogenous)
  - mostly veins, sometimes arteries, systemic circulation [breast cancer]
- lymphatic system (lymphogenous)
  - local lymphatic drainage, sentinel/regional lymph nodes, systemic circulation [colorectal cancer]
- transcoelomic
  - via organ of origin into peritoneal, pleural, pericardial cavity [ovarian carcinoma, mesothelioma]
- chemotactic mechanism btw cancer cells & target organs
  - prostate → **bone marrow**, liver, lungs, brain
  - pancreas → **liver**, lungs
  - breast → **bone marrow, lungs**, liver, brain
  - colon → **liver**, lungs, bone marrow

neoplasm of myometrium