The Diagnosis of Cancer in the Pathology Laboratory

Dr Edward Sheffield

Christmas Select 74 Meeting, Queen's Hotel
Cheltenham, 3rd December 2014

Agenda

- Overview of the pathology of cancer
- How specimens are taken from patients
- The journey of a specimen from laboratory reception to a pathology report
- Discussion of specific tumour types

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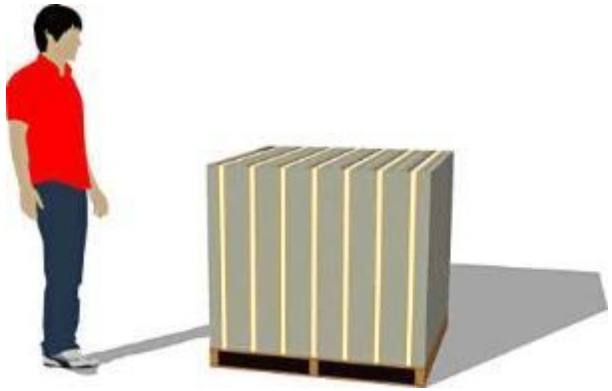
Overview of the pathology of Cancer

- A cellular problem
- Imbalance between cell production and cell loss
- Cell is a is fundamental biological unit
- Humans made of 37.2 trillion cells

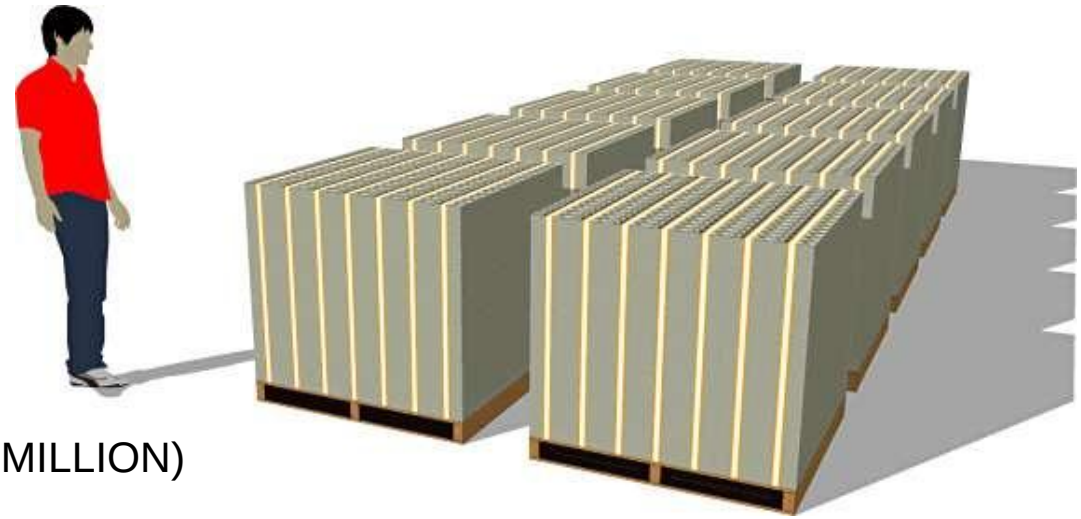
100

10 000

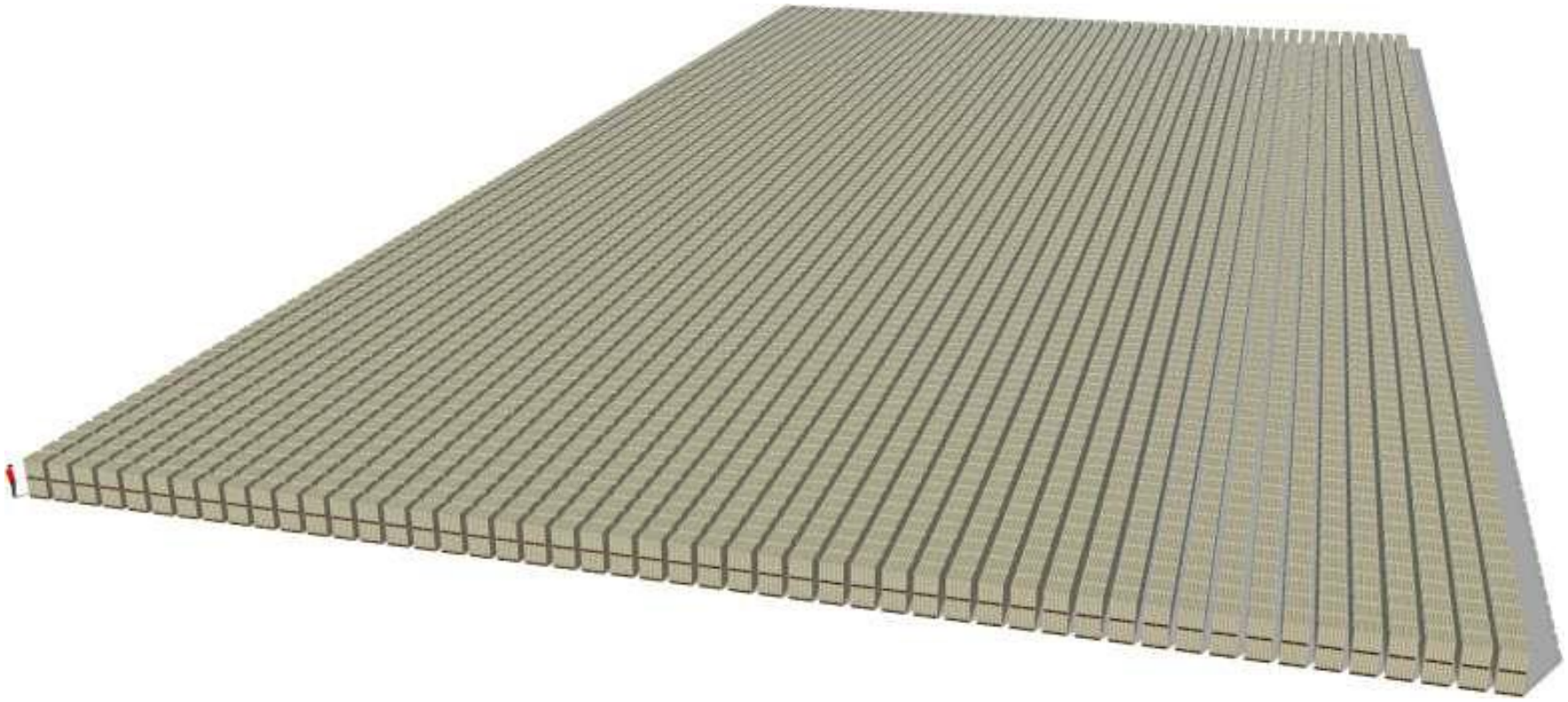
1 000 000



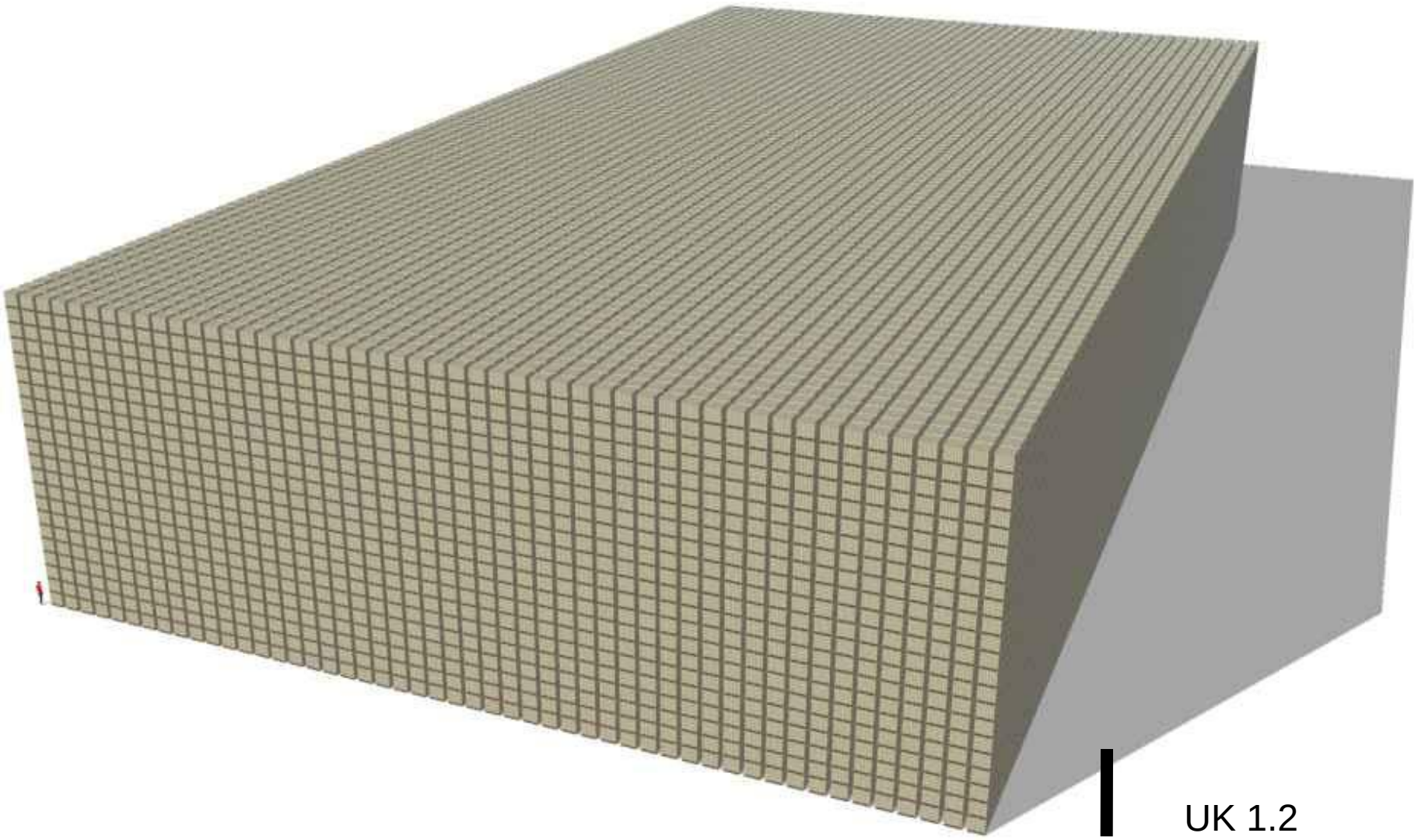
100 000 000



BILLION (1000 MILLION)



TRILLION (MILLION MILLION)



USA NATIONAL DEBT (11 TRILLION, 2009)

HUMAN BODY - 37.2 TRILLION CELLS

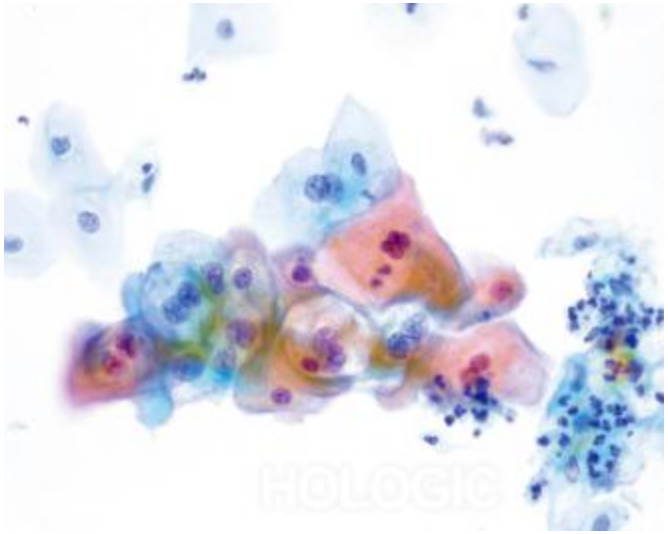
Overview of the pathology of Cancer

- **‘Stem cell’ problem**
- **May be a single cell origin**
- **‘Clonal’ – a genetic problem**
- **Imbalance between cell production (division) and cell loss (desquamation or programmed cell death,‘apoptosis’)**

50-70 billion cells /day lost

Overview of the pathology of Cancer

- **‘Neoplasia’ – benign or malignant**
- **Multi-step process**
- **Seen first down the microscope as cellular ‘dysplasia (dyskaryosis)’**

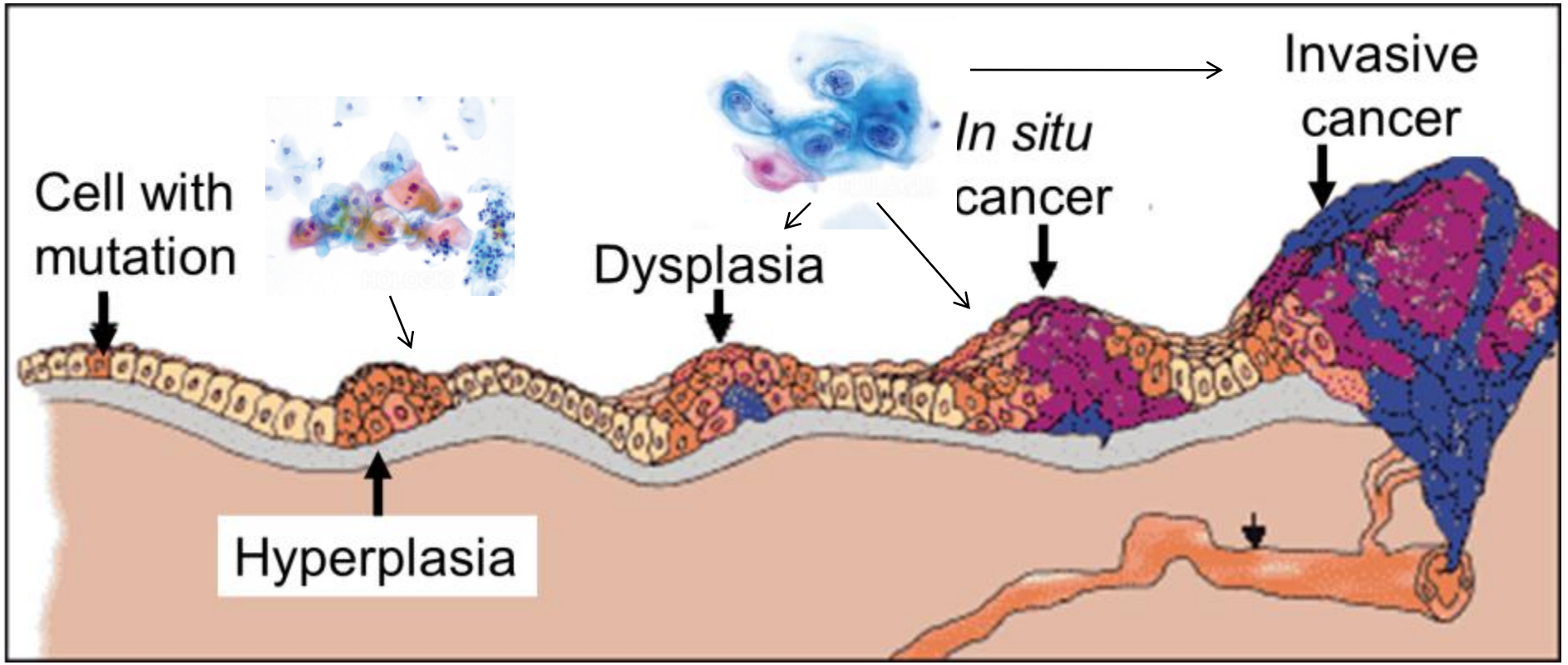


NORMAL (*CYTOLOGY SMEAR*) DYSPLASIA

MULTISTEP PROGRESSION OF NEOPLASIA

Carcinoma-in-situ *vs*. Invasive carcinoma

(similar in sarcoma but no basement membrane)



HISTOLOGY SECTION

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How specimens are taken from patients

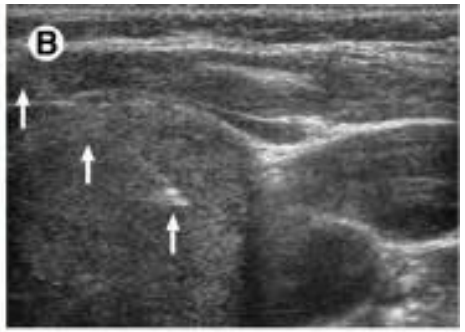
CYTOLOGY - Fine Needle Aspiration
Cell smears
Fluid aspiration

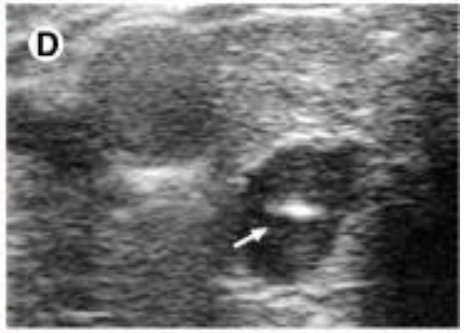
HISTOLOGY

BIOPSY – diagnostic, local excision, core

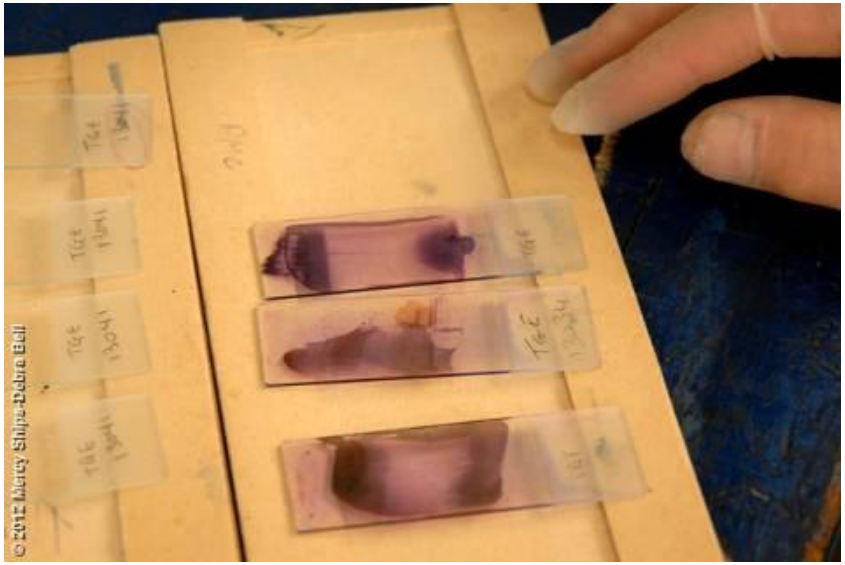
RESECTION

FINE NEEDLE ASPIRATION





Cytology specimen preparation



Histology specimen types

- Curettage and cautery
- Shave biopsy
- Punch biopsy
- Core biopsy
- Excision biopsy
- Resection

CORE BIOPSY

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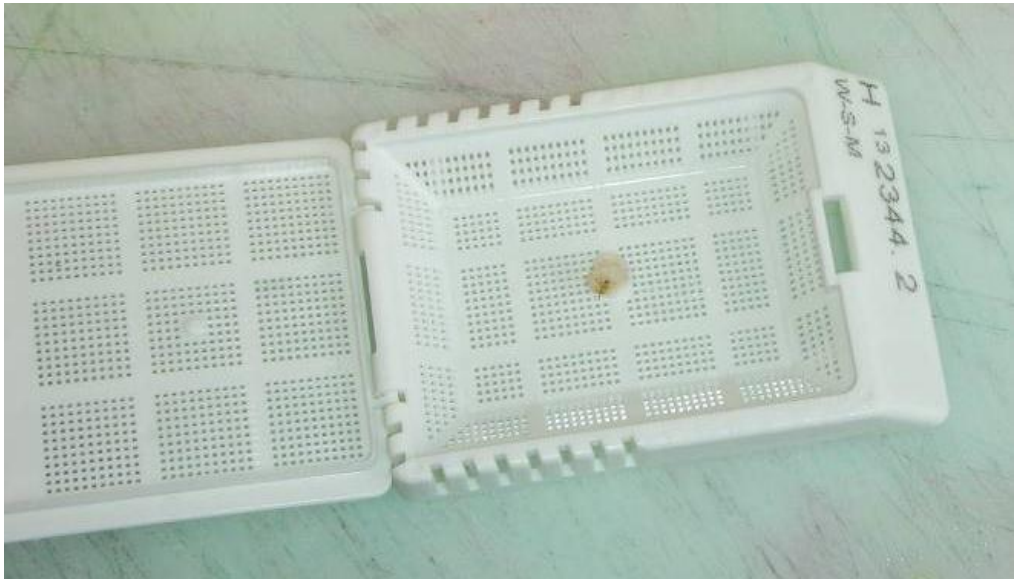
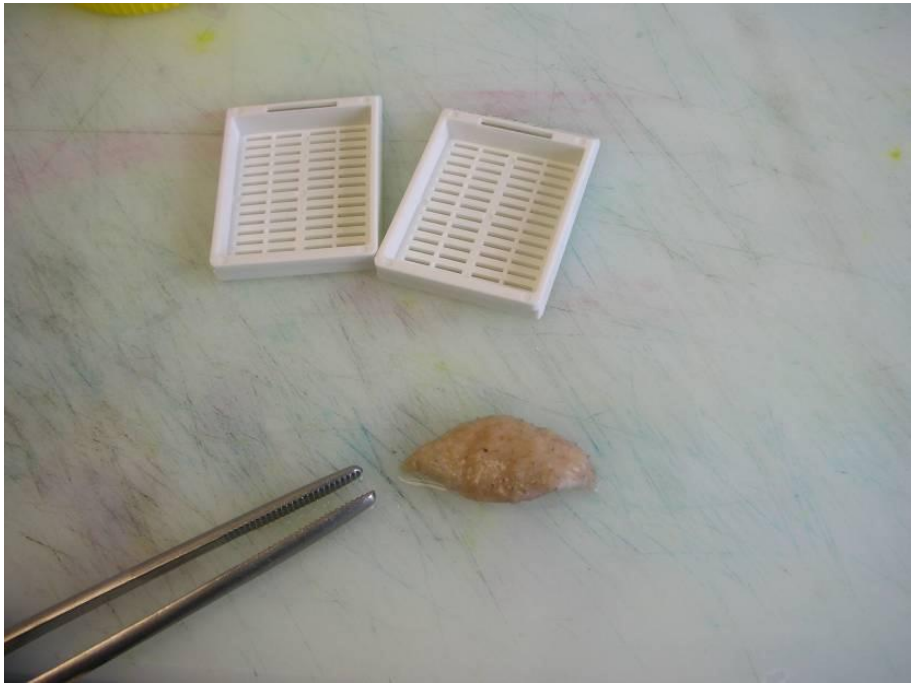


PUNCH BIOPSY SAMPLE

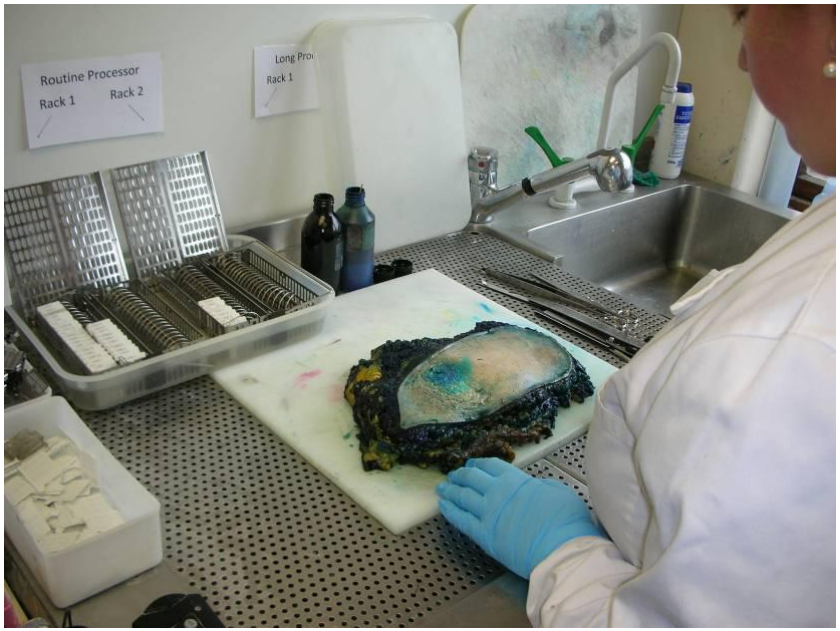
EXCISIONAL BIOPSY SAMPLE

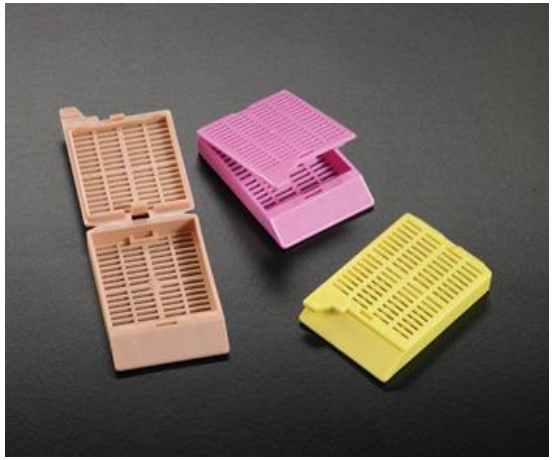


LARGE RESECTION

“Cut-up” small specimen

“Cut-up” large specimen

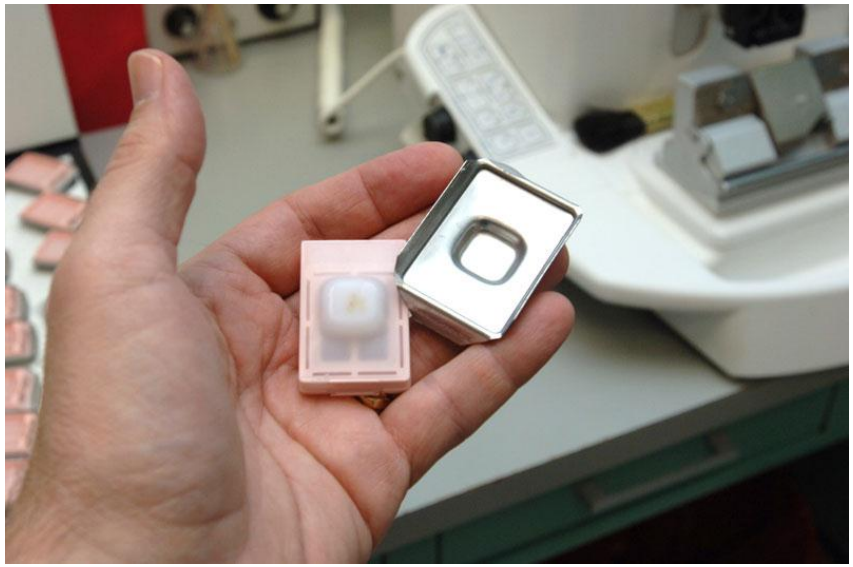


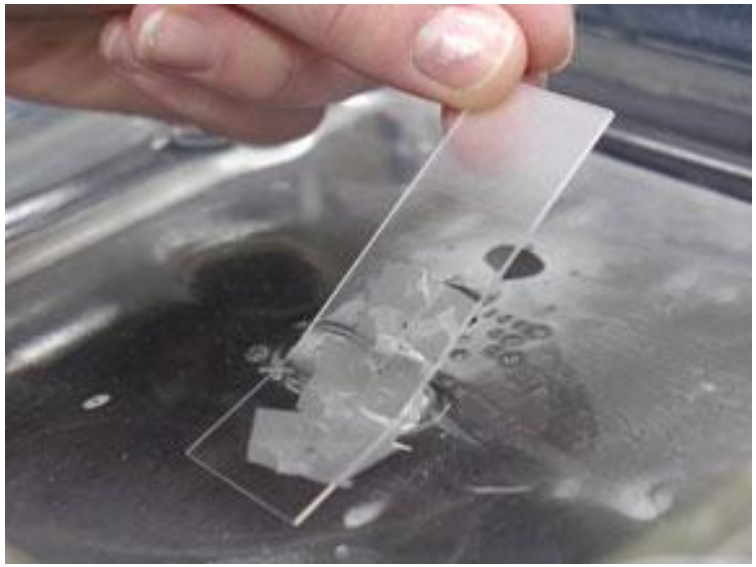


Processing to paraffin blocks

Embedding

Section cutting

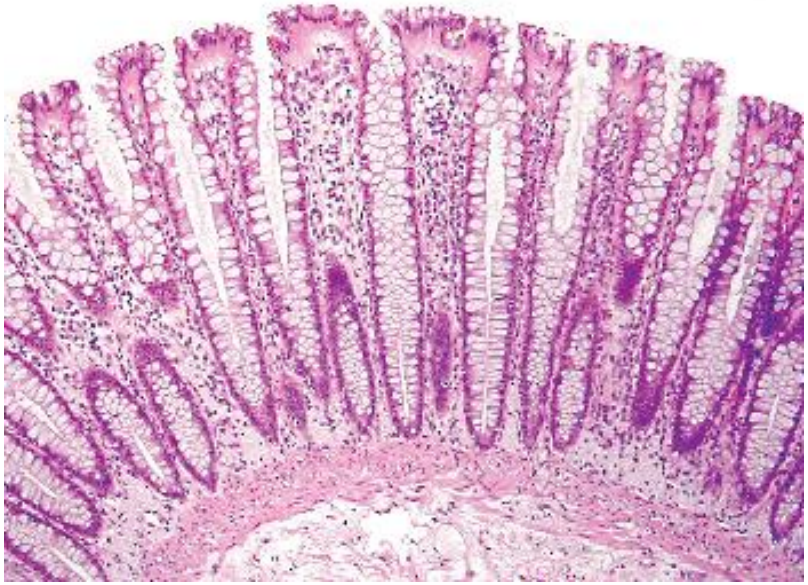




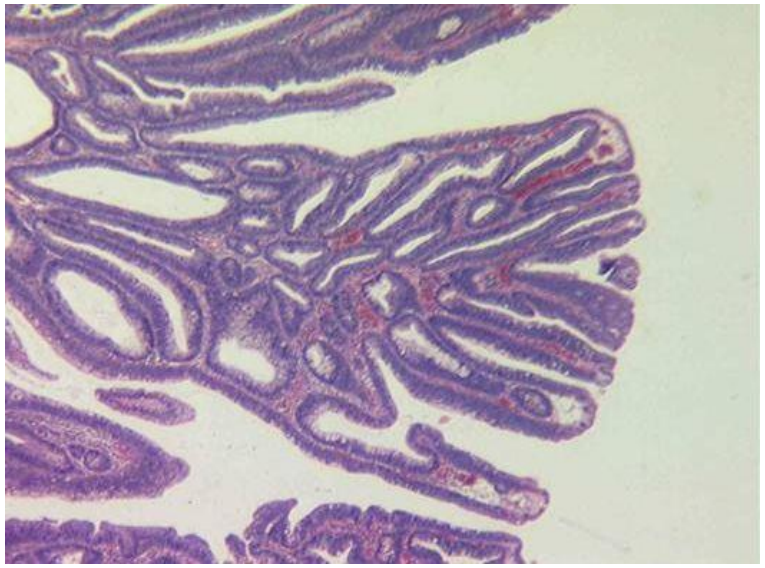
Final stained histology slide

Haematoxylin & Eosin

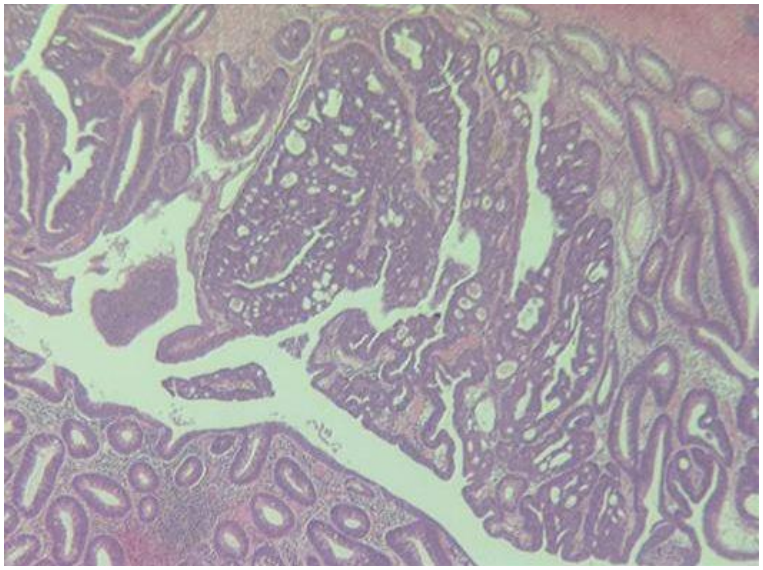
MICROSCOPIC EXAMINATION



Normal colorectal mucosa



Low-grade dysplasia



High-grade dysplasia

- **HISTOCHEMICAL STAINS**
- **IMMUNOCHEMISTRY**

  HORMONE RECEPTORS – breast cancer

- **GENETIC ANALYSIS OF SAMPLES**

  RAS, MSI – colon cancer

  EGFR – lung cancer

  BRAF - melanoma

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- **CLASSIFICATION**

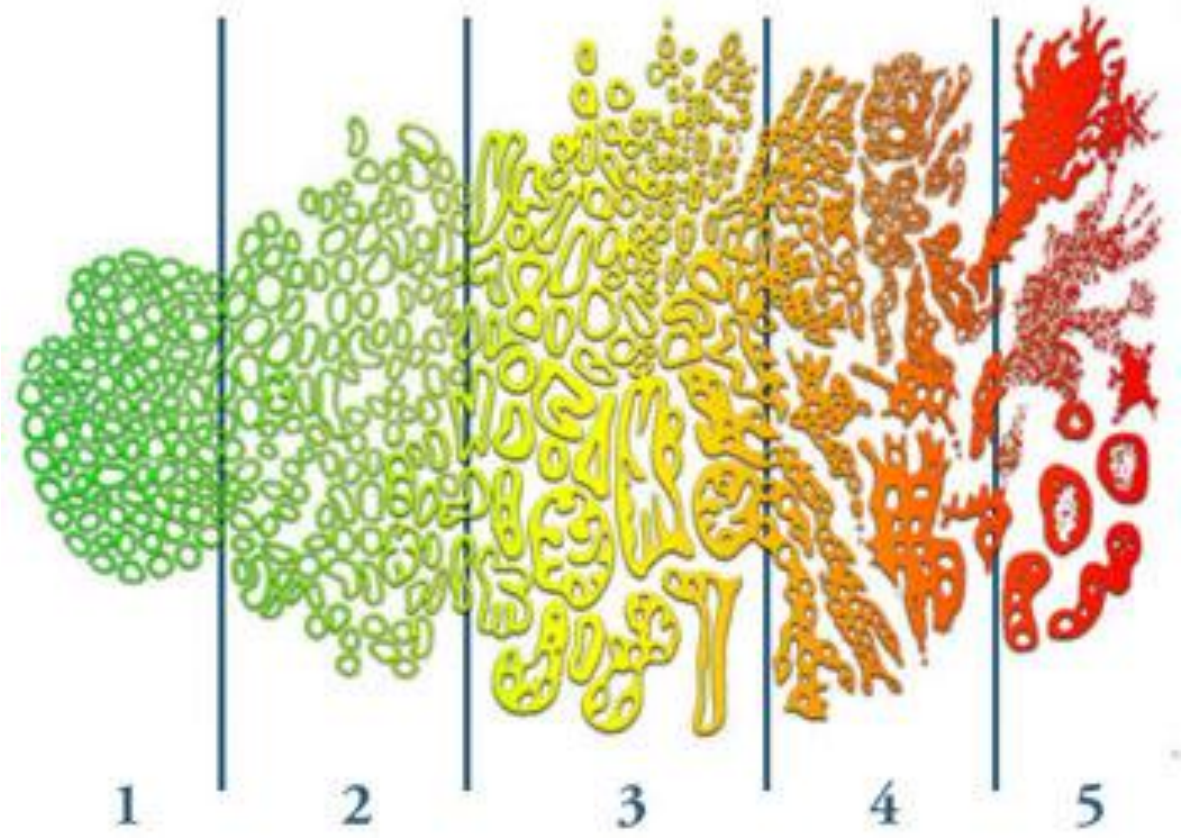
  Carcinoma **– epithelial (squamous, adenocarcinoma)**

  Sarcoma **- connective tissue (lymphoma, melanoma, mesothelioma, liposarcoma)**

- **GRADING**

- **STAGING**

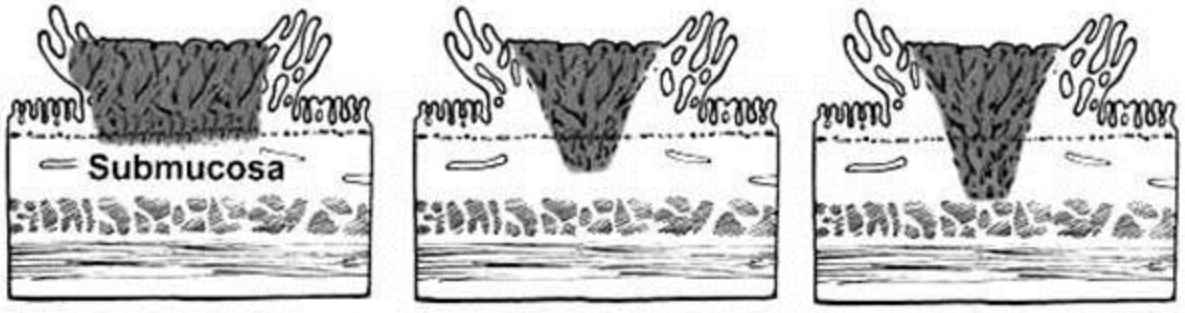
Prostate Carcinoma – Gleason Grade



STAGING-

CARCINOMA ARISING IN COLORECTAL POLYP

HAGGITT STAGING



KIKUCHI STAGING

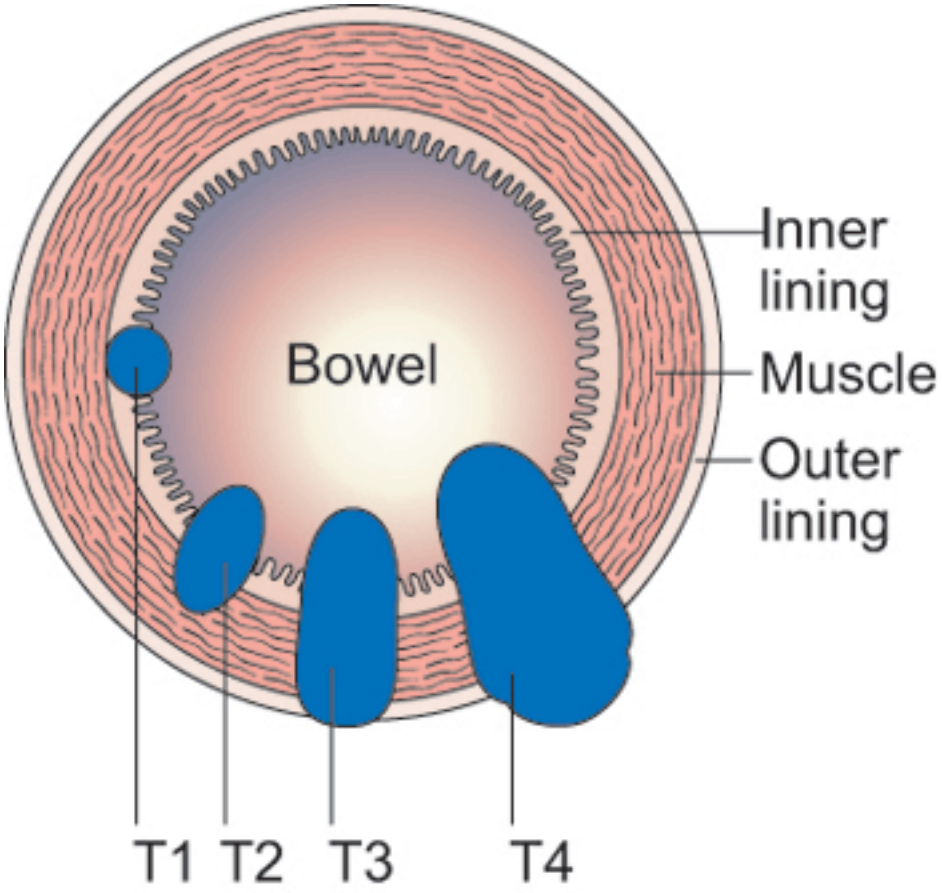
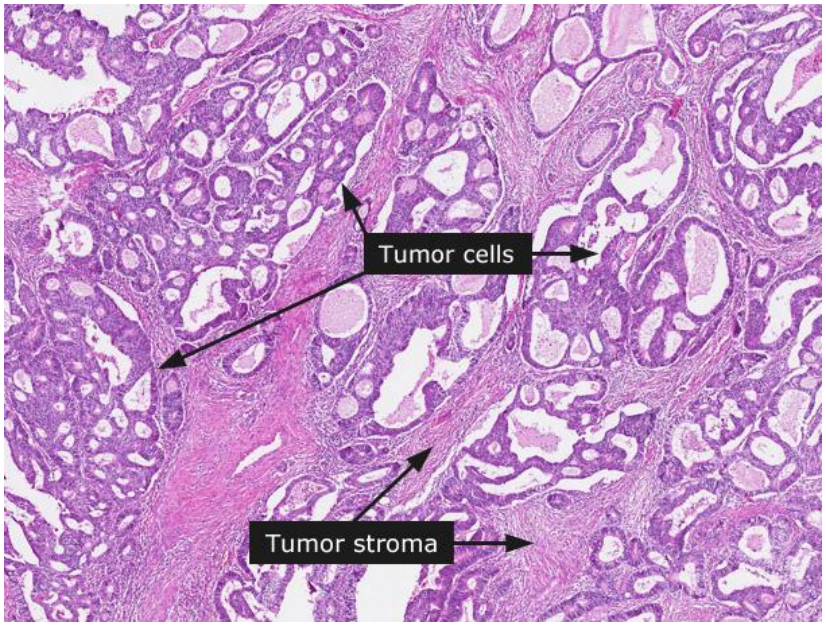
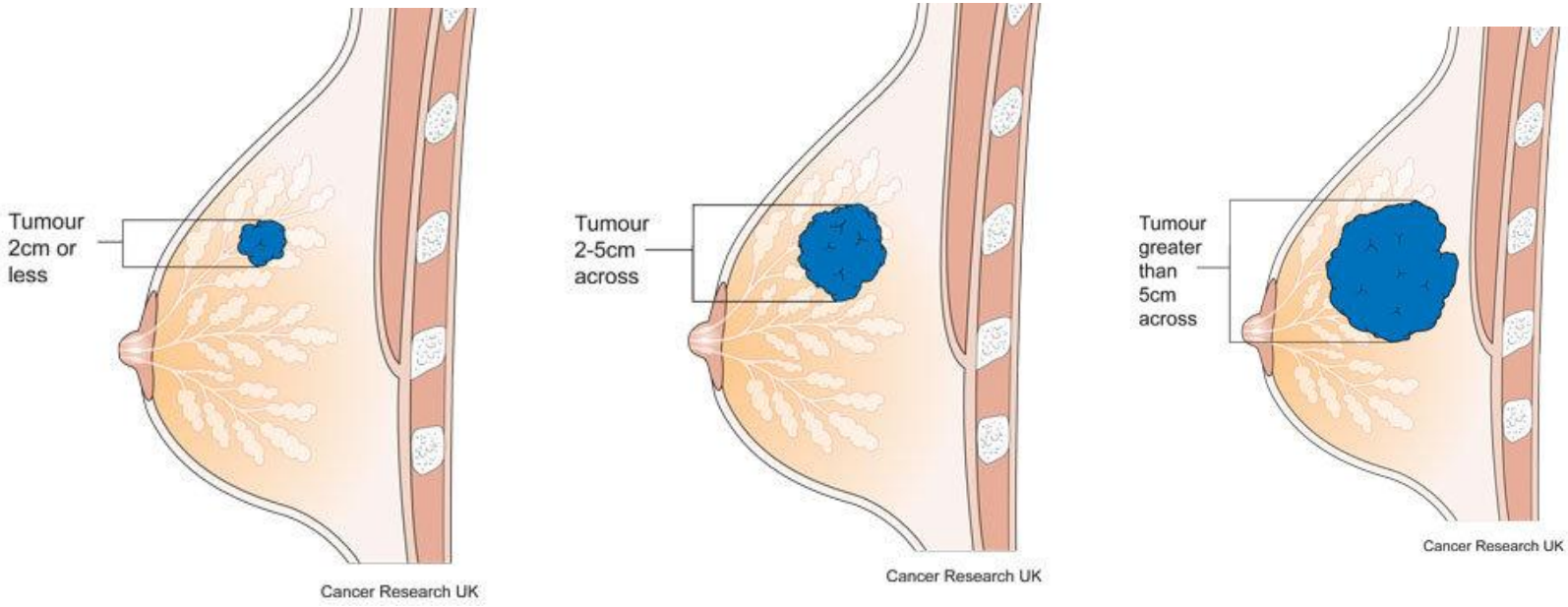


Diagram showing T stages of bowel cancer

Also DUKES system used

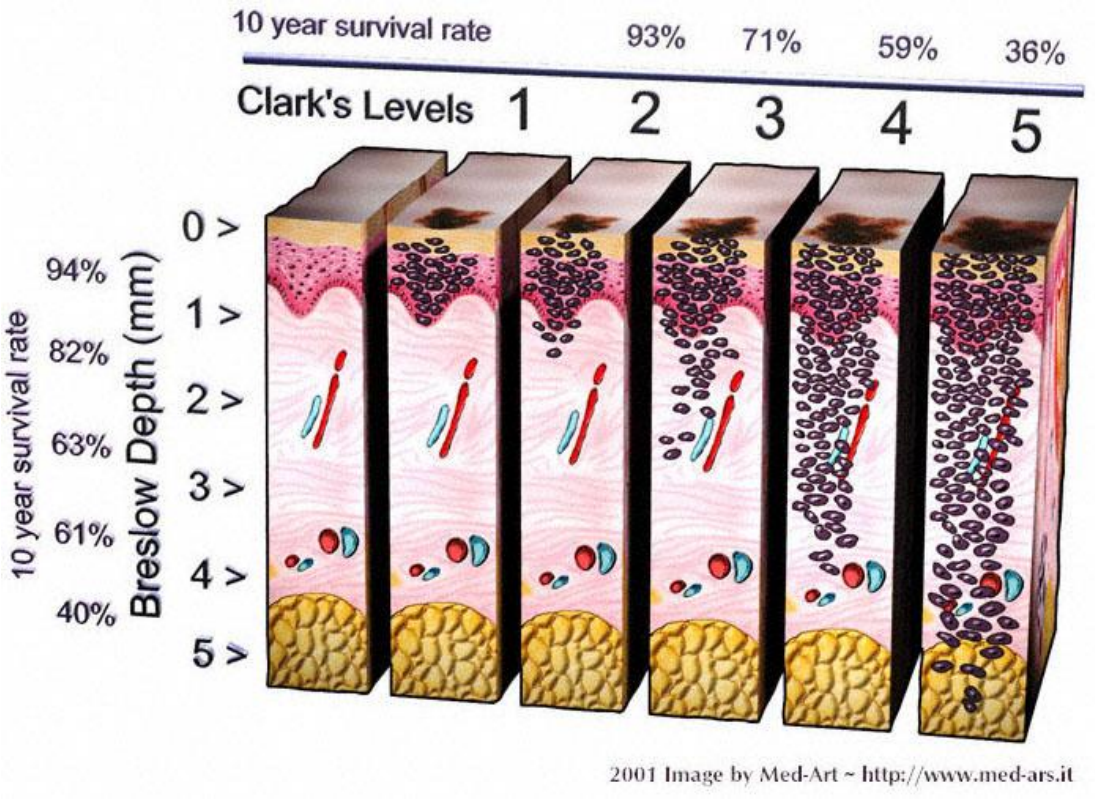


STAGING- BREAST CARCINOMA

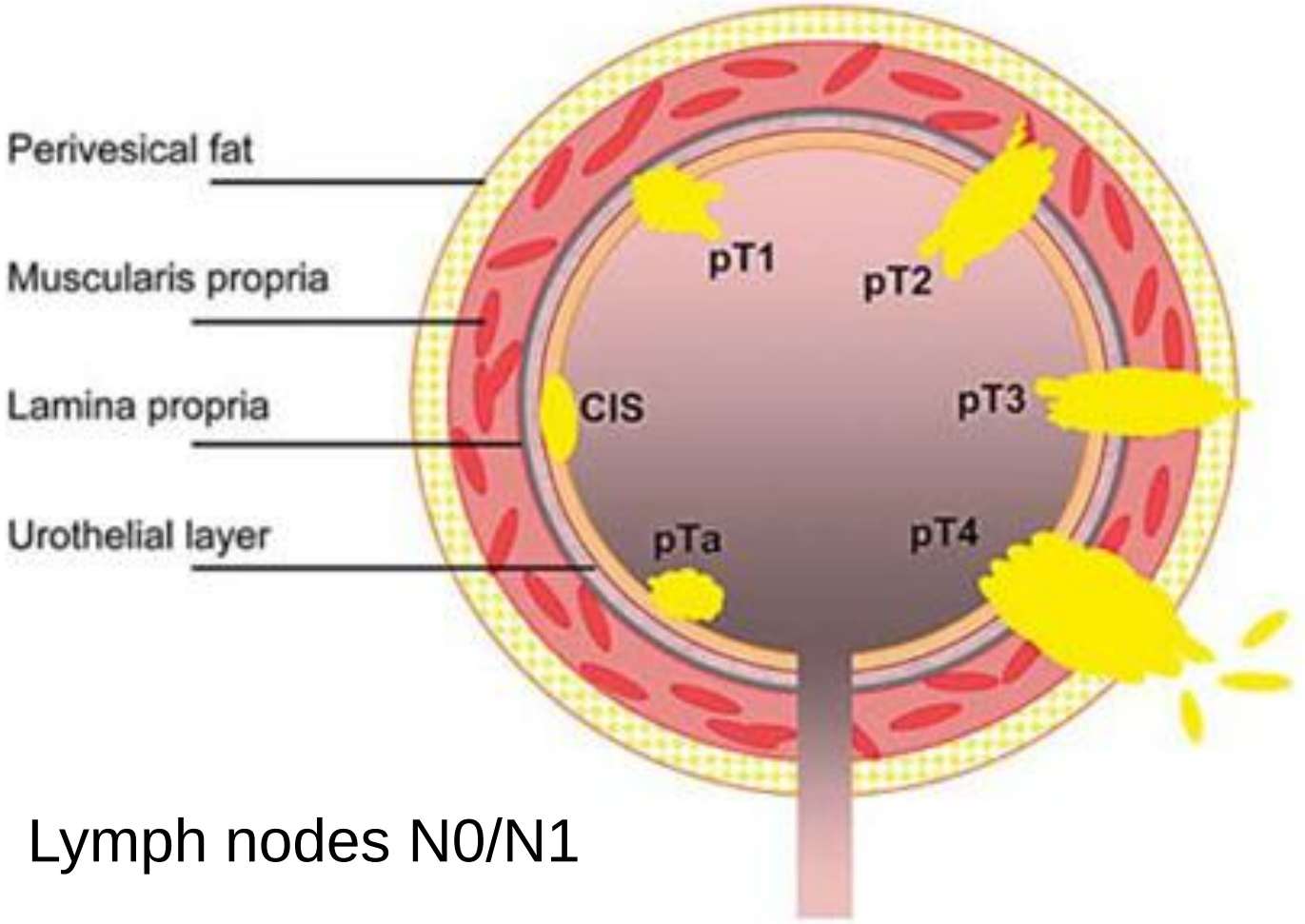


T4a – The tumour has spread into the chest wall
T4b – The tumour has spread into the skin and the breast may be swollen
T4c – The tumour has spread to both the skin and the chest wall
T4d – Inflammatory carcinoma – this is a cancer in which the overlying skin is red, swollen.

Melanoma


10 year survival rate
93%
71%
59%
36%
Clark's Levels 1 2 3 4 5
10 year survival rate
94%
82%
63%
61%
40%
Breslow Depth (mm)
0 >
1 >
2 >
3 >
4 >
5 >
2001 Image by Med-Art ~ http://www.med-ars.it

TRANSITIONAL CELL CARCINOMA OF BLADDER



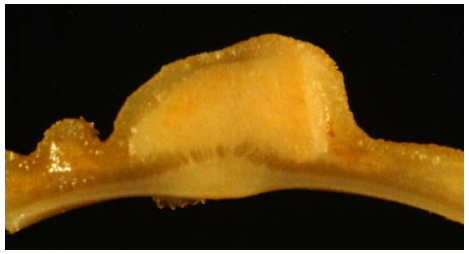
Lymph nodes N0/N1

BORDERLINE TUMOURS:

Basal Cell Carcinoma

BORDERLINE TUMOURS:

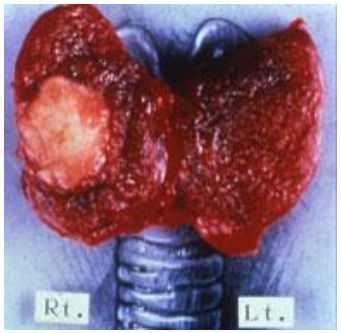
CARCINOID



DERMATOFIBROSARCOMA PROTUBERANS

MYCOSIS FUNGOIDES (SKIN LYMPHOMA)

PAPILLARY THYROID CARCINOMA



QUESTIONS ?