MED 505 B Lecture 4:
Neoplasia: Benign and Malignant Tumours

¶ 4.1

Normal Tissue + Accumulated Genetic Δ → Neoplasm (Tumour)

Changes in genes that control growth (Review Med 503 B).

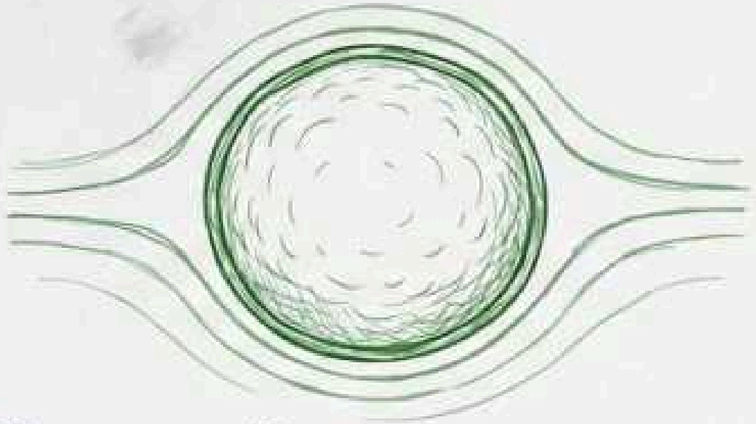
- Excessive Growth
- Uncoordinated with surrounding tissue
- Independent continues after starting stimulus is gone

Terminology Note: Tumour originally meant only a swelling.

Oncology = The study of neoplasms.

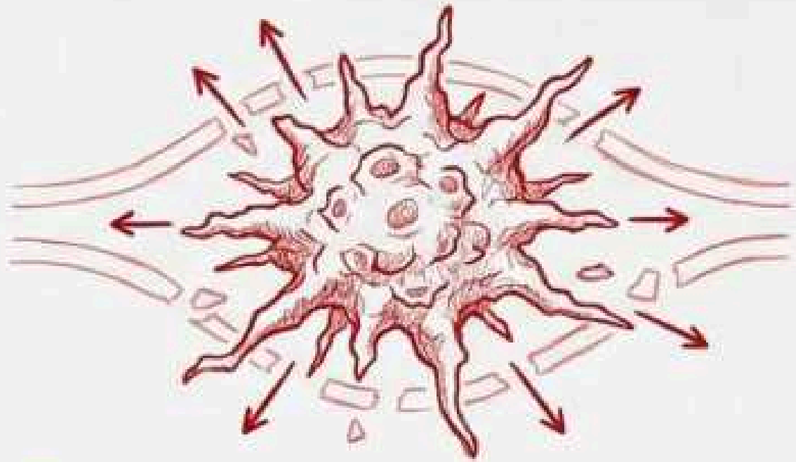
Benign vs. Malignant Tumours

Benign



- Slow growth
- Encapsulated
- Expansile (pushes neighbours aside)
- Localised (stays where it starts)

Malignant / Cancer



- Invasive
- Destructive
- Spreads to distant sites

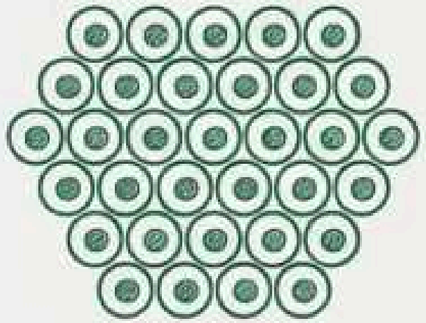
Benign ≠ Harmless

↳ Can cause serious problems by pressing on vital structures (e.g., brain) or overproducing hormones.

Differentiation & Anaplasia

¶ 4.3

Point A: Well-Differentiated
Resembles the normal tissue of origin

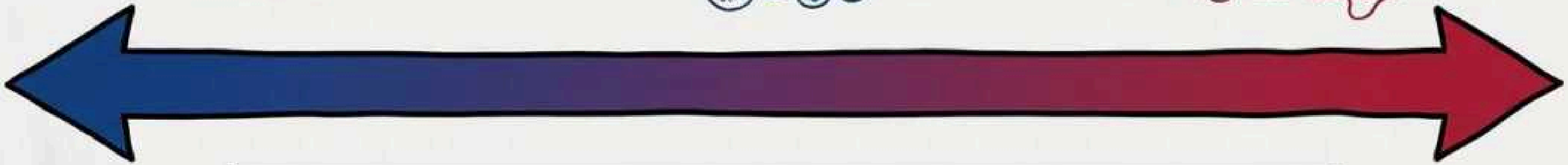


Point B: Poorly Differentiated
Primitive and disorganised



Point C: Anaplastic
Lost all resemblance to tissue of origin





↓ Cellular Differentiation = ↑ Tumour Aggressiveness

Tumour Nomenclature Rules

¶ 4.4

Tissue of Origin	Benign Tumour (-oma)	Malignant Tumour (Cancer)
Glandular	Adenoma	Adenocarcinoma
Epithelium (Surfaces/Glands)	[General -oma]	Carcinoma
Fat	Lipoma	Liposarcoma
Connective (Bone/Muscle)	Osteoma / Myoma	Sarcoma
Blood-forming	---	Leukaemia
Lymph Nodes	---	Lymphoma

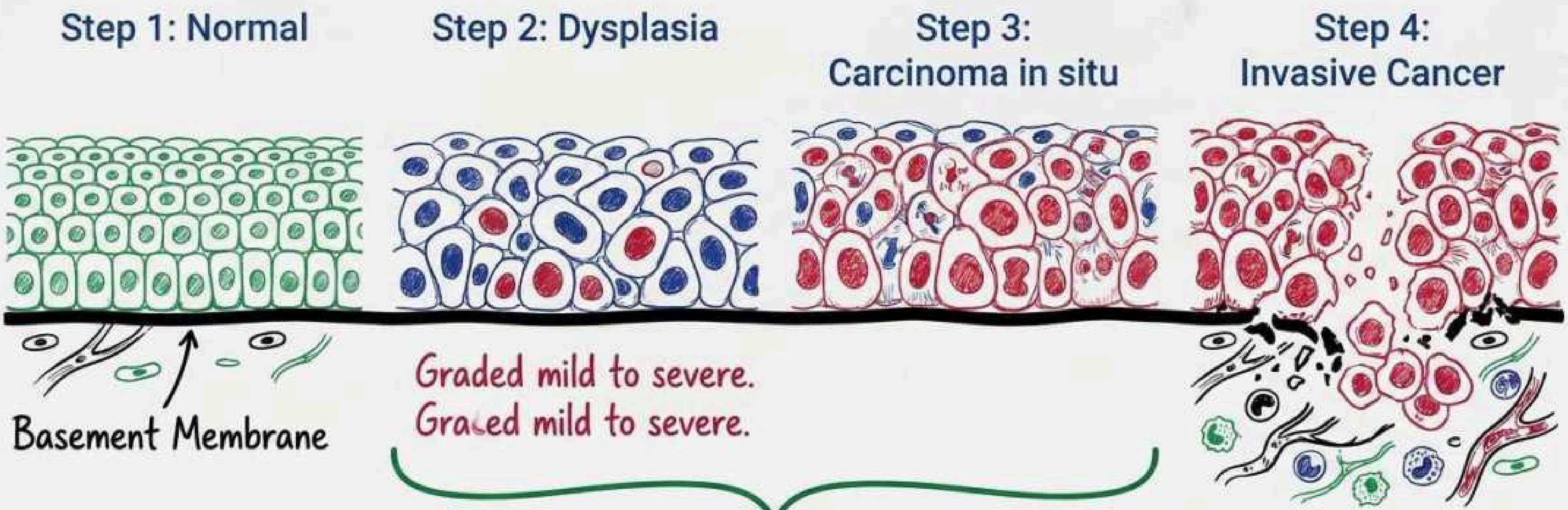
← By far the commonest cancers in adults

Rule Breaker: Melanoma

Despite the '-oma' suffix, it is always malignant.

¶ 4.5

The Stepwise Path to Carcinoma



Target of Screening Programmes (e.g., Cervical, Bowel).

Aim: Find and remove early changes before invasion occurs.

The Hallmarks of Cancer

¶ 4.6

(Hanahan & Weinberg, 2000)

1 — Self-Signalling:
Keeps signalling itself to grow (+∞)

2 — Ignores Stop Signs:
Bypasses anti-growth signals

3 — Escapes Apoptosis:
Evades programmed cell death

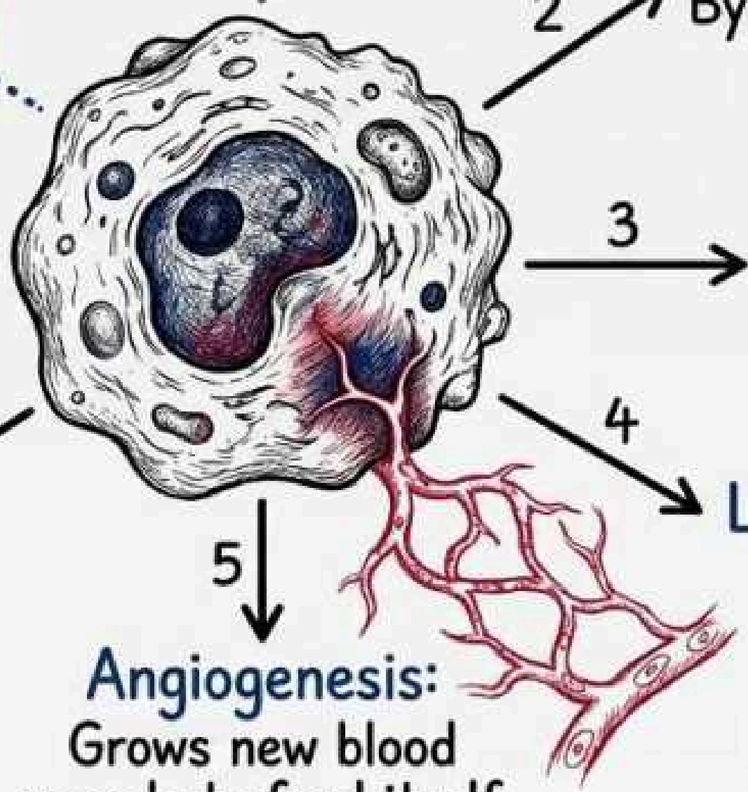
4 — Limitless Division:
Immortality

5 — Angiogenesis:
Grows new blood vessels to feed itself

6 — Invasion & Spread:
Metastasis

7 — Reprogramming Metabolism

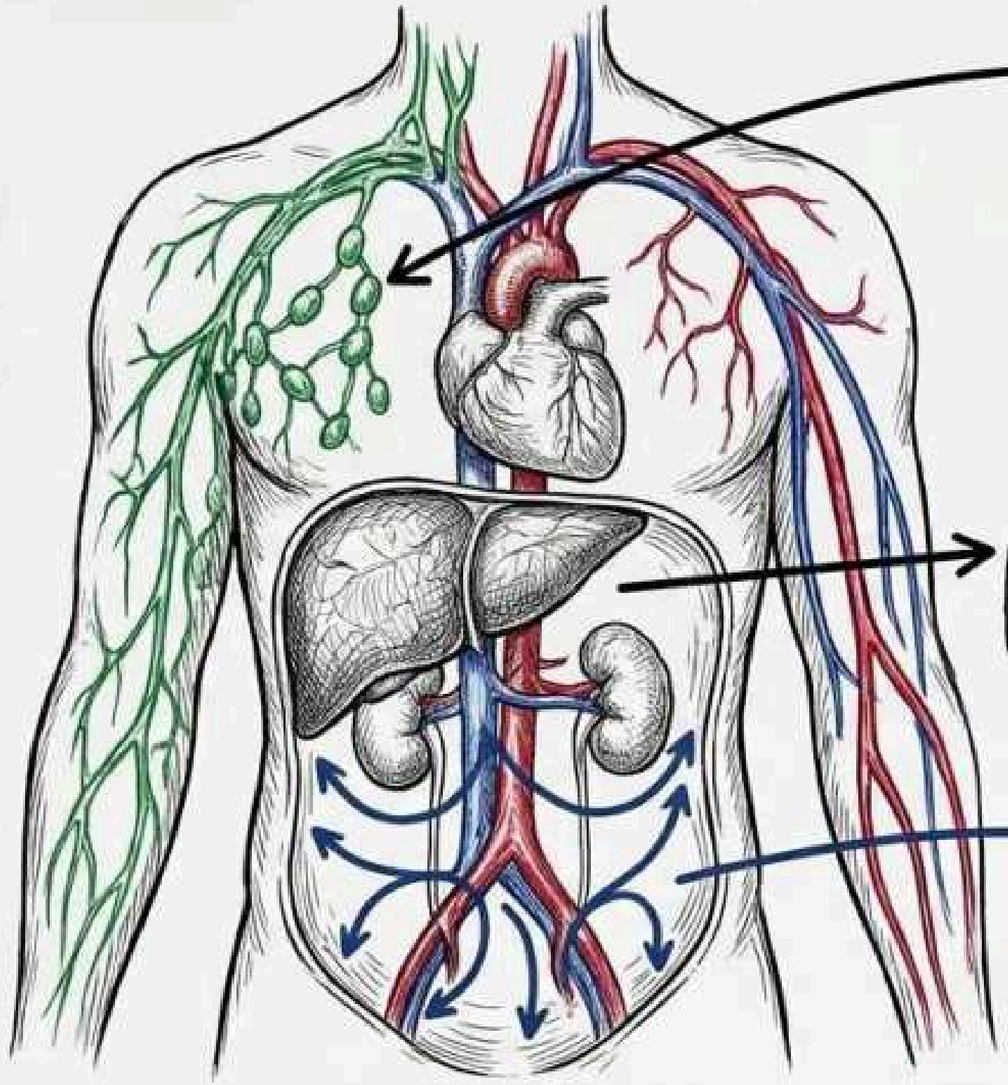
8 — Evading Immune System
Target of immunotherapies - Med 504 B



Each hallmark corresponds to specific genetic changes and provides a potential target for treatment.

Metastasis: Pathways of Spread

¶ 4.7



Lymphatic Spread:

Travels through lymphatic vessels.
Surgeons routinely examine nearby nodes.



Haematogenous Spread:

Travels via blood.
Liver and lungs are common destinations due to massive blood flow.

Transcoelomic Spread:

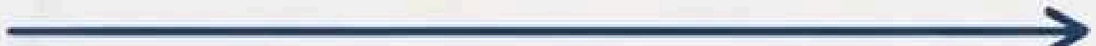
Spreads across surfaces of body cavities (e.g., Ovarian cancer seeding the abdomen).

Metastasis (spread to distant sites) is what makes cancer deadly.

Describing Cancers: Grade vs. Stage

¶ 4.8

Grade = How abnormal the cells look



Low Grade (closer to normal) — High Grade (more abnormal)

Stage = How far the cancer has spread

TNM Staging System

- T (Tumour): Size and extent of the primary tumour.
- N (Nodes): Whether nearby lymph nodes are involved.
- M (Metastasis): Whether there is distant spread.

Predictive Power: Stage > Grade

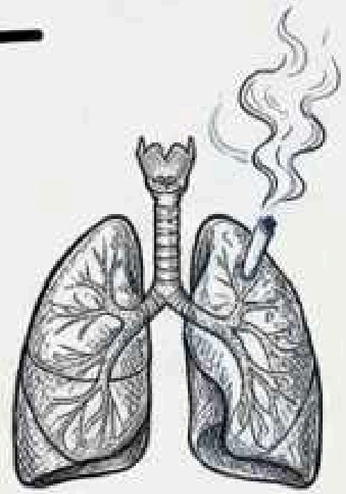
Because stage dictates outcome, early detection is crucial.

The Aetiology of Cancer

¶ 4.9

$$\text{Cancer} = \sum$$

(Multiple Interacting Factors)

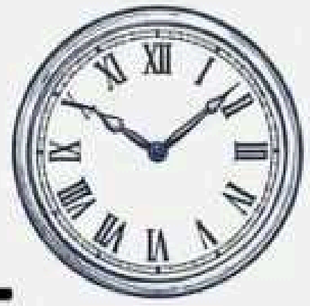


Tobacco Smoke
Largest single preventable cause.

Environmental / Chemical
UV light, radiation, chemical exposures.

Infections
Human Papillomavirus (HPV) causes cervical cancer. Preventable by vaccination.

Genetics
Inherited variants (e.g., BRCA genes).



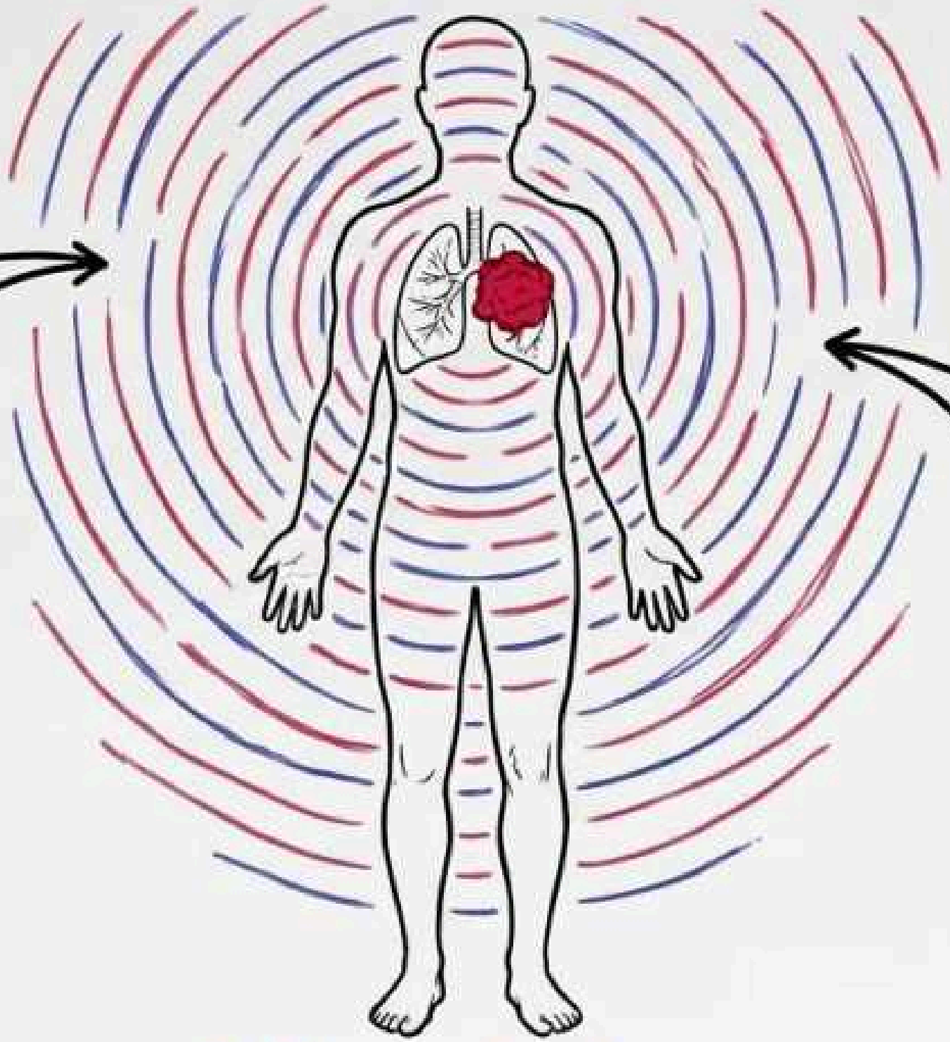
Time / Age
Major factor; genetic changes accumulate over a lifetime.

Systemic Effects (Beyond the Lump)

¶ 4.10

Paraneoplastic Syndromes

Tumour produces hormones or other substances that act on distant organs.



Cachexia

Severe weight loss and wasting in advanced cancer. Driven by chemical signals from both the tumour and the immune system.

Cancer is a disease of the whole person, not just a lump.

Application: Translating Pathology Reports

¶ 4.11

Well-differentiated adenoma

[Looks like normal tissue] +
[Benign glandular tumour]

↓

Plain Words Result:
A slow-growing, localized, non-invasive mass.

Poorly differentiated carcinoma with lymph node involvement

[Primitive/abnormal cells] +
[Malignant epithelial tumour] +
[Local lymphatic spread (N in TNM)]

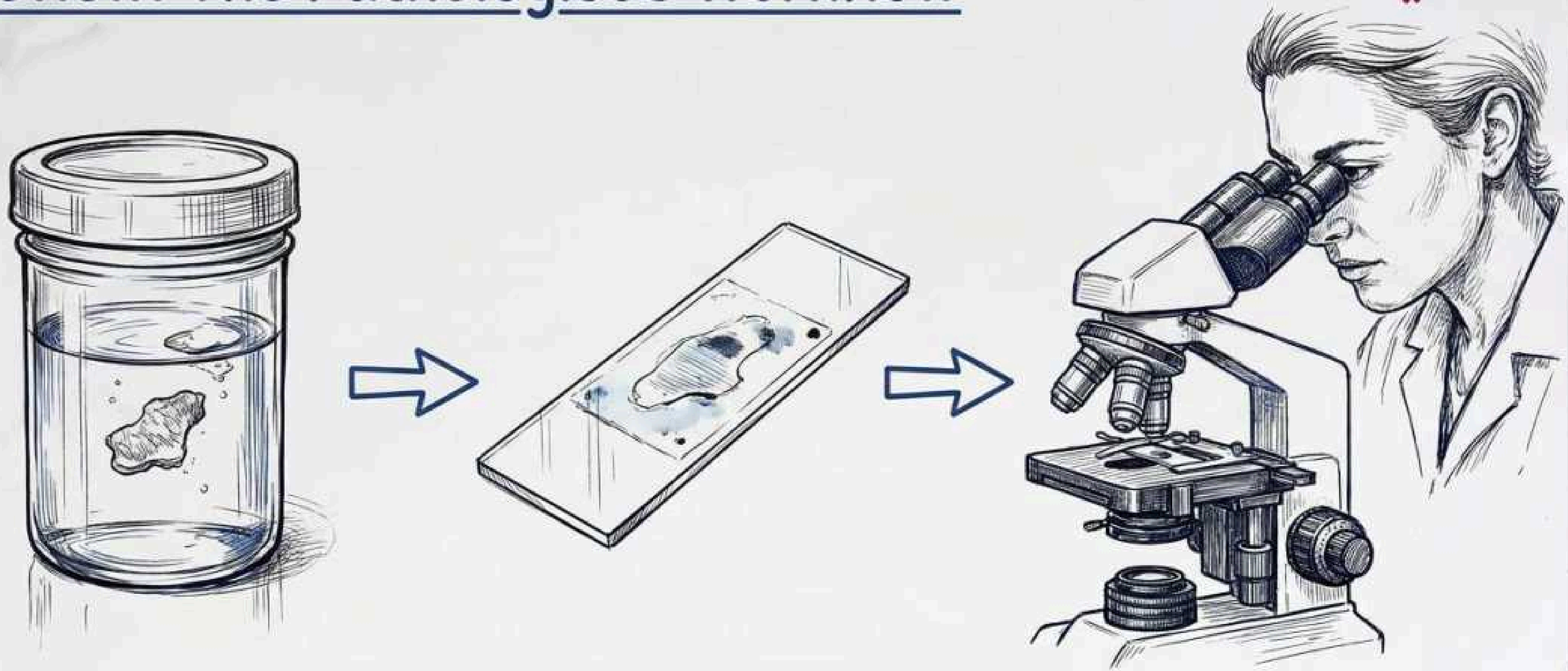
↓

Plain Words Result:
An aggressive cancer that has invaded tissue and begun to travel through the lymphatic system.

Disclaimer: Real reports should always be explained to the patient by the ordering doctor.

Preview: The Pathologist's Workflow

¶ 4.12



Lecture 5 Preview: How pathologists actually work, and what happens to a sample after it leaves the patient.