D.PHARM • SECOND YEAR

Biochemistry & Clinical Pathology

CHAPTER 13

Introduction to Pathology of Blood and Urine



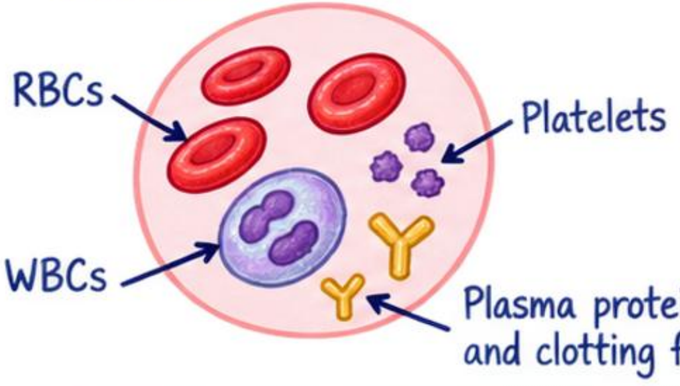
ENGLISH CHAPTER NOTES

DIPLOMA IN PHARMACY

CLINICAL PATHOLOGY OF BLOOD & URINE

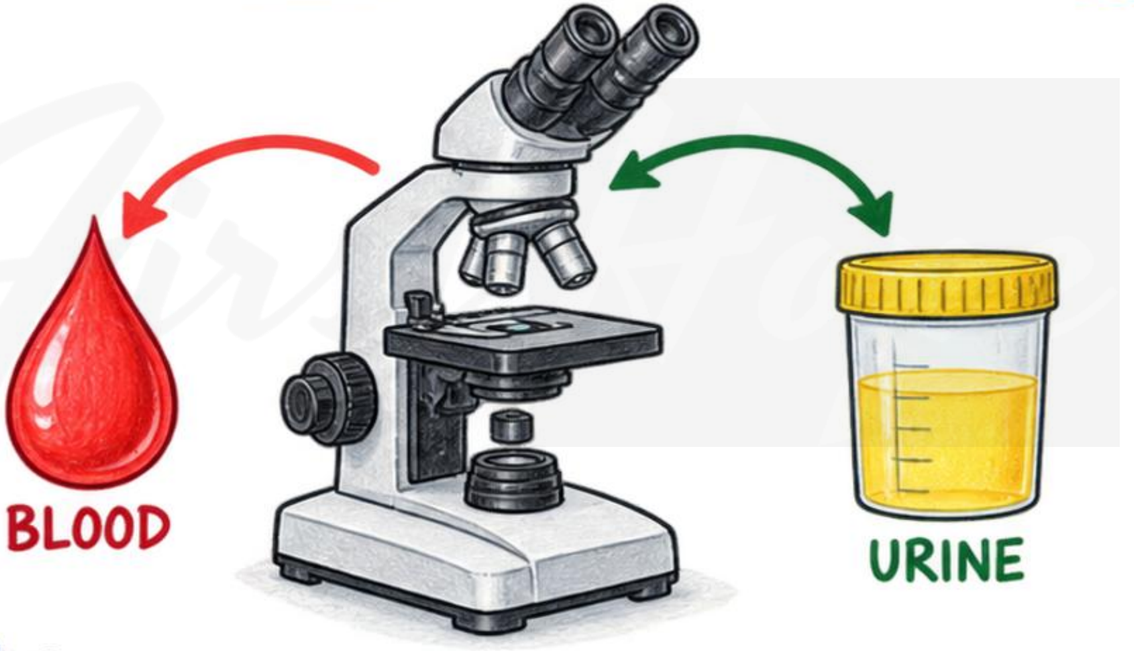
BLOOD PATHOLOGY STUDIES

- RBCs, WBCs and platelets
- plasma proteins and clotting factors
- changes linked with anaemia, infection, leukaemia and bleeding disorders



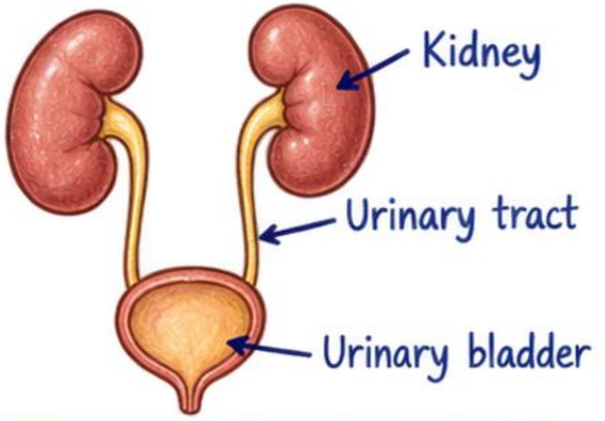
DEFINITION

Clinical Pathology is the laboratory study of body fluids, mainly blood and urine, to help diagnose disease and assess health.



URINE PATHOLOGY STUDIES

- physical, chemical and microscopic features of urine
- kidney and urinary-tract disorders
- systemic or metabolic changes reflected in urine



WHY IS IT IMPORTANT?

Laboratory findings help detect abnormalities, assess organ function, support diagnosis and monitor disease or treatment.

CORE IDEA

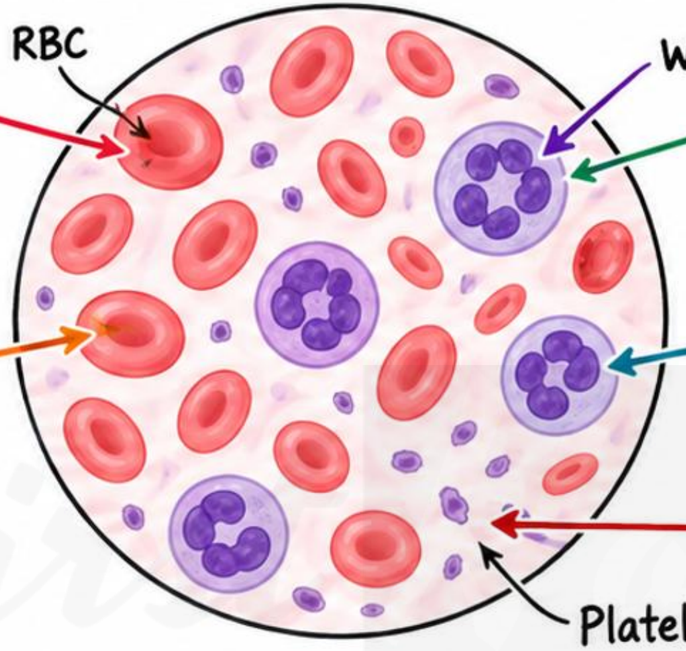
A laboratory result must be interpreted with symptoms, clinical examination and other investigations.

COMMON BLOOD DISORDERS & TESTS

COMMON DISORDERS

ANAEMIA
reduced oxygen-carrying capacity, commonly related to low haemoglobin or fewer RBCs

POLYCYTHAEMIA
abnormally increased red-cell mass



LEUKAEMIA
malignant disorder of blood-forming tissues with abnormal blood cells

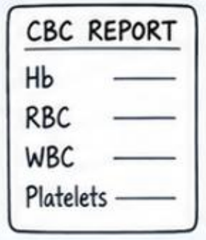
LYMPHOMA
malignancy of lymphoid tissue

BLEEDING DISORDERS
defective platelets or coagulation; example: haemophilia

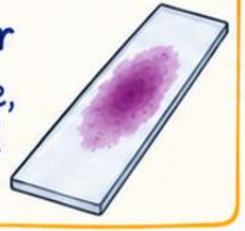
WBC CHANGES
Infections and inflammation may change the total WBC count and the proportion of different WBC types.

IMPORTANT TESTS

1. CBC
measures haemoglobin, RBCs, WBCs and platelets



2. Peripheral blood smear
examines cell size, shape, colour and appearance



3. Coagulation tests
PT, INR and aPTT assess clotting pathways



4. Bone-marrow aspiration or biopsy
evaluates blood-cell production and marrow disorders



REMEMBER Abnormal blood counts suggest a problem; they do not identify the exact cause alone.

URINARY ABNORMALITIES & ROUTINE TESTS

COMMON URINARY ABNORMALITIES

PROTEINURIA
may occur in nephrotic syndrome, diabetes or hypertension

HAEMATURIA
RBCs in urine; may occur with infection, stones or tumours

GLYCOSURIA
glucose in urine, commonly with uncontrolled diabetes mellitus

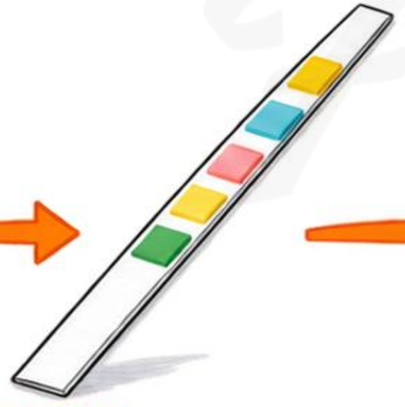
PYURIA
WBCs or pus cells in urine; often suggests urinary infection or inflammation

CASTS
moulds formed in renal tubules; type helps localise renal disease

CRYSTALS
may be associated with stones or metabolic conditions

ROUTINE TESTS

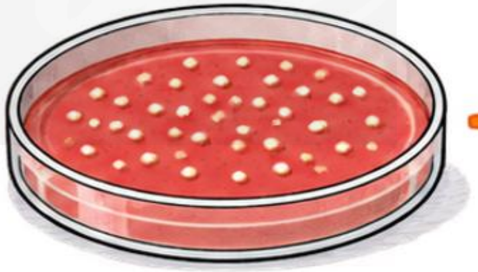




DIPSTICK
rapidly checks protein, glucose, ketones, blood, bilirubin, pH and specific gravity



MICROSCOPY
looks for cells, casts, crystals and microorganisms



URINE CULTURE & SENSITIVITY
identifies bacteria and guides antibiotic selection



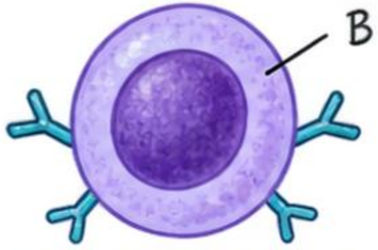
24-HOUR URINE
may measure protein or support creatinine-clearance calculation

IMPORTANT Collection method, timing, hydration and specimen contamination can affect results.

LYMPHOCYTES: ORIGIN & TYPES

Adaptive immunity

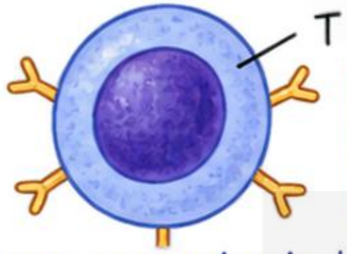
B LYMPHOCYTES — B CELLS



Produce antibodies

- mature mainly in bone marrow
- differentiate into plasma cells that produce antibodies
- form memory B cells after antigen exposure

T LYMPHOCYTES — T CELLS

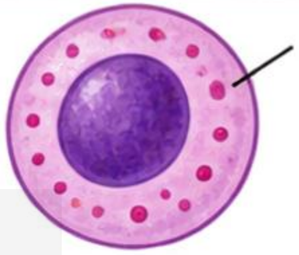


Coordinate and activate immune responses

- precursors arise in bone marrow and mature in the thymus
- CD4 helper T cells coordinate and activate immune responses
- CD8 cytotoxic T cells kill infected or abnormal cells

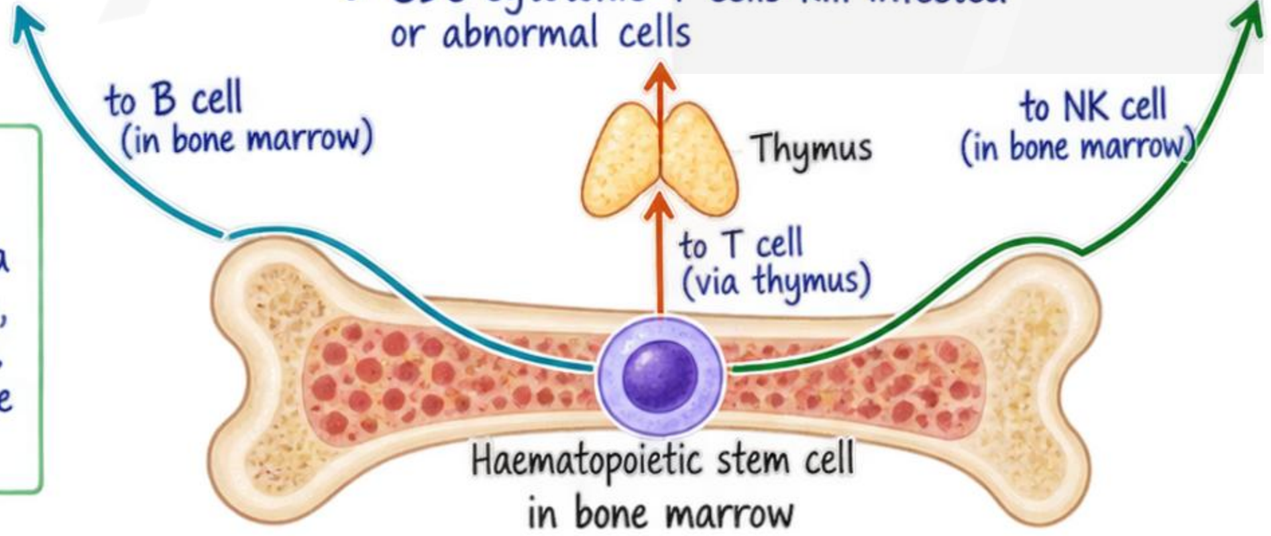
Innate immunity

NATURAL KILLER CELLS — NK CELLS



Kill virus-infected and tumour cells

- part of innate immunity
- kill many virus-infected and tumour cells without prior sensitisation



LYMPHOCYTES

Lymphocytes are WBCs with a major role in immune defence, especially adaptive immunity, antigen recognition and immune memory.

ORIGIN

All lymphocytes arise from haematopoietic stem cells in the bone marrow.

CLASSIFICATION

B cells and T cells — adaptive immunity
NK cells — innate immunity

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