

Laboratory Reference Map

Complete Blood Count and Hematology Tests

Clinical reasoning with a CBC

- Read hemoglobin, hematocrit, MCV, RDW, WBC differential and platelets together; use the local laboratory reference interval, age, pregnancy status and clinical context.
- Confirm unexpectedly critical findings, assess symptoms and compare with prior results. Do not interpret a single value in isolation.
- Classify anemia as microcytic, normocytic or macrocytic while recognizing mixed deficiencies may normalize MCV. Reticulocytes help distinguish low production from blood loss or hemolysis.

Microcytic and macrocytic patterns

- Microcytosis: evaluate ferritin and iron studies in context of inflammation; consider thalassemia when RBC count is relatively preserved and microcytosis is disproportionate.
- Macrocytosis: consider B12/folate deficiency, alcohol use, hepatic disease, hypothyroidism, medications and marrow disorders; examine smear and reticulocyte response.
- B12 deficiency with neurologic features warrants prompt clinical assessment; normal hemoglobin does not exclude clinically relevant deficiency.

White cells and platelets

- Neutrophilia may reflect infection, inflammation, corticosteroids or stress. Marked leukocytosis with blasts or systemic illness requires escalation.
- Neutropenia with fever is an urgent emergency concern, especially with immunosuppression.
- Interpret thrombocytopenia alongside bleeding, smear and possible pseudothrombocytopenia from platelet clumping; severe bleeding or suspected TTP needs emergency care.

Hemostasis and safety

- PT/INR and aPTT are pathway-oriented tests, not universal bleeding risk tests; indications include anticoagulant monitoring and selected bleeding disorders.
- Evaluate unexpected bleeding with medication review, platelet count, PT/aPTT, liver disease and targeted assessment.
- A peripheral smear can identify schistocytes and other clues; schistocytes with thrombocytopenia and organ injury are a medical emergency.

Case exercise: Case: A patient with fatigue has Hb 93 g/L, MCV 70 fL and low ferritin. Assess iron deficiency and investigate the cause of blood loss where appropriate, rather than assuming dietary deficiency alone.

Chemistry, Endocrine and Metabolic Testing

Electrolyte interpretation

- Inspect sodium, potassium, chloride, bicarbonate and renal function together. Hyperkalemia with ECG changes or marked severity needs immediate emergency management.

- Consider hemolysis in a surprising isolated potassium elevation; repeat promptly when appropriate without delaying urgent care if symptomatic or high risk.
- Corrected interpretation of sodium may be affected by glucose; interpret osmolality, volume status and medication history.

Renal and hepatic panels

- Creatinine and eGFR reflect filtration estimates and can be affected by muscle mass and acute changes; eGFR formulas are less reliable during rapidly changing kidney function.
- Urine albumin-to-creatinine ratio helps assess kidney damage; confirm persistent albuminuria because exercise, infection and other factors may transiently raise it.
- Interpret ALT, AST, ALP, bilirubin and albumin in hepatocellular vs cholestatic patterns; check clinical severity and synthetic function when indicated.

Glycemic and thyroid investigations

- Use guideline-appropriate fasting plasma glucose, A1c or oral glucose testing for diabetes diagnosis; A1c can mislead in hemolysis, anemia or altered RBC turnover.
- TSH with reflex free T4 is commonly useful in thyroid evaluation; biotin and medication interference can produce misleading immunoassay results.
- Use targeted hormonal tests based on symptoms and pretest probability rather than broad unindicated panels.

Acid-base and specimen factors

- Interpret acid-base disturbances with clinical status, bicarbonate, anion gap and blood gas when indicated; respiratory failure and significant acidosis need urgent assessment.
- Review sample timing, fasting requirements, anticoagulant tubes, posture and drugs before interpreting unusual findings.
- Explain incidental minor abnormalities, decide when repeat testing is needed and establish ownership for follow-up.

Case exercise: Case: An asymptomatic patient has potassium 6.4 mmol/L reported from a hemolyzed specimen. Check urgency, medication and renal context, promptly repeat an appropriate sample and obtain urgent ECG/emergency evaluation when indicated.

Microbiology, Immunology and Public Health Tests

Selecting infectious tests

- Use exposure history, syndrome, symptom duration, vaccination and local prevalence to choose appropriate tests.
- Obtain cultures before antimicrobial therapy when feasible for severe infection, but never delay life-saving management.
- Distinguish infection from colonization: a positive test may not imply the organism causes symptoms.

Test characteristics and timing

- NAAT/PCR detects organism nucleic acid, which may persist after infectivity resolves; timing and specimen quality matter.
- Antibody tests can be negative early in infection and sometimes remain positive after prior infection or vaccination.
- A negative test does not reliably exclude disease when pretest probability is high and sensitivity depends on illness stage.

Autoimmune and inflammation tests

- ESR and CRP are nonspecific; interpret with symptoms and history instead of using them as stand-alone diagnoses.

- ANA has a substantial false-positive burden in low-risk populations; order with a compatible clinical syndrome.
- Use reflex or specific antibodies judiciously and understand that a positive screen alone is not a diagnosis.

Public health and consent

- Follow applicable local public-health reporting obligations and laboratory collection instructions; explain confidentiality limits.
- Use informed consent and pre/post-test counselling for sensitive testing as required by local policy.
- Use evidence-based screening recommendations; avoid ordering repeated serology without a meaningful clinical question.

Case exercise: Case: A patient with dysuria but no systemic illness needs symptom-directed urine testing; a positive urine culture without symptoms generally should not trigger antibiotics except in specific guideline-defined circumstances such as pregnancy.

Educational material only. Use current authoritative guidelines and local standards for clinical decisions; numerical laboratory intervals vary by laboratory.