Iraqi Board for Medical Specializations
The Scientific Council of Pathology
Chemical Pathology

المجلس العراقي للاختصاصات الطبية
المجلس العلمي لعلم الامراض
اختصاص الكيمياء المرضية

Chemical Pathology Curriculum

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Introduction

Chemical pathology is the discipline of pathology that deals with disease diagnosis and management by the measurement of chemicals found in body fluids and tissues. Chemical pathology laboratories are typically the largest subdivisions in pathology departments, measuring hundreds of different chemicals on hundreds of patient samples each day. Because many of these analyses are critical, the chemical pathology laboratory is frequently highly automated and employs complicated analysers capable of performing several assays in a short period of time.

Chemical pathologists are in charge of administering these laboratories, assuring the quality of the results, offering diagnostic services, and providing clinical advice. This necessitates a solid understanding of disease pathophysiology, the diagnostic value of individual tests, and laboratory testing.

Learning Outcome

General Level

Domains of Professional Capabilities

1. Able to function successfully within Iraqi organisational and management systems.
2. Able to deal with ethical and legal issues related to clinical practice.
3. Communicates effectively and is able to share decision making, while maintaining appropriate situational awareness, professional behaviour and professional judgement.
4. Is focussed on patient safety and delivers effective quality improvement in patient care.
5. Able to carry out research and manage data appropriately.
6. Able to act as a teacher and clinical supervisor.

Speciality Level

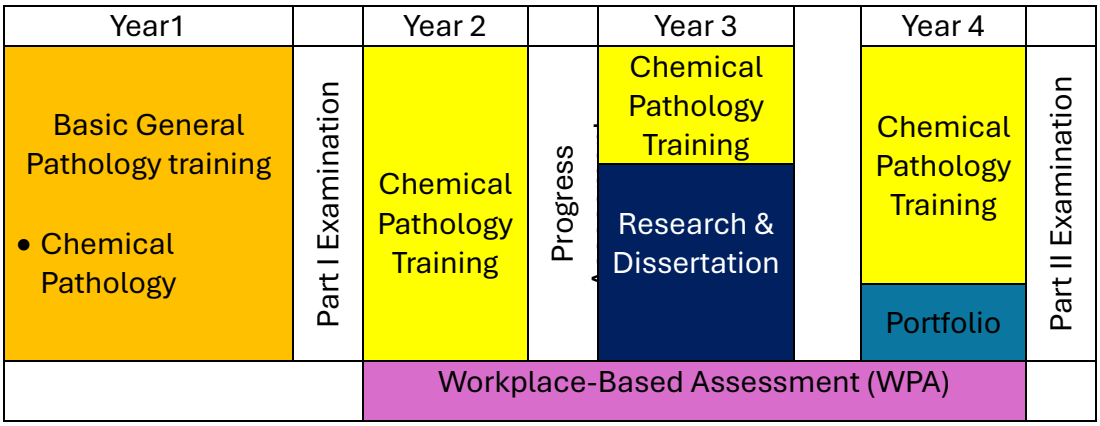
1. Able to lead and manage a laboratory.
2. Able to use the laboratory service effectively in the investigation, diagnosis, and management of disease processes.
3. Able to manage a multi-disciplinary team effectively.
4. Able to contribute effectively to the management of problems inpatients in other specialties

General aims of the training program

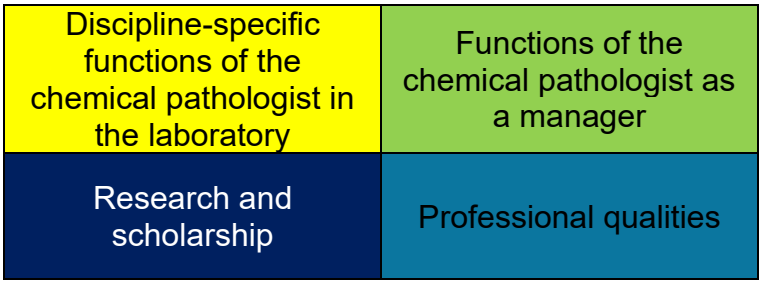
- Have a thorough understanding of pathophysiology and be able to liaise with clinicians.
- Understand laboratory organisation and processes and be able to manage a budget;
- Understand how to manage staff and communicate effectively about issues that may arise;
- Stay up to date with new assays and new ideas arising in chemical pathology.

Entry Requirements Duration of Study

- Graduate from medical school with MBChB credential with or without Certificate course in Laboratory practices
- Medical School graduate with M.Sc. in Clinical Biochemistry (Exempted for Short training Duration
- Duration of Study is 4 years.



Area of Training in Chemical Pathology



Essential training Module in Chemical Pathology (ChP1)

Physiological and pathophysiological principles

Metabolic inter-conversions in healthy individuals form the basis for understanding the pathophysiology of diseases for which chemical pathologists provide testing.

First Year Curriculum

Knowledge level	Skills	Attitudes
Physiology and pathophysiological principle in chemical pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• **water, sodium and potassium balance** • **Acid-base balance and oxygen transport** • **kidney** • **Calcium, phosphate and magnesium metabolism** • **Diabetes mellitus and hypoglycaemia** • **hypothalamus and pituitary** • **Thyroid gland** • **The adrenal glands** • **The gonad** • **Cardiovascular disorders** • **Liver disease** • **Plasma protein** • **Diagnostic enzymology** • **Lipid and lipoprotein** • **Gastrointestinal tract disease** • **Malignancy & Tumour markers** • **Iron and porphyrin metabolism** • **Uric acid, gout and purine metabolism**	**General Principles** • Weight and volume calibration • Unit of measurement • Pipettes • Buffers • Centrifugation • Sample collection and pre- and post-analytical variables • Calibration & QC **Principle underpinning technology** • Photometry • Enzymology • Fluorescence • Ion-selective Electrode • Blood Gas Analysis • Isoelectric Focusing **Principle of Quality Control** • Statistical tools in Quality control • Levy Jenning chart	• Leadership and management • Laboratory design and service • Safety and Hazards • Optimizing Laboratory Workflow • Ethics

References

- Lecture notes on clinical Biochemistry
- Clinical Chemistry by Willaim Marshal
- Contemporary Practice in Clinical Chemistry Fourth Edition
- WHO handbook in quality management system

Week of Activity During Chemical Pathology Residency

Day 1	Day2	Day3	Day4	Day5
Knowledge Lecture/Seminar	**Skills & Attitude** Practical laboratory training			Journal Club/Seminar /**MDT**

Advanced training Module in Chemical Pathology (ChP2)

This module should proceed during the rest of the training period in the speciality of chemical pathology to the following more advocated the enrichment of the principal knowledge and skills in the fields of chemical pathology and laboratory management. The following activity during the week should be as follows.

References

- Tietz textbook of Clinical Chemistry and Molecular Diagnostics
- Henry's Clinical Diagnosis and Management by Laboratory Methods

Second year

Laboratory management (3 months)

Knowledge level	Skills	Attitudes
Laboratory Management	Aspect in Laboratory Workflow and interference	
Pre-Analysis Pre-analysis variables Interference **Post analysis** • Assessment of Clinical**ly** Significant • Principle of Laboratory results • Sensitivity, specificity, predictive values, likelihood ratio. **Laboratory Statistics**	• Blood collection techniques • Urine and other body fluid collection methods • Chemical Basis of analyte assay and common interference • Configuration of Automation • Alarm and Flags assessment • Method Comparison and method validation • Types of Quality Controls	• Clinical Laboratory informatics • Financial Management

• Trend in evaluation and correlation of statistics • Method validation and process control **Quality Control** • Overview of quality control procedures • Implementing quality control procedures **Proficiency testing** **Westgard rules** **Six Sigma**	• Frequency of Quality Controls • Interpretation of Proficiency testing results	

Endocrine testing (4 months)

Knowledge level	Skills	Attitudes
Advances in Chemical Pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• Diabetes & Measures of Glycaemic Control • hypothalamus and pituitary • Thyroid gland • The adrenal glands • The gonad • Calcium, Phosphate, Mg • Bone metabolism and biomarkers • Metabolic bone disease • Evaluation of Endocrine functions • All dynamic tests • Obesity and adiposity cytokine	• Immunoassay • HPLC and A1c measurements • Interference in immunoassays • Performance and reporting of Dynamic endocrine testing • Mass spectrometry • LC-MS/MS • Clonidine suppression test; • Dexamethasone suppression test; • Glucagon stimulation test; • Lactose tolerance test; • Oral glucose tolerance test; • Oral glucose suppression test for growth hormone excess	

	• Overnight and two (2) day low and high dose dexamethasone suppression test; • Synacthen stimulation test; • Water deprivation test;	

Cardiology /Intensive cases (2 months)

Knowledge level	Skills	Attitudes
Advances in Chemical Pathology	Principle of Laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• Disorders of lipoprotein metabolism • Cardiac Markers • Heart Failure	Blood Gas analysis Point of Care testing Ion Selective Electrode	Critical intervals

Renal Disease (2 months)

Knowledge level	Skills	Attitudes
Advances in Chemical Pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• Disorder of Potassium • Disorder of water and sodium • Acid Base disorders and interpretation • Acute and Chronic kidney failure • Urine composition and analysis	• Osmolaity • Techniques in protein separation and Quantification • Immunofixation and western bloating • Volume, principle of osmolality, Osmometry • Ion Selective Electrode • Blood Gas analysis • Urine composition and analysis	

Gastrointestinal/Emergency medicine (2 months)

Advances in Chemical Pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• Liver function tests • Gastrointestinal tract • Pattern of protein abnormality • Vitamins and trace elements • Parental nutrition • Fluid Analysis and interpretation	Blood Gas analysis Point of Care testing Interpretation of capillary and gel electrophoresis Automation and Stool analysis and new markers	

Third year

Toxicology (2 Months)

Knowledge level	Skills	Attitudes
Advances in Chemical Pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory

• Therapeutic Drug Monitoring • Toxicology • TRANSPLANT	• Chromatography (Gas, liquid) • Mass Spectrometry • Flame photometry; Atomic absorption spectrophotometry • HPLC • Point of Care DOA	

Paediatric/ geriatrics (2 month)

Advances in Chemical Pathology	Principle of laboratory Techniques & instrumentation	General concept and administration in clinical laboratory
• Amino acid and in born errors of metabolism • Principle of newborn screening • Principle of molecular testing • Prenatal diagnosis • Geriatric Clinical Biochemistry	• Mass Spectrometry • HPLC • Molecular testing • Newborn screening • Next generation sequencing • Estimation of (ICA) Intracellular enzyme activity (Confirmatory)	Age-related reference range

Miscellaneous Courses (2 months)

Hematologic Related Course 1 Months	Oncology	
• Haematological Aspect in Chemical Pathology	Tumour Markers s Metabolic Aspect of Malignancy Genetic Tumour Markers Molecular Testing details course	

Research Activity: 6 months in dedicated research approved by the council scientific activity

Fourth Year:

The training program for students is designed to provide thorough instruction in a wide range of specialized topics using a case-based approach. The goal is to build upon existing knowledge by presenting updated information and offering practical reinforcement.

RESEARCH AND SCHOLARSHIP

Chemical pathologists have responsibilities with regard to the processes of scientific inquiry, research and education. They maintain professional competence throughout their careers, by keeping up to date with new knowledge in both the technical aspects of chemical pathology and the wider professional aspects, and they integrate this knowledge into their practice.

Research Dissertation

In their third year, the candidates are expected to complete a research project and submit it as a dissertation. The candidate should be able to write scientific articles, utilise the literature, understand research techniques, and present his/her findings to a panel of experts for approval. The applicant is expected to carry out fundamental and practical research pertinent to the field and career of chemical Pathology.

Journal Clubs/Seminars

educational meeting in which a group of individuals discuss published articles, to keep themselves abreast of new knowledge, promoting in them the awareness of current research findings, teaching them to critique and appraise research, and encourage them to utilize research in evidence-based practice of the speciality.

ASSESSMENT

Assessment is by formal examination and by submission of a portfolio, which is a record of workplace-based assessment and other achievements during training. The periodic and annual supervisor reports are also kept in the portfolio.

Formal Examination

Part I Examination (Primary): The primary examination in basic laboratory medicine. In the area chemical pathology. In the first year of the programme, the applicant is expected to have a foundational understanding of laboratory medicine and fundamental clinical chemistry practice abilities and knowledge. This examination achieved through different format including written examination (Single Best Answer (SBA), Extended Match Question (EMQ) Short Answer Question (SAQ) or Essay) and OSPE (Observed Structure Practical Examination)

Part II Examination (final): This examination is administered at the conclusion of the fourth year of study to make sure the candidate has acquired the necessary skills and is prepared to work as an independent laboratory-based chemical pathologist. This examination achieved through different format including written examination (Single Best Answer (SBA), Extended Match Question (EMQ) Short Answer Question (SAQ) or Essay) and OSPE (Observed Structure Practical Examination) and Objective Structure Viva Voce Examination (OSVVE)

Portfolio

The portfolio is a physical collection of workplace-based assessment forms and other documents that provide evidence that trainees have successfully completed a range of activities that form part of their daily work in the laboratory. The portfolio records the trainee's progress in developing technical skills and professional values, attitudes and behaviours that are not readily assessed by formal examinations

Workplace-based assessment

Trainees will be expected to undertake workplace-based assessment in the form of supervised learning events (SLE) throughout their training in chemical pathology. In general,
SLEs are designed to be formative in nature; as such they are best suited to determine educational progress in different contexts. To this end, it is strongly recommended that
workplace-based assessment be carried out regularly throughout training to assess and
document a trainee's progress. The numbers below are indicative however, it is recommended that a minimum number of SLEs should be completed during each

stage of training. These Workplace-based assessment should be applied from 2nd to 4th year of training using the following tools

Case-based Discussion (CbD) is a way for trainees to present and discuss their cases with more experienced colleagues throughout their training and obtain systematic and structured feedback from the assessor. It is designed to assess decision-making and the application or use of medical knowledge in relation to the care of patients where the trainee has been involved either clinically or through their laboratory involvement.

Direct Observation of Practical Skills (DOPS) is a method that has been designed specifically for trainees to be assessed for competence in the day-to-day practical procedures that they undertake as part of their training. The procedure may involve a patient or laboratory technique. The assessor is expected to give their open and honest opinion of the trainee's performance and should provide immediate feedback by high-lighting strengths and identifying areas for development

- **C**ase-**b**ased **D**iscussion (**CbD**): minimum of **4** per year
- **D**irect **O**bservation of **P**ractical **S**kills (**DOPS**); minimum of **4** per year