

## Course Specification

University: Al-Azhar University

Faculty: faculty of medicine

Department: Clinical and chemical pathology

### 1- Data of the course: 2013 - 2014

Code of the course: 07-501-cli path-med	Title of the course: MD degree Clinical and Chemical pathology	Year: 3 - 5      Level: high
Specialty: Clinical Pathology	Number of teaching units: Clinical Pathology: 1. Clinical Chemistry 2. Hematology 3. Immunology 4. Bacteriology	Lectures:1508h Practical/ Clinical:2678 h

2- Objectives of the course:	The objectives for each course/module/rotation are specified in conjunction with teaching/training methods, requirements for achieving these objectives and assessment methods.
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### 3- ILOs

**A- Knowledge and understanding:**

1. Demonstrate in-depth knowledge and understanding of theories, basics and updated biomedical, clinical epidemiological and socio-behavioral science relevant to his specialty as well as the evidence based application of this knowledge to patient care.
2. Explain basics, methodology, tools and ethics of scientific medical, clinical research related to clinical pathology.
3. Mention ethical, medico logical principles and bylaws relevant to his practice in clinical pathology including clinical chemistry, hematology, microbiology and immunology.
4. Mention principles and basics of quality assurance and quality improvement in medical education in clinical pathology including clinical chemistry, hematology, microbiology and immunology and in clinical practice of clinical pathology including clinical chemistry, hematology, microbiology and immunology.
5. Mention health care system, public health and health policy, issues relevant to this specialty and principles and methods of system-based improvement of patient care in common health problems of the field of clinical pathology including clinical chemistry, hematology, microbiology and immunology.
6. Mention the basics of quality assurance to ensure good clinical care in the field of Clinical Pathology.
7. Mention the ethical and scientific principles of medical research.
8. State the impact of common health problems in the field of clinical pathology on the society.

<p><b>B- Intellectual Skills:</b></p> <ol style="list-style-type: none"> <li>1. Apply the basic and clinically supportive sciences which are appropriate to the specialty related conditions /problem / topics including clinical chemistry, hematology, microbiology and immunology.</li> <li>2. Demonstrate an investigatory and analytic thinking “problem - solving “approaches to clinical situation related to clinical pathology including clinical chemistry, hematology, microbiology and immunology.</li> <li>3. Plan research projects related to clinical pathology including clinical chemistry, hematology, microbiology and immunology</li> <li>4. Plan for quality improvement in the field of medical education and clinical practice in clinical pathology including clinical chemistry, hematology, clinical bacteriology and clinical immunology</li> </ol>	
<p><b>Professional Skills:</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate respect, compassion, and integrity; a responsiveness to the needs of the institution and society</li> <li>2. Demonstrate a commitment to ethical principles including provision or withholding of clinical care, confidentiality of patient information, informed consent, and business practices.</li> <li>3. Demonstrate sensitivity and responsiveness to patient culture, age, gender, and disabilities</li> </ol>	

General Skills:

1. Demonstrate the competency of continuous evaluation of different types of skills provision in laboratory work in the different area of clinical pathology including clinical chemistry, hematology, microbiology and immunology
2. Appraise scientific evidence.
3. Continuously improve laboratory skills based on constant self-evaluation and life-long learning.
4. Design clinical guidelines and standard protocols of management.
5. Appraise evidence from scientific studies related to the patients' health problems.
6. Apply knowledge of study designs and statistical methods to the appraisal of experimental/clinical studies and other information on diagnostic and/or therapeutic effectiveness including: clinical chemistry, hematology, microbiology and immunology.
7. Provide information using effective nonverbal, explanatory, questioning, and writing skills.
8. Work effectively with others as a member of a health care team or other professional group.
9. Work effectively in relevant health care delivery settings and systems.
10. Practice cost-effective health care and resource allocation that does not compromise quality of care.
11. Assist patients in dealing with system complexities.

## **1. Course Content:**

### **Clinical Pathology:**

#### **1. Clinical Chemistry:**

##### **1. General Laboratory principles.**

- General laboratory supplies (glassware, plastic ware and volumetric equipments).
- Laboratory operation (centrifugation, weighing and laboratory water)
- Calculations in clinical chemistry.
- Specimen collection and handling
- General laboratory techniques (spectrophotometry techniques, fluorometry, chemiluminescence, turbidmetry, nephelometry, electrophoresis, Osmometry, electrochemistry and Chromatography).
- Principle of immunological techniques
- Establishment and use of reference values.
- General laboratory safety measures.
- Basic statistical techniques.

##### **2. Analytic procedures**

- Carbohydrates
- Lipids, lipoproteins and apolipoproteins
- Proteins and amino acids
- Water, electrolytes, blood gases and PH.
- Non protein nitrogenous compounds.
- Bone minerals
- Vitamins and Trace elements.
- Clinical enzymology
- Nucleic acid
- Hem – related products (iron, bilirubin and porphyrins)
- Hormones.
- Tumor markers

##### **3. Assessment of organ system functions**

- Liver functions
- Renal functions
- Cardiac functions
- Pancreatic functions
- Gastrointestinal functions
- Endocrinal disorders
- Gonadal functions

- Disorders of water and electrolytes and acid base balance.
- Disorders of porphyrin metabolism
- Clinical chemistry of pregnancy
- Laboratory medicine in pediatrics and geriatrics
- Clinical toxicology, therapeutic drug monitoring and drug abuse.
- 4. Molecular diagnostics
  - Basics of molecular biology.
  - Types of DNA, modes of inheritance and genetic abnormalities.
  - Methods of DNA separation & amplification methods of detecting DNA abnormalities
  - Amplification methods for detecting DNA abnormalities
- 5. Quality management in clinical chemistry lab
  - Framework of Quality management in a health care laboratory.
  - Elements of quality assurance program.
  - Control of preanalytical and analytical variables.
  - Control of analytical quality.
  - Role of external quality assessment and proficiency testing programs.
- 6. Specialty areas of clinical chemistry:
  - a. Nutritional assessment
  - b. Clinical chemistry of pregnancy.
  - c. Inborn error of metabolism.
  - d. Body fluids analysis
  - e. Laboratory medicine in pediatrics & geriatrics
  - f. Clinical toxicology, therapeutic drug monitoring and drug abuse.

## **2. Hematology:**

### **1. Normal hematologic system**

- Haematopoiesis
- Origin and development of blood cell.
- Hematopoietic organs.
- Hematopoietic stem cells.
- Mechanisms of action of haematopoietic growth factors.
- Erythrocyte:
- Erythropoiesis.

- Biosynthesis of Hemoglobin.
- Regulation & control of erythropoiesis.
- Structural features of RBCs.
- Red cell membrane.
- Haemoglobin & erythrocyte function.
- Erythrocyte metabolism & enzymes.
- Granulocytes:
- Neutrophils:
- Neutrophils function.
- Structure & morphology.
- Eosinophils
- Differentiation & mediators.
- Structure & morphology.
- Basophils & mast cell:
- Function.
- Structure & morphology.
- Mononuclear phagocyte
- Mononuclear phagocyte production & kinetics
- Lymphocyte:
- Types.
- Morphology
- Lymphoid organs
- Megakaryocyte:
- megakaryopoiesis
- platelet structure & function
- 2 :Disorders of red cells**
- Aplastic anaemia
- Pure red cell aplasia
- Anaemia of chronic renal failure
- Anaemia of indocrine disorder
- Congenital diserythropoietic anaemia
- Paroxysmal nocturnal haemoglobinuria
- Folate, cobalamin and megaloblastic anaemia
- Disorders of iron metabolism
- Anaemia of chronic disease
- Disorder of red blood cell membrane
- Disorder of red blood cell enzymes
- Disorder of globin synthesis and thalassemia
- Disorder of haemoglobin structure and sickle cell anaemia
- Methaemoglobinuria
- Haemolytic anaemia
- Hypersplenism and hyposplenism
- Sideroblastic anaemia

**3 : Non malignant disorders of leukocytes and the spleen:**

- Neutropenia
- Neutrophilia
- Chediachigashi syndrome
- Chronic granulomatous disease
- Eosinophilia and eosinopenia
- Hypereosinophilic syndrome
- Basophilia
- Monocytopenia and monocytosis
- Lipid storage disease
- Langerhans cell histiocytosis
- Haemophagocytosis syndrome
- Lymphocytosis and lymphocytopenia
- Immunodeficiency disorder

**4 : Hematologic malignancies**

**-Myeloproliferative Disorders:**

- Chronic myelogenous leukemia.
- Chronic neutrophilic leukemia.
- Polythycemiavera.
- Primary myelofibrosis.
- Essential thrombocythaemia.
- Chronic eosinophilic leukemia.
- Mastocytosis.
- Myeloproliferative neoplasms unclassifiable.

**-Myelodysplastic/myeloproliferative neoplasms**

**-Myelodysplastic syndromes**

**-Acute myeloid leukemia & related precursor neoplasms**

- Acute myeloid leukemia with recurrent genetic abnormalities
- Acute myeloid leukemia with myelodysplasia – related changes & therapy – related myeloid neoplasms
- Acute myeloid leukemia not otherwise specified
- Myeloid sarcoma
- Myeloid proliferation related to Down syndrome
- Blasticplasmacytoiddentric cell
- Acute myeloid leukemia of ambiguous lineage neoplasm

**-Lymphoid neoplasms:**

Non Hodgkin lymphoma

Hodgkin lymphoma  
Precursor lymphoid neoplasms  
Mature B-cell neoplasm  
Mature B-cell neoplasm with leukemic manifestation  
Mature B-cell neoplasm with plasma cell or plasmacytoid differentiation  
Mature B-cell neoplasm with primary tissue manifestation  
-Mature T-cell & natural killer cell neoplasm

### **5: Disorders of hemostasis**

#### 1. Disorders of platelet number

-Thrombocytopenia  
-Decreased production  
-Increased destruction  
-Thrombocytosis  
-Thrombocytosis resulting from myeloproliferative disorders

Secondary thrombocytosis

#### 2. Disorders of platelet function

-Congenital disorders  
-Disorders of membrane receptors  
Bernard Soulier syndrome  
-Glanzmann thrombasthenia  
-Disorders of platelet secretion  
-Abnormalities of platelet granules  
-Abnormalities of prostaglandin pathway  
-Acquired disorders

#### 3. Coagulation physiology and hemorrhagic disorder

-Coagulation physiology  
-Congenital hemorrhagic disorders  
-Acquired hemorrhagic disorders

#### 4. Coagulation regulation and hypercoagulable states

-Control mechanisms in coagulation  
-Thrombotic disorders  
-Thrombohemorrhagic disorders

### **6: Blood banking & Transfusion medicine**

#### 1. Introduction

Brief history of blood transfusion  
The role of physician in blood centre

#### 2. Donor testing

Pretransfusion testing

Antibodies identification

Antiglobulin tests

3. Blood groups

ABO & H blood group systems

Rh blood group systems

Kell & Kidd blood group systems

MNS & Duffy blood group systems

Lewis, I & P blood group systems

4. Blood products

5. Transfusion reactions

**7: Laboratory haematology**

1. Erythrocyte studies

-Polychrome staining

-Hiens body staining

-Reticulocyte enumeration

-Peripheral blood smear examination

-Haemoglobin electrophoresis

-Sickling test and solubility

-Osmotic fragility test

-Manual count of RBCs

-ESR

2. leucocyte study

-Cytochemistry

-Immunophenotyping

-Manual count of WBCs

3. hemostasis studies

-Partial thromboplastine time

-Prothrombin time

-Bleeding time

-Thrombin time

-Fibrinogen degradation products estimation

-Clotting factors assay

-Platelet aggregation

**8: Genetics**

-Introduction

-Genetic and gene structure

-Cytogenetic analysis

-Karyotyping

-Molecular cytogenetics

-FISH

-Spectral karyotyping

-Cell cycle regulation

**3. Immunology**

## **1. properties and overview of immune response**

- Innate and adaptive immune responses
- Types of adaptive immune response
- Cellular components of adaptive immune responses

## **2. Cells, tissues and organ of immune system**

### **3. Leukocyte migration into tissues**

- Recirculation of Naïve T lymphocytes
- Migration of effector T lymphocytes
- Memory T cell Migration
- Homing of B Lymphocytes

### **4. Innate immunity**

- Feature of innate immunity
- Epithelial barrier
- Phagocytes and inflammatory responses
- cells of innate immunity
- Circulating pattern recognition molecule and effector protein
- Cytokines of innate immunity
- Role of innate immunity in stimulating adaptive immunity
- Adhesion Molecules

### **5. Complement:**

- Pathways of complement activation
- Receptors of complement
- Regulation of complement
- Function of complement
- Evasion of complement by microbes
- Complement deficiency

### **6. Adaptive Immunity**

- Subset of Lymphocytes
- T- Lymphocytes
- Development of T lymphocytes morphology and maturation
- T cell receptor
- Signal transduction by TCR
- CD4 T lymphocytes
- Activation of CD4 lymphocytes
- CD8 T lymphocytes
- Frequency and responsive to particular antigen.
- Effector function.
- Surface protein expression
- B- lymphocytes
- Development of B lymphocytes, morphology and maturation

## **7. Antibodies and Antigens**

- Immunoglobulin:
- Structure
- Types
- Immunoglobulin gene rearrangement
- Function
- Immune response
- Antigen Presenting Cells and antigen presentation:
- Antigen Presenting Cells
- Role in immune response
- Antigen processing and presentation to T lymphocytes

- MHC class I associates with endogenous peptide
- MHC class II associates with exogenous peptide

## **8. Major histocompatibility complex molecules and antigen presentation to T lymphocytes**

- Structure of MHC molecule
- Binding of peptide to MHC molecule
- Genomic organization of MHC molecules

## **9. Immune receptors and signal transduction**

### **10. Lymphocyte development and antigen receptor gene rearrangement**

### **11. Activation of T lymphocytes**

### **12. Effector mechanisms of cell mediated immunity**

### **13. B cells activation and antibody production**

### **14. Effector mechanisms of humoral immunity**

### **15. Regional immunity: specialized immune responses in epithelial and immune privileged tissues**

### **16. Immunologic tolerance and Autoimmunity**

- T lymphocyte tolerance
- B lymphocyte tolerance
- Tolerance induced by foreign protein antigen

### **17. Apoptosis**

- Difference between apoptosis and necrosis
- Pathways of apoptosis
- Inducers of apoptosis
- Inhibitors of apoptosis

### **18. Immunity to microbes**

### **19. Transplantation immunology**

### **20. Immunity to tumors**

### **21. Hypersensitivity disorders**

- type I immediate hypersensitivity
- type II antibody mediated hypersensitivity
- type III immune complex mediated Hypersensitivity
- type IV cell mediated hypersensitivity

**22. Congenital and acquired immunodeficiencies**

**23. Autoimmune disorders**

**24. Immune manipulation**

- Immunization
- Allergy and desensitization
- Immune suppressive
- Immune modulators
- Anti-inflammatory drugs
- Vaccination

**25. Gastrointestinal and liver diseases**

- autoimmune hepatitis.
- Primary biliary cirrhosis.
- Viral Hepatitis
- Drug induced hepatitis.
- Autoimmune sclerosing cholangitis

**26. Endocrine disorders.**

- Type 1 (Insulin-dependent) diabetes mellitus
- Autoimmune thyroid disease
- Pancreatic diseases

**27. Hematological disorder**

- Autoimmune hemolytic anemia
- Drug induced hemolysis
- autoimmune disease of the blood
- Neoplastic disease of B lymphocytes
- Immunophenotyping

**28. Renal diseases**

- Antibody mediated nephritis
- Glomerulonephritis associated with immune complex
- Renal disease associated with vasculitis

**29. State update and evidence based Knowledge of conditioned related to immunological disorder.**

**30. Techniques in clinical immunology**

**4. Bacteriology**

### **1- General microbiology**

Microscope

Media

Sterilization

Bacterial growth curve

Epidemiological markers

Bacterial variations

### **2 - Systemic microbiology**

Mycobacteria

Spirochetes

Legionella , mycoblasma , actinomycetes

Intracellular bacteria :

- Chlamedia
- Rickettsia
- Bartonella

Bacteremia and sepsis , pneumonia , meningitis

Infections of female genital tract

Urinary tract infection

Gastroenteritis and food poisoning

Anaerobic infections

Sexually transmitted dis

Ear , nose , throat & eye infections

Skin and soft tissue infections

Non fermentative gram negative bacilli

### **3 - Systemic virology**

General virology

Diagnosis of viral infections

DNA viruses :

- Herpes viruses
- Papo viruses
- Adenovruses
- Pox viruses
- Parvo viruses

RNA viruses :

- Pico viruses
- Arbo viruses
- Rubella viruses
- Orthomyxo and paramyxo viruses

Hepatitis viruses

### **4 – Mycology**

General mycology

Diagnosis of fungal infections

1. Methods of teaching:	lectures, seminars, tutorial, Written assignments, Oral assignments, Observation andsupervision
2. Methods of teaching of handicaps	Non

5. Students evaluation and assessment:

A- Method of assessment:	Standardized oral Examination, Written Examination, Practical Examination
B- Time of assessment	At the end of first part At the end of second part

C- Allocated marks/Distribution				
		<i>Written</i>	<i>Oral</i>	<i>Practical</i>
	1. Clinical Chemistry	100	100	100
	2. Hematology	100	100	100
	3. Immunology	100	100	100
4. Bacteriology	100	100	100	

### 6. Teaching books, notebooks, and references:

- Books/Notebooks:	<ul style="list-style-type: none"> <li>- <b>Lectures notes Staff members print out of lectures and/or CD copie</b></li> <li>- <b>Essential books</b></li> <li>1- Tietz textbook of clinical chemistry and molecular diagnostics, the seventh edition.</li> <li>2- Tietz Fundamentals of clinical chemistry. Edition...seventh</li> <li>3-- Postgraduate Haematology.</li> <li>4- Atlas of hematology</li> <li>5- Practical hematology " Dacie and Lewis</li> <li>6-- Basic immunology</li> <li>7- Basic and clinical immunology</li> <li>8- Jawetz medical microbiology</li> </ul>
- References:	<ul style="list-style-type: none"> <li>- <b>Recommended books</b></li> <li>1- Clinical chemistry (Bishop).</li> <li>2- Zilva Clinical chemistry and metabolic medicine.</li> <li>3- Marshall Clinical chemistry.</li> <li>4- Wintrobe, s clinical hematology.</li> <li>5- Williams Hematology</li> <li>6- Medical immunology</li> <li>7- Diagnostic Microbiology (Koneman)</li> <li>- <b>Periodicals, Web sites, ... etc</b></li> <li>· Journal of Clinical Chemistry</li> <li>· Molecular and cellular endocrinology</li> <li>· Atherosclerosis</li> <li>· American journal of hematology</li> <li>· Journal of hematology oncology</li> <li>· Journal of thrombosis and hemostasis</li> <li>· Blood</li> <li>· Hematologica</li> <li>· Egyptian journal of immunology</li> <li>· The journal of immunology</li> <li>· Journal of clinical immunology</li> <li>· Journal of Clinical Microbiology</li> <li>· Clinical Microbiology reviews</li> </ul>

	· Journal of Bacteriology
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**Course Coordinator:**

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