# Department of Biology

# College of Science

# University of Salahaddin

# Subject: Medical Immunology

# Course Book: Third Class

# Lecturer's names

**Dara K. Mohammad, PhD, Associate professor**

# Academic Year: 2023/2024

# Course Book

| | |
|---|---|
| **1. Course name** | Medical Immunology |
| **2. Lecturer in charge** | Dara K. Mohammad |
| **3. Department/ College** | Biology/Science |
| **4. Contact** | e-mail: dara.mohammad@su.edu.krd |
| **5. Time (in hours) per week** | 2hr./week<br>Practical: 2hr./week (e-learning+ on campus) |
| **6. Office hours** | To be returned to the schedule on the office door |
| **7. Course code** | SBIO404 |
| **8. Teacher's academic profile** | Dr. Dara K. Mohammad is an Associate Professor in Cell and Molecular Biology at Salahaddin University-Erbil, located in the Kurdistan Region of Iraq. His expertise spans diverse areas within molecular biology, biotechnology, and cancer cell signaling. Throughout his career, Dr. Mohammad has contributed significantly to academic and applied research fields, with a keen focus on immunotherapy and cancer therapeutics.<br>Dr. Mohammad was born and raised in Erbil, Kurdistan. His academic journey began with a focus on biology, which later evolved into a deep interest in molecular and cellular mechanisms, particularly those associated with cancer. Driven by a passion for scientific discovery, he pursued his PhD at the prestigious Karolinska Institute in Stockholm, Sweden. There, he conducted groundbreaking research under the supervision of Professor C.I.E. Edvard Smith, earning his doctoral degree in May 2015. His doctoral thesis delved into cancer immuno-cell signaling pathways, providing insights into the molecular underpinnings of cancer progression.<br>Following his doctoral studies, Dr. Mohammad joined Evren Alici's team at the Karolinska Institute as a postdoctoral research scientist in June 2018 and advanced to the researcher position in September 2020. His research interests encompass immuno-cell signaling, cancer development, and the signal transduction of engineered Extracellular Vesicles (EVs) for therapeutic applications in cancer immunotherapy.<br>In his role at Salahaddin University-Erbil, Dr. Mohammad combines his research expertise with a commitment to education and mentorship. He has supervised numerous student projects and guided the next generation of scientists in exploring cutting-edge topics in molecular biology and biotechnology. His teaching philosophy emphasizes critical thinking, hands-on research, and bridging the gap between theoretical knowledge and practical applications.<br>Dr. Mohammad is committed to furthering scientific research in Kurdistan and beyond. He aims to establish |

| | |
|---|---|
| | advanced research facilities and foster collaborations that bridge global scientific communities with regional talent. Through his work, he continues to inspire young scientists and contribute meaningfully to the fight against cancer.<br>Dr. Mohammad is an accomplished author, with numerous peer-reviewed publications that have gained recognition in academic and clinical research communities. His work is frequently cited for its originality and applicability to contemporary challenges in cancer treatment.<br>Dr. Mohammad holds dual citizenship, proudly embracing his roots in Kurdistan while also being a citizen of Sweden. This duality enriches his perspective, allowing him to integrate global scientific advancements with local development initiatives. As the holder of a Swedish passport, Dr. Mohammad embodies the spirit of international collaboration, leveraging his cross-cultural experiences to bridge research and education between Sweden, Kurdistan, and the broader scientific community.<br>Dr. Mohammad is married to Dr. Treska S. Hassan, a fellow academic and professional. Together, they have three sons: Aland, Sahand, and Lawand. Despite his busy professional schedule, Dr. Mohammad cherishes time with his family and enjoys various hobbies, including reading, running, playing tennis, and traveling to discover new places. |
| | |
| **9. Keywords** | Immunology, Haematopoiesis, Lymphoid Organ, Antigen, Antibody, and Immune Response |

**10. Course overview:**

Our immune system not only protects us from viruses, bacteria, and parasites, it can prevent the growth of tumours. Sometimes our immune system can be the cause of diseases like multiple sclerosis, Type 1 diabetes and rheumatoid arthritis. If you are interested in studying how our immune system works to keep us alive, then Immunology course is for you. This course of study will provide an overview of the immune system and the essential features of immune responses an introduction to the nature of the cells and molecules involved in the immune response, Phagocytosis, lymphoid organs, cells and receptors, Recognition of pathogens; antigen processing and presentation.

The study of the immune system ultimately provides us with a fascinating insight into the relationship between animals, and the organisms that infect them (not only bacteria & viruses, but also protozoans and parasites). Evolutionary science has demonstrated how the life we see around us is the product of millions and millions of years of development – and part of this process has been the development of the immune system itself, as a consequence of the long and ongoing relationship between the organisms already mentioned. There is a value, and excitement, to discovering how the immune system in different organisms works, merely for its own sake. However, understanding the immune system also gives us the potential to develop therapies that

control infectious disease (this includes vaccines, of which a great many have now been developed), cancer, and other diseases resulting from the malfunction of the immune system.

**Practical:** The course covers the fundamental principles related to the practical Immunology. Included are the immune response, principles of antigen-antibody reactions, and the principles of serological. This includes performance of serological procedures used to aid in the detection or diagnosis of certain diseases.

**11. Course objective:**

The objective of this course is to learn about the Immunity, Types of immunity, Subject and immunology tasks, History and development of immunology, Hematopoiesis-Localization of hematopoiesis, Innate Immunity (Innate immunity-Factor influencing level of innate immunity-Mechanism of innate immunity-Humoral factor-Cellular factor-Mode of intracellular killing), and Acquired Immunity (Acquired Immunity-Active immunity-Passive immunity-Difference between active and passive immunity). Localization of the immune system in the body and Lymphoid Organ [Lymphoid Organ-A/Primary lymphoid tissue (Bone marrow-Bursa of fabricius-Thymus) B-Secondary lymphoid tissue (Lymphatic circulation-Lymph node-Spleen) C/Tertiary lymphoid tissue (Mucosal associated lymphoid tissue-Intraepithelial lymphocyte), Different structure and shape of immunoglobulin (Structure of Ig-Type of Ig-Function of Ig), Properties of the immunogen-Antigen presenting cell-Ag processing pathway, and Immune Response

**Practical:**

- This course is intended to provide the student with a foundation in immunology and serology. Topics include the components of the immune system, basic immunoassay principles and immunologic techniques and the clinical symptoms and laboratory findings associated with diseases and disorders of the immune system in the human body.
- Serological procedures will be presented and their diagnostic significance will be emphasized.

**12. Student's obligation**

***Exam policy:**

Student Should take 2 exams during the course There will be no make-up exams for absences students without medical report.

***Classroom polices:**

**1- Attendance:** You are strongly encouraged to attend class on a regular basis, as participation is important to your understanding of the material. This is your opportunity to ask questions. **You are responsible for obtaining any information you miss due to absence**

2- **Lateness:** Lateness to class is disruptive

3- **Electronic devices:** All cell phones are to be turned off at the beginning of class and put away during the entire class.

4-**Talking:** During class please refrain from side conversations. These can be disruptive to your fellow students and your professor

5- **No Disrespectful to both the professor and to your fellow students**.

**13. Forms of teaching**

**Face-to-Face (Lectures and PowerPoint)**

## 14. Assessment scheme

| Component | Date | Percent |
|---|---|---|
| Exam 1 | 00/00/20-- | 50% |
| Exam 2 | 00/00/20-- | 50% |
| Total | | 100% |

**15. Student learning outcome:**

After completion of this course, you will be able to:

Define Basic Immunology (Immunology-Hematopoiesis-Localization of hematopoiesis), Innate Immunity (Innate immunity-Factor influencing level of innate immunity-Mechanism of innate immunity-Humoral factor-Cellular factor-Mode of intracellular killing), and Acquired Immunity (Acquired Immunity-Active immunity-Passive immunity-Difference between active and passive immunity).

Localization of the immune system in the body and Lymphoid Organ [Lymphoid Organ-A/Primary lymphoid tissue(Bone marrow-Bursa of fabricius-Thymus) B-Secondary lymphoid tissue (Lymphatic circulation-Lymph node-Spleen) C/Tertiary lymphoid tissue (Mucosal associated lymphoid tissue-Intraepithelial lymphocyte)

Different structure and shape of immunoglobulin (Structure of Ig-Type of Ig-Function of Ig)

Properties of the immunogen-Antigen presenting cell-Ag processing pathway

Mechanism of immune response-Primary and secondary immune response.

## 16. Course Reading List and References:


- Ivan Roitt,I. Brostoff,J. and Male,D. (2002) Immunology (6th Ed.) Ediburgh, Mosby.
- Parslow,T.G. , Stites,D.P. , Terr,A.I. , Imboden,J.B. (2001) Medical Immunology(10th Ed.) NY, McGraw Hill
- Brooks, G.F., Carroll, K.C., Butel, J.S. &Morse, S.A. (2007) Medical Microbiology (24th Ed.) NY, McGraw Hill.


**Practical**


 Baker, F. J., & Silverton, R. E. (2014). Introduction to medical laboratory technology: Butterworth-Heinemann.

 Johnson, A. G., & Clarke, B. L. (2005). High-yield immunology: Lippincott Williams &Wilkins.


| 17. The Topics: | 2hr./week(3 groups) |
|---|---|
| Lab 1/ Introduction to Immunology/ General concepts | 00/00/20-- |
| Lab 2/ Marking, Injecting and bleeding of animals (rabbit) | 00/00/20-- |
| Lab 3/ Bactericidal power of normal serum | 00/00/20-- |
| Lab 4/ Clearance of blood by reticuloendothelial system(Role of innate immunity) | 00/00/20-- |
| Lab 5/ ABO system and compatibility test (cross-matching test) | 00/00/20-- |
| Lab 6/ Preparation of lymphocytes | 00/00/20-- |
| Lab 7/ Enzyme Linked Immunosorbent Assay (ELISA)part one | 00/00/20-- |
| Lab 8/ Enzyme Linked Immunosorbent Assay (ELISA) part two | 00/00/20-- |
| Lab 9/ Immunohistochemistry (IHC) part one | 00/00/20-- |
| Lab 10/Immunohistochemistry (IHC) part two | 00/00/20-- |

| | |
|---|---|
| Lab 11/ phagocytosis (NBT) | 00/00/20-- |
| Lab 12/ immunodiffusion (RID) | 00/00/20-- |
| Lab 13 /rheumatoid factor (RF) | 00/00/20-- |
| Lab 14/ examination | 00/00/20-- |

**19. Examinations:**

***1. Compositional* (Explain), *True or false type of exams, Multiple choices, and Fill the blanks***

Answer the following:

Q1: Define

T-dependent Antigen
C4b binding protein
Diageorge Syndrome
Secondary immune response

Q2: Fill in the blanks

1- Precursor T cells must migrate to thymus where they undergo differentiation into tow type of T cells _____ and _____.

2-Chemotactic factor for attracting phagocytic cells to site of inflammation includes _____, _____, and _____.

3- Fixation of first complement (C1) needed for immune complex and binding with Ig requires _____ and _____ ions.

4- _____ blocks the association of factor-B complement with C3b in alternative pathway.

5- NK cells are capable of killing _____ and _____ cells.

6- IgA has a _____ which mad in _____ cells as its passes into secretions.

7- Thymic nurse cells secreted _____, _____, and _____ hormones to promote maturation of T cell in thymus.

Q3: Explain with drawing the early events in Antibody production in lymph node.

Q4: Explain

A- The classical pathway for complement activation.

B- Detoxification reaction in PMN and Macrophage.

**Practical Examination**

**Q/** Answer the following?

1- Why newborn blood is only forward typed?

2- Why sometime the blood of fetus become hemolysis?

3- What is the perfect test (immunological aspect) use for the diagnosis of H.pylori and why?

**Q/** Fill the following blanks:

1- Precipitation reaction can be converted into agglutination reaction by coating soluble antigen onto----------.

2- The normal range of ASO is ----------.

3- The unheated serum kills bacteria by ----------pathway

**20. Extra notes:**

I want to be supportive to everyone. This "Course Book" will help you understand how College of Science/Biology Department environment works, what to do first, and who to contact if you need help. I appreciate the participation and sharing from all students related to classroom activities for the first time.

Whenever you have some questions or concerns about virology and the course book, ask any questions you may have about your concern. Sometimes a quick question at time can save a lot of frustration later!

Our discussion goal in the classroom is to be collaborative, not combative. This is important to your success in the course and as a professional. Experience shows that even an innocent remark in the class environment can be easily misconstrued. Please re-think your responses carefully before you react with others in order not to be conceder as personal attacks. Be positive to others and diplomatic with your words. I will try my best to do the same. Be careful when using sarcasm and humor. Without face-to-face communications your joke may be viewed as criticism. Remember you are not competing with each other for grades, but sharing information and learning from one another.

The College of Science, Department of Biology, expects that all students exhibit professional behaviour.

**21. Peer review**

I have read this course book and I see that it is contains the most necessary subjects…..

Dr. Taban K. Rasheed