وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الشمالية
اسم التشكيل :- المعهد التقني الدور

الحقيبة التعليمية

قسم تقنيات المختبرات الطبية

اسم المقرر:	Basic of Immunology
المرحلة / المستوى:	Second
الفصل الدراسي:	First
السنة الدراسية:	٢٠٢٦/٢٠٢٥

معلومات عامة

اسم المقرر:	Basic of Immunology					
القسم:	Medical Laboratory Technologies					
الكلية: المعهد	Dour Technical Institute					
المرحلة / المستوى	Second					
الفصل الدراسي:	First					
عدد الساعات الاسبوعية:	نظري	١	عملي	٢		
عدد الوحدات الدراسية:	٣					
الرمز:	MLT ٢١٤					
نوع المادة	نظري		عملي		كلهما	*
هل يتوفر نظير للمقرر في الاقسام الاخرى	No					
اسم المقرر النظير	-					
القسم	-					
رمز المقرر النظير	-					
معلومات تدريسي المادة						
اسم مدرس (مدرسي) المقرر:	Hanan Shihab Ahmed					
اللقب العلمي:	Assistant Professor					
سنة الحصول على اللقب	٢٠١٩					
الشهادة :	Doctor					
سنة الحصول على الشهادة	٢٠١٦					
عدد سنوات الخبرة (تدريس)	١٤					

الوصف العام للمقرر

يكـتـب فـي هـــذا الجـزء وصفاً عـامــاً و ملخصاً للمقرر الـدراسـي :-

Understanding the idea of immunity, as well as the components of the immune system and how to protect the body.

١. اسم المقرر	
Basic of Immunology	
٢. رمز المقرر	
MLT٢١٤	
٣. الفصل / المستوى	
First/Second	
٤. تأريخ اعداد الوصف	
٢٠٢٤/٣/٧	
٥. اشكال الحضور المتاحة	
Weekly presence	
٦. عدد الساعات الدراسية (الكلية) / عدد الوحدات (الكلية)	
٣ / ٤٥	
٧. اهداف المقرر	
اهداف المقرر الدراسي	• The goal of the course is to make sense of the fundamental concepts and terminology of immunology while focusing on the vital components of natural immunity—chemical, biochemical, physiological, and cellular immunological barriers—and antivirals in particular.
٨. استراتيجيات التعليم والتعلم	
• Explanation of the course • Daily exams • Student groups • Field visits	
٩. بنية المقرر	

weeks	times	Subject	Learning method	Attendance Forms	Method of examination
First	٣	Definition of immunity, types, and Relationship to other natural and biological sciences	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Second	٣	Innate immunity, components of the immune system, factors affecting immunity, and Innate immune mechanisms	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Third	٣	Acquired Immunity, and Types	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fourth	٣	Humoral Immunity, and Types	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fifth	٣	Vaccines, Types, Importance of Vaccines.	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Sixth	٣	Definition Complement system, Types, and Physical-chemical properties.	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Seventh	٣	Antigens, types, sizes, and detection	Explain the lecture, PowerPoint	Classroom and	Exams

		methods	presentations, and practical applied	Laboratory	
Eighth	٣	Antibodies, types, sizes, and detection methods	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Ninth	٣	Interaction between antigens, antibodies, types of interactions, familiarity, effects of monovalent and polyvalent antigens	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Tenth	٣	Agglutination, Definition, and Application	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Eleventh	٣	Indirect Agglutination - Latex Test - Pregnancy Test - Comp Test	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Twelve	٣	General information laboratory guidance for the student about immunity and the laboratory.	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Thirteenth	٣	Hepatitis Viral, Principle, causes, Infection, and Diagnosis.	Explain the lecture, PowerPoint presentations, and practical	Classroom and Laboratory	Exams

			applied		
Fourteenth	٣	Rose – Bengal method	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fifteenth	٣	Toxoplasmosis test	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
١.تقييم المقرر					
Daily, monthly, and final exams, as well as weekly reports.					
٢.مصادر التعلم والتدريس					
scientific books					
Main references for Immunology					
Scientific papers for immunology					
Online scientific resources					

الاهداف العامة

١-knowledge of the mechanisms of action of innate immunity and acquired immunity.
٢-studying immunological cells and the lymphatic system.
٣- The study of antigens, antibodies, and antigen receptors.
٤- Understand how immunity to microorganisms develops.
٥- Understanding of the prevalence of illnesses including allergies, AIDS, and immunological deficiencies.
٦- Study of transplantation, tumors, and vaccinations.

الأهداف الخاصة

- Study the basics of immunity, the components of the immune system, and how to protect the body from infections and pathogens.

الأهداف السلوكية او نواتج التعلم

- **The learner has to be aware of the significance of immunity fundamentals and understand the components of the immune system.**
- **The learner must understand the difference between innate and adaptive immunity.**
- **The student should be able to provide some information about the basics of immunity and how to work in the immunology laboratory.**

((Educational aims): After finishing the lesson (lecture), the learner will be able:-

- Knows the basics of immunology.
- Recognize the many forms of immunity and know how to differentiate them .

المتطلبات السابقة

- اذكر أي متطلبات سابقة قد يحتاجها الطالب قبل التسجيل في المقرر، مثل مواد دراسية سابقة أو مهارات معينة.
- **Recognize immunology and study the immune system's functions and interactions with pathogens, diseases, and other biological processes. it is critical for understanding and controlling infectious diseases, as well as developing vaccines and medicinal treatments. As well as the field of immunology has also increased in significance because of its increasing applications in several areas such as biotechnology, pharmaceuticals, healthcare, and research.**

الأهداف السلوكية او مخرجات التعليم الأساسية		
ت	تفصيل الهدف السلوكي او مخرج التعليم	آلية التقييم
١	Student Understanding of Immunology	• Lectures. • Home works and participation.

		• Discussions and tests.
٢	The student gets the ability to identify immunological types.	• Research and skill development through scientific reports
٣	Ability to provide immunology information	• Home works • Tests
٤	The student's understanding of the significance of immunity for the human body	• Home works • Tests

أساليب التدريس (حدد مجموعة متنوعة من أساليب التدريس لتناسب احتياجات الطلاب ومحتوى المقرر)

الاسلوب او الطريقة	مبررات الاختيار	
١. Lectures and practical lectures	**Classical lectures**	
٢. Interactive and mutual learning	**Interactive Lecture**	
٣. Learning via reasons and evidence	**The skill of interpreting information**	
٤. Discussion at the finish of the lecture	**Provide abstract and understanding of the topic**	

Theoretical syllabus	
Weeks	**Topics**
١	The immunity definition , types of immunity , historitical .perspective of development of immunology , role of Arab about immunity , The importance of immunity teaching student of analytical pathology , connection of immunology with other natural medical & biologic science . Recommended references .
٢ , ٣	Natural immunity , definition parts of immunity (table of types of immunity) ١- Specific immunity / definition with example. ٢- Non –specific immunity (innate-immunity) definition with example. Factor affect on individual immunity like age, harmonic effect, nutrition. Mechanism of natural immunity ١- epithelial layers skin ٢- Tissue defenses. A- Humoral immunity. B- Cellular immunity. Humoral immunity its types e.g. lysozyme, properdin –B- lysine, reactive protein, spectrocin, complement.
٤	Acquired immunity, definition between natural &acquired immunity. Part of acquired immunity ١- passive acquired immunity divided into:- a) Natural passive immunity.

	b) Active artificial acq. Immunity. Vaccines & their types. ٢- Passive acq. Immunity , definition & types Demand of table of differences between passive & active immunity.
٥	Vaccine & types, importance, table of vaccine, with duration. Demand for student to prepare a report of vaccines with importances.
٦	Structure of immune system, funct.(Diagram illustrated of human body refer to the site of immune system. a) Central lymphatic system, part of it, thymus, Bursa of lumbricous. b) Peripheral lymp h. System \lymph- Nodes – shape, structure spleen, illustrated diagram & it effect upon the cells of reticule - the lymph. System. ١- Macrophage, and microphage, their functions. ٢- Lymphatic cells , description , types T-cells & B- cells ٣- Plasma cells. K-cells in the human.'prepare on defenses in human defenses of T-cell & B-cell (from the student) (Oral quizzes).
٧	Complement system, definition. Chemical of physic properties their component ratio in the body, function of each component. Sits of their synthesis (c^- comp.) in the body, tests depend on the c^- .

٨,٩,١٠	Antigen , defined , properties as foreignness , size ١- Complete Ag. ٢- Partial Ag (hapten). ٣-chemical nature. ٤- Responses to T. regulations. ٥- Antigenic specificity. ٦- Species specificity. ٧- Auto specificity. ٨- Analogues specificity. ٩- Organ specificity. ١٠- Ag – specificity heterogeneously
١١,١٢	Antibodies (Abs). Immune globulins, definition, properties, types, structure of immunoglobulin. (illustrated diagrams from student) The study of IgA ,IgM and IgG function of each one briefly. As student homework, prepare notes about each types of Ig. E.g. IgE and IgM and IgA with defenses tables of Ig. As complementary for that presented in the lectures.
١٣,١٤,١٥,	Ag-Ab reaction bonds that responsible of interaction, types of reaction, affinity, monovalent Ags &polyvalent Ags effects. Agglutinations , definition & their applying , using them in general Indirect aggulut. Or negative definite. With example. (Latex –test (R-f test) & pregnancy –test. commbs test (definition. Uses , principle , technique , reading results) Precipitation, definition. With comparison with agglut. (From student). Application of ppt. reactions, the principle of ppt., Lattice hypothesis ppt. techniques (their uses principle of reaction).

المحتوى العلمي

خارطة القياس المعتمدة

المحتوى التعليمي	عناوين الفصول	الأهمية النسبية	الأهداف السلوكية					عدد الفقرات
			المعرفة	الفهم	التطبيق	التحليل	التقييم	
الفصل الاول / المستوى الثاني	تعريف علم المناعه انواع المناعة	٪١٠٠	٪٣٥	٪١٠	%٢٥	٪١٠	٪٢٠	٥
الفصل الاول/ المستوى الثاني	المناعة والامراضية	٪١٠٠	٪٣٥	٪١٠	٪٢٥	٪١٠	٪٢٠	٥

الاسبوع الاول

أ.الفئة المستهدفة Target Population

طلبة المرحلة الثانية-قسم المختبرات الطبية

ب-المحتوى

- **Immunology**
- **immunological disorders or disease**
- **immune system division**
- **humoral immunity**

- الاختبار القبلي (pre-test)

Q١ /What is the concept of immunity

Q٢/What are the types of immunity?

Immunology: is a branch of biomedical science that covers the study of immune systems in all organisms. It charts, measures, and contextualizes the: physiological functioning of the immune system in states of both health and diseases

- **immunological disorders or disease**

١- hypersensitivities
٢- immune deficiency
٣- Transplant rejection
٤- autoimmune diseases

- **Immunology has applications in numerous disciplines of medicine,**

١- organ transplantation,
٢- oncology,
٣- virology,
٤- bacteriology,
٥- parasitology,
٦- psychiatry
٧- dermatology

Note: Prior to the designation of immunity from the etymological root *immunis*, which is Latin for **"exempt";** early physicians characterized organs that would later be proven as essential components of the immune system.

- **immune system division into (innate and adaptive)**

١- **Innate system** being composed of primitive bone marrow cells that are programmed to recognise *foreign* substances and *react*,

٢- **Adaptive system** being composed of more advanced lymphatic cells that are programmed to recognise self substances and *don't react*

- **Innate immunity, or nonspecific immunity:** is the natural resistances with which a person is born. It provides resistances through several physical, chemical and cellular approaches.

١- **Microbes first encounter the epithelial layers**

٢- **physical barriers (**skin and mucous membranes.)

٣- **Subsequent general defences include secreted chemical signals** (cytokines), antimicrobial substances, fever, and phagocytic activity associated with the inflammatory responses.

٤- **The phagocytes express cell surface receptors that can bind and respond to common molecular patterns expressed on the surface of invading microbes. Through these approaches,**

٥- **innate immunity can prevent the colonization, entry and spread of microbes.**

- **Adaptive immunity**: is often sub-divided into two major types depending on how the immunity was introduced.

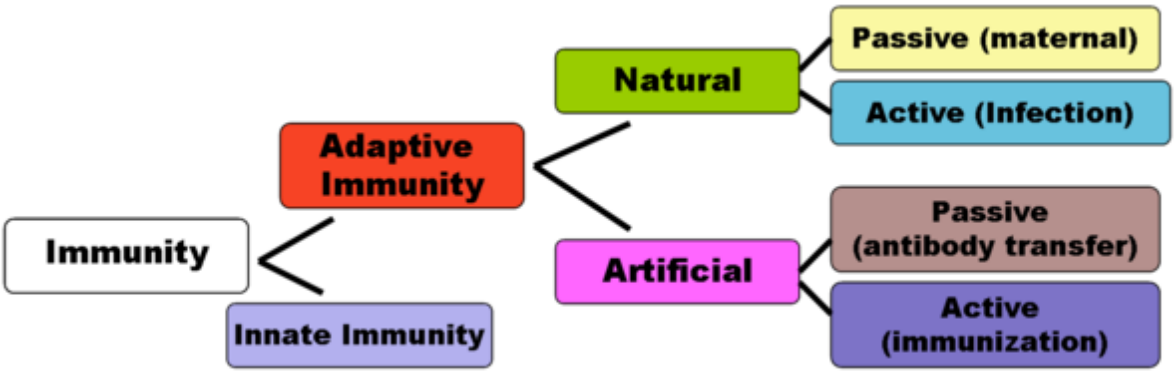
١- Naturally acquired immunity' occurs through contact with a disease causing agent, when the contact was not deliberate

٢- artificially acquired immunity develops only through deliberate actions such as vaccination.

- **Both naturally and artificially acquired immunity can be further subdivided depending on whether immunity is induced in the host**

١- **Passive immunity** is acquired through transfer of antibodies or activated T-cells from an immune host, and is short lived—usually lasting only a few months.

٢- **Active immunity'** is induced in the host itself by antigen and lasts much longer, sometimes lifelong. The diagram below summarizes these divisions of immunity.



humoral immunity: is the aspect of immunity that is mediated by secreted antibodies, whereas the protection provided by cell mediated immunity: involves T-lymphocytes alone.

١- **Humoral immunity is active** when the organism generates its own antibodies
٢- **Humoral immunity is passive** when antibodies are transferred between individuals.

Innate immune system	Adaptive immune system
Response is non-specific	Pathogen and antigen specific response
Exposure leads to immediate maximal response	Lag time between exposure and maximal response
Cell-mediated and humoral components	Cell-mediated and humoral components
No immunological memory	Exposure leads to immunological memory
Found in nearly all forms of life	Found only in jawed vertebrates

- الاختبار البعدي (Post-Test)

- **Q/What are immune disorders and diseases?**
- **Q/What is the difference between innate immunity and Adaptive immunity?**

- الاسبوع الثاني والثالث
- الاختبار القبلي (pre-test)

Q/ What are the characteristics of innate immunity?

Q/ What is inflammation?

History of immunology

The earliest known reference to immunity was during the plague of Athens in ٤٣٠ BC.

- Pierre-Louis Moreau de Maupertuis made experiments with scorpion venom and observed that certain dogs and mice were immune to this venom.

-This and other observations of acquired immunity were later exploited by Louis Pasteur in his development of **vaccination** and his proposed **germ theory** of disease

- the discovery of the **yellow fever virus** by **Walter Reed**

-the study of **humoral immunity** and cellular immunity. Particularly important was the work of **Paul Ehrlich**

- was jointly awarded to the founder of **cellular immunology**, **Elie Metchnik**

-Innate immune system

١-Surface barriers

Several barriers protect organisms from infection, including :

A- Mechanical barriers that are the first line of defense against infection.

١- The waxy cuticle of many leaves

٢- The waxy cuticle of many leaves

٣- the exoskeleton of insects

٤- the shells and membranes of externally deposited eggs

٥- skin

٦- other systems act to protect body openings such as the lungs, intestines, and the genitourinary tract. In the lungs, coughing and sneezing mechanically eject pathogens and other irritants from the respiratory tract.

٧- The flushing action of tears and urine also mechanically expels pathogens,

٨- The flushing action of tears and urine also mechanically expels pathogens,

B- Chemical barriers also protect against infection

١- The skin and respiratory tract secrete antimicrobial peptides such as the β-defensins

٢- Enzymes such as lysozyme andphospholipase A٢ in saliva

٣- Tears

٤- breast milk are also antibacterials

٥- Vaginal secretions

٦- zinc to kill pathogens

٧- . In the stomach, gastric acid and proteases serve as powerful chemical defenses against ingested pathogens

C- biological barriers Within the genitourinary and gastrointestinal tracts, commensal flora serve as biological barriers by competing with pathogenic bacteria for food and space and, in some cases, by changing the conditions in their environment**.** such as pH or available iron. This reduces the probability that pathogens will reach sufficient numbers to cause illness.

٢- **Inflammation:** Inflammation is one of the first responses of the immune system to infection. The symptoms of inflammation are redness, swelling, heat, and pain, which are caused by increased blood flow into tissue.

-The symptoms of inflammation

١-redness ٢-swelling ٣- heat ٤- pain

-Inflammation is produced

١- eicosanoids and cytokines, which are released by injured or infected cells. Eicosanoids include prostaglandins that produce fever and the dilation of blood vessels associated with inflammation,

٢-leukotrienes that attract certain white blood cells (leukocytes).

٣- cytokines include interleukins that are responsible for communication between white blood cells;

٤- chemokines that promote chemotaxis

٥- interferons that have anti-viral effects, such as shutting down protein synthesis in the host cell. Growth factors and cytotoxic factors may also be released. These cytokines and other chemicals recruit immune cells to the site of infection and promote healing of any damaged tissue following the removal of pathogens.

٣-Complement system: The complement system is a biochemical cascade that attacks the surfaces of foreign cells. It contains over ٢٠ different proteins and is named for its ability to "complement" the killing of pathogens by antibodies. Complement is the major humoral component of the innate immune response.

Characteristics complement

١- Complement is the major humoral component of the innate immune response

٢- Many species have complement systems, including non-mammals like plants, fish, and some invertebrates.

٣- In humans, this response is activated by complement binding to antibodies that have attached to these microbes or the binding of complement proteins to carbohydrates on the surfaces of microbes.

٤- This recognition signal triggers a rapid killing response.

٥- The speed of the response is a result of signal amplification that occurs following sequential proteolytic activation of complement molecules which are also proteases

٦- After c, they activate their protease activity, which in turn activates other complement proteases Complement proteins initially bind to the microbe

٧- This produces a catalytic cascade that amplifies the initial signal by controlled positive feedback. The cascade results in the production of peptides that attract immune cells,

٨- increase vascular permeability, and opsonize (coat) the surface of a pathogen, marking it for destruction. This deposition of complement can also kill cells directly by disrupting their plasma membrane.

٣- Cellular barriers :Leukocytes (white blood cells) act like independent, single-celled organisms and are the second arm of the innate immune system. The innate leukocytes include the

A- phagocytes (macrophages, neutrophils, and dendritic cells)

B- innate lymphoid cells,

D- mast cells,

C- eosinophils

D- basophils,

E- natural killer cells.

These cells identify and eliminate pathogens, either by attacking larger pathogens through contact or by engulfing and then killing microorganisms. Innate cells are

also important mediators in lymphoid organ development and the activation of the adaptive immune system.

- الاختبار البعدي (Post-Test)

Q/ What is Cellular barriers

Q/ What is Characteristics Phagocytosis

- الاسبوع الرابع والخامس
- الاختبار القبلي (pre-test)

-What are immune cells?

- What is Adaptive immune system

-Characteristics Phagocytosis

١- **Phagocytosis is** an important feature of cellular innate immunity performed by **cells called 'phagocytes'** that engulf, or eat, pathogens or particles.

٢- Phagocytes generally patrol the body searching for pathogens,

٣- but can be called to specific locations by cytokines. Once a pathogen has been engulfed by a phagocyte,

٤- Phagocytes trapped in an intracellular vesicle called a **phagosome**,

٥- Phagocytes subsequently fuses with another vesicle called a lysosome to form a **phagolysosome**.

٦- The pathogen is killed by the activity of digestive enzymes or following arespiratory burst that releases free radicals into the phagolysosome. Phagocytosis evolved as a means of acquiring nutrients, but this role was extended in phagocytes to include engulfment of pathogens as a defense mechanism. Phagocytosis probably

represents the oldest form of host defense, as phagocytes have been identified in both vertebrate and invertebrate animals

Characteristics Neutrophils Cells

١- **Neutrophils and macrophages** are phagocytes that travel throughout the body in pursuit of invading pathogens.

٢- Neutrophils are normally found in the blood stream and are the most abundant type of phagocyte,

٣- normally representing ٥٠٪ to ٦٠٪ of the total circulating leukocytes.

٤- During the acute phase of inflammation, particularly as a result of bacterial infection, neutrophils migrate toward the site of inflammation in a process called chemotaxis

٥- usually the first cells to arrive at the scene of infection

Macrophages are versatile cells that reside within tissues

١- produce a wide array of chemicals including enzymes, complement proteins, and cytokines, while they can also

٢- act as scavengers that rid the body of worn-out cells and other debris, and as antigen-presenting cells that activate the adaptive immune system

Characteristics Dendritic cells (DC)

١- phagocytes in tissues that are in contact with the external environment

٢- they are located mainly in the skin, nose, lungs, stomach, and intestines.

٣- They are named for their resemblance to neuronal dendrites, as both have many spine-like projections, but dendritic cells are in no way connected to the nervous system.

٤- Dendritic cells serve as a link between the bodily tissues and the innate and adaptive immune systems, as they present antigens to T cells, one of the key cell types of the adaptive immune system.

Characteristics Mast cells

١- reside in connective tissues and mucous membranes, and regulate the inflammatory response.

٢- They are most often associated with allergy and anaphylaxis.

Characteristics Basophils and eosinophils

Basophils and eosinophils are related to neutrophils. They secrete chemical mediators that are involved in defending against parasites and play a role in allergic reac

Natural killer (NK cells) cells are leukocytes that attack and destroy tumor cells, or cells that have been infected by virusestions, such as asthma.

Characteristics **Natural killer** NK cells,

١- are a component of the innate immune system which does not directly attack invading microbes. Rather, NK cells destroy compromised host cells, such as tumor cells or virus-infected cells,

٢- recognizing such cells by a condition known as "missing self." This term describes cells with low levels of a cell-surface marker called MHC I (major histocompatibility complex) – a situation that can arise in viral infections of host cells.

Adaptive immune system

١- Lymphocytes The cells of the adaptive immune system are special types of leukocytes, called lymphocytes. B cells and T cells are the major types of lymphocytes and are derived from hematopoietic stem cells in the bone marrow.

-the major types of lymphocytes .

١-B Cells and

٢-T cells are

* B cells and T cells are derived from **hematopoietic stem cell** _

in the bone marrow .

Bcell are involved in the **humoral immune response** .*

Tcell are involved in the **cell – mediated immune respons** .*

Both B cells and T cells carry receptor molecules that recognize specific targets. T cells recognize a "non-self" target, such as a pathogen, only after antigens (small fragments of the pathogen) have been processed and presented in combination with a "self" receptor called a major histocompatibility complex (MHC) molecule.

There are Tow major subtypes of T cells

١- ***Killer T cells***

٢- ***helper T cells*** .

_ regulator T cells which have role in modulating immune response .

Killer T cell only recognize antigens coupled to **class** MHC I .

_ Helper T cells and regulatory T cells only recognize antigens coupled to **class** IIMCH .

٣- A third T cells minor sub type are the Gamma delta Tcells not bound IMHC .

_ B-cell antigen – specific receptor is an antibody molecule on the B cell surface. and recognizes whole pathogens without any need for antigen processing. Each lineage of B cell expresses a different antibody, so the complete set of B cell antigen receptors represent all the antibodies that the body can manufacture.

B cell	T cell
-The humoral immune response	In the cell mediate immune response

٢- carry receptor molecules that recognice specific targets	٢- carry receptor molecules that recognice specific targets
	٣-Type ١- killer T-cell ٢- helper ٣-gamma delta T cell

Killer T-cell :- are a sub group of T cell that kill cell that are infected with viruses (and other pathogens) . or are otherwise damaged or dysfunctional

-Killer T cell are activated when their T cell receptor (TCR) binds to this specific antigen in complex wich MHC .

- Antigen complex is aided by a co- receptor on the Killer T cell , called CD٨

- When an activated T cell contacts such cells , it releases cytotoxins , such as perforin .

-Perforin , wich from pores is in the target cells plasma membrane
-Allowing ions , water and toxin called **granulysin** (a protease) .

-Apoptosis :- T cell killing of host cells is particularly important in preventing the replication of viruses .

Helper T cell :- regulate both the innate and adaptive immune responses and help determine which immune responses the body makes to a particular pathogen .
__ antigen complex is also recognized by the helper cells **CD٤** co-receptor .
(APCs) :- antigen – presenting cells
(MHC٢) :- class II MHC
(CD٤ +) :- CD٤ co- receptor

Gamma delta T cells	Helper T cell	T Killer T cell
١- **γδ T cells**) possess an	helper T cell :-	Killer T cell :- are a sub

alternative T cell receptor (TCR) as opposed to CD٤+ and CD٨+ (αβ) T cells and share the characteristics of helper T cells, cytotoxic T cells and NK cells	regulate both the innate and adaptive immune responses and help determine which immune responses the body makes to particular pathogen .	group of T cells that kill cells that are infected with viruses and other pathogens . or are otherwise damaged or dysfunctional. As with B cells, each type of T cell recognizes a different antigen.
٢-T cell subsets bearing invariant TCRs, such as CD١d-restrictedNatural Killer T cells	**MHC class II**	**MHC class I**
٣-γδ T cells straddle the border between innate and adaptive immunity	**co- CD٤**	co- CD٨
٤-γδ T cells are a component of adaptive immunity as they rearrange TCR genes to produce receptor diversity and can also develop a memory phenotype	٤- TCR (T cell receptors)	**٤- TCR (T cell receptors)**
٥-On the other hand, the various subsets are also part of the innate immune system, as restricted TCR or NK receptors may be used as pattern recognition receptors.	**cytokines**	**٥- cytotoxine such as perforin**
٦-For example, large numbers of human Vγ٩/Vδ٢ T cells respond within hours to common moleculesproduced by microbes		
٧- highly restricted Vδ١+ Tcellsin epithelia respond to stressed epithelia cells.		

- الاختبار البعدي (Post-Test)

-Whar are Characteristics Phagocytosis

- Whar are Characteristics Mast cells

-what are the differenceGamma delta T cells Helper T cell T Killer T cell

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الاسبوع السادس والسابع والثامن

- الاختبار القبلي (pre-test)

Q١/What are the characteristics Phagocytosis

Q٢/ Characteristics Neutrophils Cell

Q٣/What is the difference between cells T,B

Q٤/What are cells *lymphocytes*

B lymphocytes and antibodes

B lymphocytes and antibodes:- a B cell identifies pathogens when antibodies on its surface bind to a specific foreign antigen. This antigen – antibody complex is taken up by the B cell and processed by proteolysis into peptides .

١- The B cell then displays these antigenic petiddes on its surface MCH II molecule .

٢- this comtination of MHC and antigen attracts matching helper T cell which releases lymphokines

٣- activates the B cell. As the activated B cell then begins to divide, its offspring (plasma cells) secrete millions of copies of the antibody that recognizes this antigen. . bind to pathogens expressing the antigen

٤-these antibodies circulate in blood plasma and lymn bind to pathogens expressing the antigen and marlc then for destroy ction by complement actiration .

٥-mark them for destruction by complement activation or for uptake and destruction by phagocytes.
٦- Antibodies can also neutralize challenges directly, by binding to bacterial toxins or by interfering with the receptors that viruses and bacteria use to infect cells.

-Alternative adaptive immune system: Evolution of the adaptive immune system occurred in an ancestor of the jawed vertebrates. Many of the classical molecules of the adaptive immune system (e.g., immunoglobulins and T cell receptors) exist only in jawed vertebrates.

١- However, a distinct lymphocyte-derived molecule has been discovered in primitive jawless vertebrates, such as the lamprey and hagfish

٢- These animals possess a large array of molecules called Variable lymphocyte receptors (VLRs)

٣-, like the antigen receptors of jawed vertebrates, are produced from only a small number (one or two) of genes. These molecules are believed to bind pathogenic antigens in a similar way to antibodies, and with the same degree of specificity.

Immunological memory:- when B cells and T cell are activated and begin to replicate. Some of their off spring become long – lived memory cells .throughout
The life time of an animal .

Immunlogical memory can be in the form of
(١- passive short- term memory)
(٢-active long- term memory)
Passive memory

١- Newborn infants have no prior exposure to microbes and are particularly vulnerable to infection.

١- Several layers of passive protection are provided by the mother. During pregnancy, a particular type of antibody

٢ a particular type of antibody, called IgG, is transported from mother to baby directly across the placenta,

٣- so human babies have high levels of antibodies even at birth, with the same range of antigen specificities as their mother. Breast milk or colostrum also contains antibodies that are transferred to the gut of the infant and protect against bacterial infections until the newborn can synthesize its own antibodies

٤- This is passive immunity because the fetus does not actually make any memory cells or antibodies—it only borrows them.

٥-This passive immunity is usually short-term, lasting from a few days up to several months

٦- In medicine, protective passive immunity can also be transferred artificially from one individual to another via antibody-rich serum.

Active memory and immunization

Active memory :- Long-term *active* memory is acquired following infection by activation of B and T cells. Active immunity can also be generated artificially, through vaccination. The principle behind vaccination (also called immunization)

١-following infection by activation١

٢-active immunity can also be generated artificially through vaccination .

٢- vaccination . the principle bebind vaccination (also called immunization) is to introduce an antigen from a pathogen in order to stimulate the immune system and develop specific immunity against that particular pathogen with out causing disease associated with that organism

٣- in factious disease remaining one of the leading causes of death in the human population .

٤- vaccination represents the most effective manipulation of the immune system mankind has developed.

Viral vaccines	*Bacterial vaccines*
١-most viral vaccines are based on live attenuated viruses.	١-bacteral vaccines are based on acellular components of micro_organisms ٢- includind harmless toxin components ٣-most bacterial vaccines are provded With additional adjuvaning that activate The antigen- presenting cells of the innate immune system and maximize immunogenicity.

- الاختبار البعدي (Post-Test)

-Define The following: Immunological memory, Active memory,

-What is the difference between Viral vaccines and Bacterial vaccines

- الاسبوع التاسع والعاشر
- الاختبار القبلي (pre-test)

Q١/Chose the correct answer

is a substance that causes the allergic reaction. The (detrimental) reaction may result after exposure via ingestion, inhalation, injection or contact with skin.

A- Allergen B- **Tumor antigens** **C- Tolerogen**

Q٢/Define Antigen

Antigen

١- Concept of Antigen

- Antigens are substances that induce a specific immune response and subsequently react with the products of a specific immune response.
- An **antigen** is a molecule that stimulates an immune response.
- The word originated from the notion that they can stimulate **anti**body **gen**eration. We now know that the immune system does not only consist of antibodies.

- The modern definition encompasses all substances that can be recognized by the adaptive immune system.

-**Tolerogen** - An antigen that invokes a specific immune non-responsiveness due to its molecular form. If its molecular form is changed, a tolerogen can become an immunogen.

-Allergen - An allergen is a substance that causes the allergic reaction. The (detrimental) reaction may result after exposure via ingestion, inhalation, injection or contact with skin.

-Antigens can be classified in order of their origins

- **Exogenous antigens**

  Exogenous antigens are antigens that have entered the body from the outside, for example by inhalation, ingestion, or injection. By endocytosis or phagocytosis, these antigens are taken into the antigen-presenting cells (APCs) and processed into fragments

- **Endogenous antigens**

  Endogenous antigens are antigens that have been generated within the cell, as a result of normal cell metabolism, or because of viral or intracellular bacterial infection

- **Autoantigens**

An autoantigen is usually a normal protein or complex of proteins (and sometimes DNA or RNA) that is recognized by the immune system of patients suffering from a specific autoimmune disease.

These antigens should under normal conditions not be the target of the immune system, but due to mainly genetic and environmental factors the normal immunological tolerance for such an antigen has been lost in these patients.

- **Tumor antigens**

Tumor antigens are those antigens that are presented by the MHC I molecules on the surface of tumor cells. These antigens can sometimes be presented only by tumor cells and never by the normal ones. In this case, they are called tumor-specific antigens (TSAs) and typically result from a tumor specific mutation.

٢-Characteristics of Antigen

★ Immunogenicity

The capacity to stimulate the production of antibodies or cell-mediated immune responses.

★ Antigenicity: The ability to bind antibody.

♣ Complete antigen

♣ Incomplete antigen, also known as hapten.

Incomplete antigens have antigenic determinants, but cannot induce immune responses because they lack one or more of the important attributes needed for this function (one example of an incomplete antigen is a **hapten,** which is an artificial monovalent epitope)

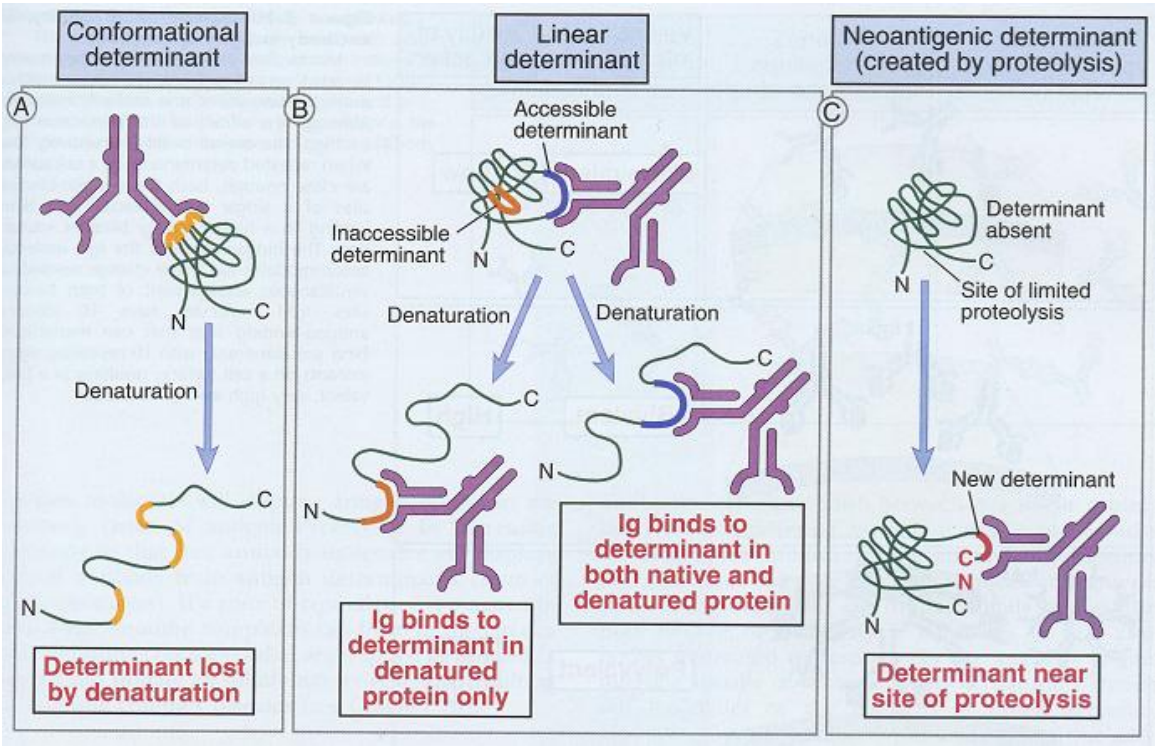
٣ Properties of antigen

- **Foreignness** is essential to immunogenicity because self-responsive cells are eliminated during lymphocyte ontogeny, leaving only cells that respond to non-self, so-called "foreign" epitopes.
- **Specificity**
- **High molecular weight**

٤ Antigenic epitopes

Epitope,or,Antigenic determinants, are the portions of antigen molecules that physically interact with paratopes (combining sites) of immune response molecules and therefore actually "determine" antigen specificity

Antigenic epitopes



Types of Epitopes

١-Linear epitopes

♣ continuous and found in polysaccharides as well as in both native (nondenatured) and denatured proteins, especially fibrillar proteins.

♣ specificity depends upon primary sequence.

♣ typical size is ٥-٦ subunits in length

٢- Conformational epitopes

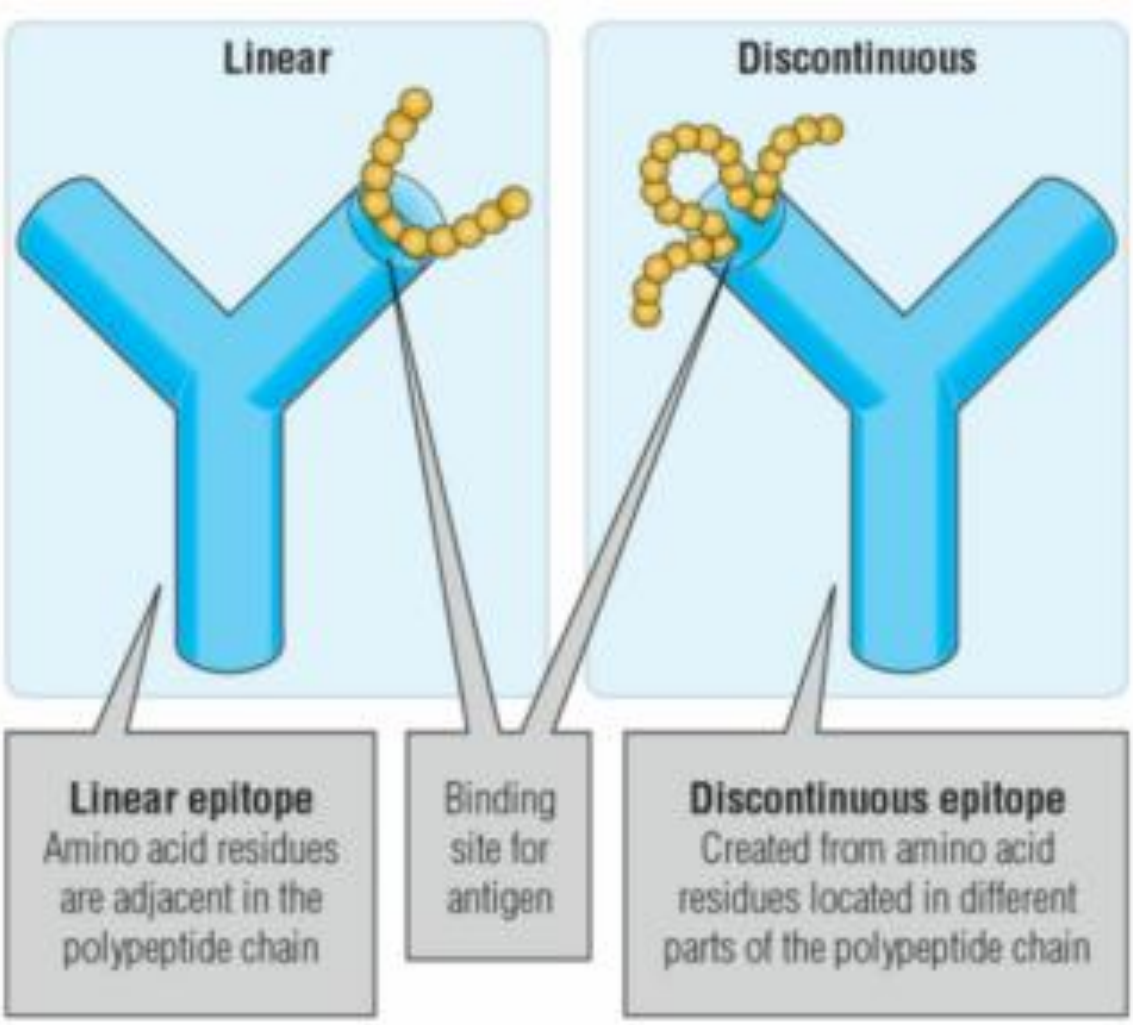
♣ Discontinuous (involve multiple subunits, often located far apart in the primary sequence of the antigen molecule) and are thus found only in native (globular) proteins.

♣Specificity depends upon conformation, or three-dimensional shape, which is a combination of tertiary and quaternary structure ... supported by primary and secondary structure.

♣ Typical size is hard to pinpoint, but sequences of up to ١٦ amino acids in certain protein antigens have been shown to interact with their complementary paratope.

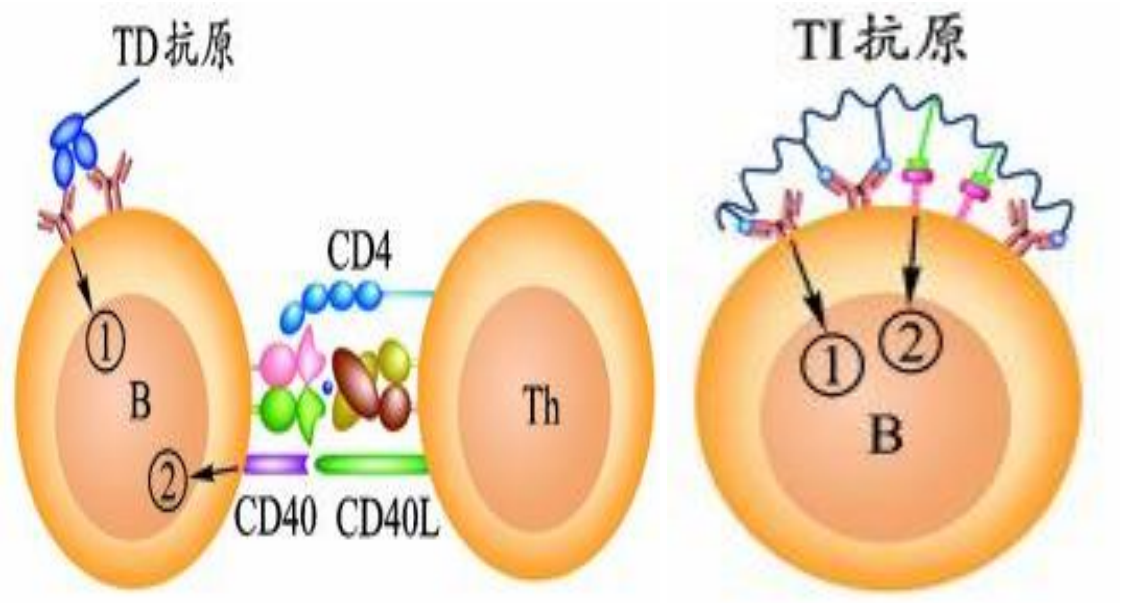
Two different epitopes

B cell epitope, a portion of antigen molecule that is recognized by B cell receptors.	**T cell epitope,** the region of antigen molecules that are recognized by T cell receptors



٥ Classification of Antigens

- Thymus-dependent antigen(TD-Ag)
- Thymus-independent antigen(TI-Ag)



٦ Superantigen

- Molecules that are potent T lymphocyte mitogens and simultaneously bind to class II MHC molecules. They are often associated with staphylococcal products and are involved in enterotoxemias and toxic shock syndrome in humans.

-Superantigens (SAgs) are secreted proteins (exotoxins) that exhibit highly potent lymphocyte-transforming (mitogenic) activity directed towards T lymphocytes

- Compared to a normal antigen-induced T-cell response where ٠,٠٠١-٠,٠٠٠١٪ of the body's T-cells are activated, SAgs are capable of activating up to ٢٠٪ of the body's T-cells. This causes a massive immune response that is not specific to any particular epitope on the SAg.

٧ -Mitogen

- An agent that induces mitosis.
  Here means to activate T cells and/or B cells without help from APCs.
- Lectin, for example, concanavalin A (ConA).

- LPS(lipopolysaccharide)
- Staphylococcal protein A(SPA)

٨ Adjuvant

- **Adjuvant:** The Latin "adjuvans" means to help, particularly to reach a goal.
- An adjuvant is a substance that helps and enhances the pharmacological effect of a drug or increases the ability of an antigen to stimulate the immune system.

Mechanisms of adjuvants

- **Prolonged persistence of immunogen molecules at the site of injection.**
- **Enhancement of co-stimulatory signals.**
- **Induction of granuloma formation.**
- **Stimulation of lymphocyte proliferation in a non-specific manner.**

-Classification of Adjuvant

- Freund's adjuvant

♥ Complete Freund's adjuvant(CFA)

♥ Incomplete Freund's adjuvant(IFA)

- Liposome
- Inorganic compound
- Cytokine
- Biodegradable nanoparticles

٩ Other antigens

٩-١ Heterophilic antigen : A kind of common antigen, existing in human, animals, and microbes.

Fossman antigen.

٩-٢ Xenogenic antigen

This antigen comes from different genus and generic. For example, pathogenic antigen.

٩-٣ Allogenic antigen

The specific antigen exists in different individuals. Blood type antigens

٩-٤ Autoantigen

A pathological term.

, sperm antigen

٩-٥ Idiotypic antigen

An antibody molecule is some sort of foreign molecule when generated in animal body. Such that immune system recognizes it as **Antigen**, which is known as Idiotypic antigen

Factors that influence the immunogenicity of proteins		
Parameter	Increased immunogenicity	Decreased immunogenicity
Size	Large	Small (MW<2500)
Dose	Intermediate	High or low
Route	Subcutaneous > intraperitoneal > intravenous or intragastric	
Composition	Complex	Simple
Form	Particulate	Soluble
	Denatured	Native
Similarity to self protein	Multiple differences	Few differences
Adjuvants	Slow release	Rapid release
	Bacteria	No bacteria
Interaction with host MHC	Effective	Ineffective

Figure A-2 Immunobiology, 6/e. (© Garland Science 2005)

الاختبار البعدي (Post-Test)

Q١/Chose the correct answer

- Molecules that are potent T lymphocyte mitogens and simultaneously bind to class II MHC molecules. They are often associated with staphylococcal products and are involved in enterotoxemias and toxic shock syndrome in humans.

A- Superantigen B- Mitogen c- Adjuvant

- An agent that induces mitosis. Here means to activate T cells and/or B cells without help from APCs.

A- Autoantigen B -Mitogen C- Idiotypic antigen

Q٢/What are Types of Epitopes

Q٣/ What are Characteristics of Antigen

الاسبوع الحادي عشر والثاني عشر

-الاختبار القبلي (pre-test)

Q١/Define Antibodies

Q٢/ Chose the correct answer

-Structure: Monomer Percentage serum antibodies: ٨٠٪Location: Blood, lymph, intestine Half-life in serum: ٢٣ days

A- IgG B- IgM C- IgE

-Structure: Monomer Percentage serum antibodies: ٠,٢٪Location: B-cell surface, blood, and lymph Half-life in serum: ٣ days

A- IgG B- IgM C- IgD

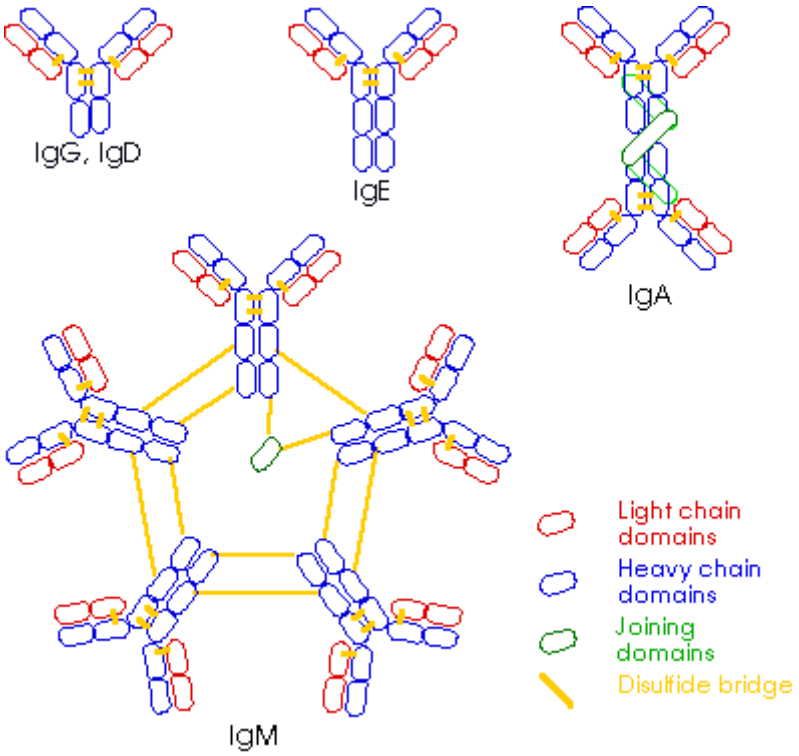
-Antibodies

- Proteins that recognize and bind to a particular antigen with very high specificity.
- Made in response to exposure to the antigen.
- Each antibody has at least two identical sites that bind antigen: Antigen binding sites.
- Belong to a group of serum proteins called immunoglobulins (Igs).

* Five classes of Antibodies:

- IgG
- IgM
- IgA
- IgD
- IgE

Immunoglobulins



Antibody Structure

Immunoglobulins are glycoproteins made up of:

- Four polypeptide chains (IgG):

a- Two light (L) polypeptide chains

b- Two heavy (H) polypeptide chains

The four chains are linked by disulfide bonds

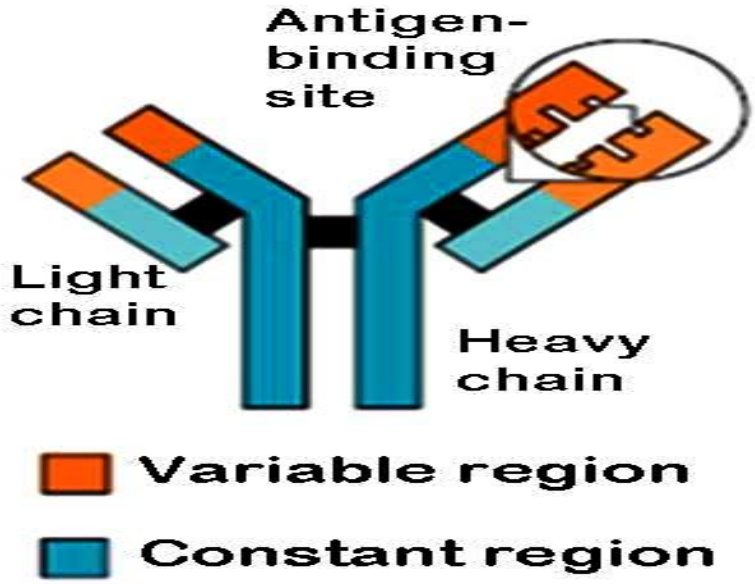
- Terminal portion of L-chain contains part of antigen binding site

- H-chains are distinct for each of the five Immunoglobulins

- Terminal portion of H-chain participate in antigen binding site

- The other (Carboxyl) terminal portion+

Antibody Structure



The four chains are linked by disulfide bonds

- Terminal portion of L-chain contains part of antigen binding site

- H-chains are distinct for each of the five Immunoglobulins

- Terminal portion of H-chain participate in antigen binding site

- The other (Carboxyl) terminal portion

An antibody molecule is composed of two identical Ig heavy chains (H) and two identical light chains (L), each with a variable region (V) & constant region ©.

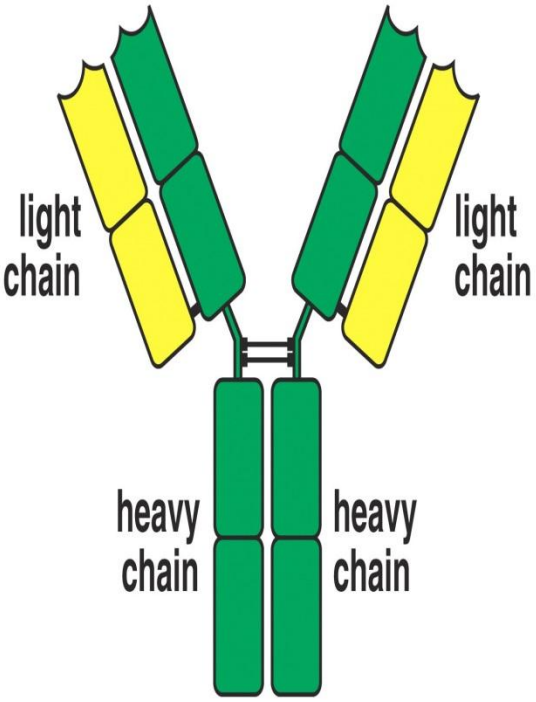


Figure 1-17 Immunobiology, 6/e. (© Garland Science 2005)

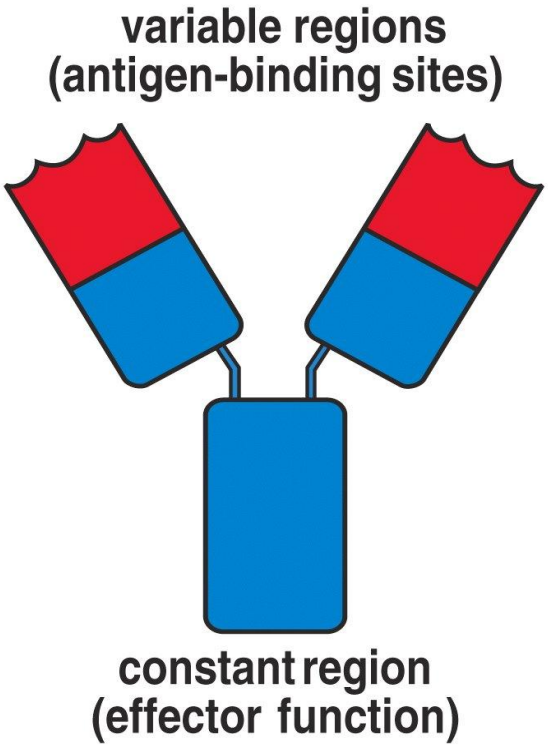


Figure 1-16 Immunobiology, 6/e. (© Garland Science 2005)

Variable (V) and Constant © Regions

- Each H-chain and each L-chain has V-region and C-region

  - V-region lies in terminal portion of molecule

  - V-region shows wide variation in amino a. sequences
  - Responsible for the antigen binding.
  - C-region lies in carboxyl or terminal portion of molecule
  - C-region shows an unvarying amino acid sequence
  - It is responsible for biologic functions

Immunoglobulin Classes

IgG

١-Structure: Monomer

٢- Percentage serum antibodies: ٨٠٪

٣- Location: Blood, lymph, intestine

٤- Half-life in serum: ٢٣ days

٥- Complement Fixation: Yes

٦- Placental Transfer: Yes

٧- Known Functions: Enhances phagocytosis, neutralizes toxins and viruses, protects fetus and newborn.

II. IgM

١- Structure: Pentamer

٢- Percentage serum antibodies: ٥-١٠٪

٣- Location: Blood, lymph, B cell surface

٤- Half-life in serum: ٥ days

٥- Complement Fixation: Yes

٦- Placental Transfer: No

٧- Known Functions: First antibodies produced during an infection. Effective against microbes and agglutinating antigens.

III. IgA

١- Structure: Dimer

٢- Percentage serum antibodies: ١٠-١٥٪

٣- Location: Secretions (tears, saliva, intestine, milk), blood and lymph.

٤- Half-life in serum: ٦ days

٥- Complement Fixation: No

٦- Placental Transfer: No

٧- Known Functions: Localized protection of *mucosal* surfaces. Provides immunity to infant digestive tract.

. IgD

١- Structure: Monomer

٢- Percentage serum antibodies: ٠,٢٪

٣- Location: B-cell surface, blood, and lymph

٤- Half-life in serum: ٣ days

٥- Complement Fixation: No

٦- Placental Transfer: No

٧- Known Functions: In serum function is unknown. On B cell surface, initiate immune response.

V. IgE

١- Structure: Monomer

٢- Percentage serum antibodies: ٠,٠٠٢٪

٣- Location: Bound to mast cells and basophils throughout body. Blood.

٤- Half-life in serum: ٢ days

٥- Complement Fixation: No

٦- Placental Transfer: No

٧- Known Functions: Allergic reactions. Possibly lysis of worms.

الاختبار البعدي (Post-Test)

Q١/ What are Antibody Structure

Q٢/ What are The four chains are linked by disulfide bonds

الاسبوع الثالث عشر والاسبوع الرابع عشر

-الاختبار القبلي (pre-test)

Q١/what are Ab affinity

Q٢/

Antigen-Antibody Interactions: Principles and Applications

- The Ag-Ab interaction is a biomolecular association similar to enzyme-substrate interaction but with few differences as:

١. It does not lead to irreversible chemical alteration in either the Ag or the Ab.

٢. It is a noncovalent interaction which include hydrogen bond, ionic bond, hydrophobic bond and van der Waals interaction.

Strong Ag-Ab interaction depend on a very close fit between the Ag & Ab.

- **Ab affinity:**

It is the strength of the total noncovalent interaction between a single Ag-binding site on an Ab & a single epitope, so

low affinity →week binding → dissociate easily.

High affinity → strong binding → difficult to dissociate.

Ab avidity:

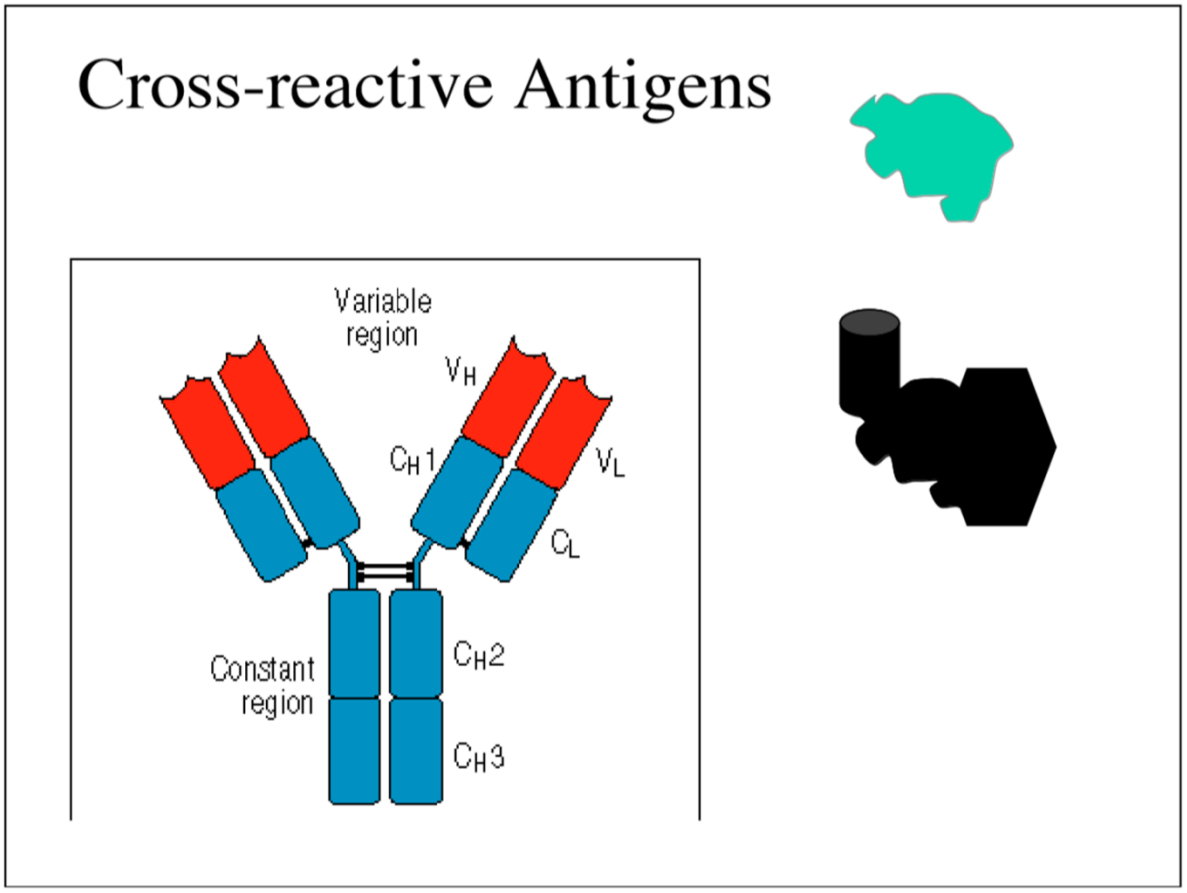
Is the strength of multiple interaction between a multivalent Ab & Ag. High avidity can compensate for low affinity for e.g. IgM has low affinity than IgG but has high avidity ٣٨ecause it is pentamer.

- **Cross reactivity:**

In which Ab elicited by one Ag can cross react with an unrelated Ag. This is because the ٢ different Ags share an identical epitope as for e.g.

١. ABO blood- group Ag cross react with microbial Ags present on the common intestinal bacteria which induce the formation of Ab in individuals lacking the similar blood-group Ag on their red blood cells.

٢. Streptococcal pyogenes cell protein(M protein),of which Ab against it will cross-react with several myocardial & skeletal muscle proteins resulting in development of Rheumatic fever and glomerulonephritis.



Many tests based have been developed to determine the presence of antibodies or antigens in a patient in the diagnose Is done in many areas of the clinical laboratory-microbiology, chemistry, toxicology, immunology, hematology, cytopathology, immunohematology(blood banking)-and great variety of specimens are tested

Types of diagnostic tests

Many types of diagnostic tests are performed in the immunology laboratory. Most of these tests can be designed to determine the presence of either the Ag or the Ab.

Major uses of serologic (Ab – based) tests:

١. Diagnosis of infectious diseases:

- When the organism cannot be cultured as in syphilis, hepatitis A,B, and C.
- When the organism is too dangerous to culture e.g. rickettsial disease.
- When culture technique are not readily available, e.g. HIV.

- When the organism takes long time to grow, e.g. Mycoplasma.

٢. Diagnosis of autoimmune disease, e.g. Ab against DNA in SLE.

٣. Determination of blood type and HLA.

ANTIGEN-ANTIBODY INTERACTIONS

- Many diagnoses would not be possible without laboratory procedures that identify antibodies or antigens in the patient
- Interaction of antigen and antibody occurs *in vivo*, and in clinical settings it provides the basis for all serologically based tests.
- The formation of immune complexes produces a **visible reaction** that is the basis of **precipitation and agglutination tests.**

الاختبار البعدي (Post-Test)

- What are Ab affinity:

Q١/What are Diagnosis of infectious diseases:

Q٢/ Types of diagnostic tests

Q٣/ /What are Diagnosis of infectious diseases:

- الاسبوع الخامس عشر

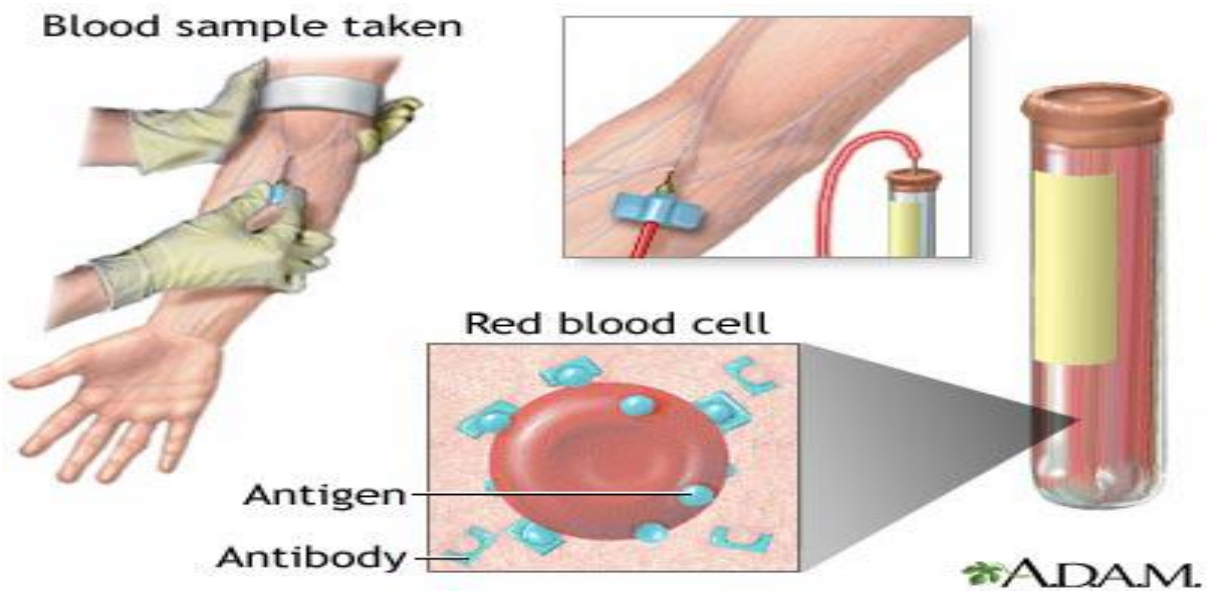
- الاختبار القبلي (pre-test)

Q١/ how Specimen collection and preparation

Antigen-Antibody Interaction

Specimen collection and preparation

Obtain a sample of venous blood from the patient and allow a clot to form. Centrifuge clotted blood sample and collect clear serum



Agglutination Reactions

It is an interaction between Ab & particulate Ag resulting in visible clumping called (agglutination).

The Ab that produce such a reaction is called (agglutinin).This reaction need a polyvalent Ag. Just as an excess of Ab inhibit ppt reaction, it will also inhibit agglutination and this is called (Prozone effect).

Causes of Prozone effect:

١.High Ab concentration. This will result in univalent binding of the Ab to Ag, so no cross-linking of one Ag to another. To overcome this you most dilute the serum .

٢.Incomplete Ab (often of IgG). This Ab may occupy most of the Agic site, this block the access by IgM, which is a good agglutinin.

Types of agglutination reactions

Direct agglutination (Bacterial agglutination)

Rose-Bengal test:

-Principle of the test:

The test depends on the ability of the Ab in the patient's serum to agglutinate the stained bacterial Ag. When this occurs the aggregates become clearly visible to the naked eye

- **Ag :** stained bacterial Ag (killed suspension of *Brucella abortus*)

Ab : Abs to Brucella in the patients serum

Assay procedure

Qualitative method :

1- Allow kit and patient serums to come to room temperature .

٢- Transfer one drop (٥٠ µl) of patient's serum on a test slide.

٣- Shake the reagent then using the dropper and add one drop to the test slide and mix and gently rotate the mixture for ٤ minutes.

Semi-quantitative method :

١- Using isotonic saline prepare serial dilution of the patient serum (١/٢, ١/٤, ١/٨, ١/١٦, ١/٣٢, ١/٦٤, and so on).

٢- Transfer one drop (٥٠ µl) of each serum dilution to the test circle slide .

٣- Shake the reagent, add one drop of suspension to the test slide then mix and gently rotate the test slide for ٤ minutes .

- Results :

A positive result is indicated by the obvious agglutination pattern of the suspension on the test slide.

A negative result is indicated by no change in the suspension on the test slide .

Agglutination of the Ag with undiluted sample indicates the presence of Ab at a concentration of greater than or equal to ٢٥ IU/ml .

A comparison between samples taken ١٠-١٤ days apart may be of value in acute illness

٢- Widal Test :

- **Principle of the test :**

The test depends on the ability of Ab in the patient's serum to agglutinate the stained bacterial Ags. When this occurs the aggregates become clearly visible to the necked eye.

***Ags :**Suspension of bacteria stained and killed. ***Salmonella O-Group A(Paratyphi A-O).**

***Salmonella O-Group B(Paratyphi B-O).**

***Salmonella H-Group a(Paratyphi A-H).**

***Salmonella H-Group b(Paratyphi B-H).**

***Salmonella O-Group d(Typhi O).**

***Salmonella H-Group d(Typhi H).**

***Ab :** Ab to bacterial Ags in patient's serum .

Rapid slide test :

١- Using a graduated pipette add the following amounts of serum to consecutive circles on a slide for each dilution under test.

٠,٠٨ ml, ٠,٠٤ ml, ٠,٠٢ ml, ٠,٠١ ml, ٠,٠٠٥ ml

٢- Thoroughly resuspend the Ag and add a drop to the appropriate circle on the slide.

٣-Mix, and gently rotate the test slide for ١ minute whilst examining the test slide for agglutination.

٤- Results obtained correspond to tube agglutination titers of ١:٢٠, ١:٤٠, ١:٨٠, ١:١٦٠, ١:٣٢٠ respectively.

Any sample showing agglutination should be tested in the tube agglutination test.

Indirect (Passive) agglutination :
Is useful with soluble Ag. This test done with the use of Ag coated RBC, or the use of synthetic particales, such as latex beads.

[١] Qualitative determination of anti-streptolysin O (ASO).

-Clinical finding :

Streptolysin O is toxic immunogenic exoenzyme produced by β –hemolytic streptococci of group A, C, and G.

Measuring the ASO Abs are useful for the diagnostic of rheumatoid fever, acute glomerulonephritis and streptococcal infections.

Rheumatic fever is an inflammatory disease affecting connective tissue from several parts of human body as skin, heart, joints, etc….and acute glomerulonephritis is a renal infection that affects mainly to renal glomerulus.

- **Principle of the test :**

The ASO-Latex is a slide agglutination test for the qualitative and semi-quanitative detection of anti-streptolysin O(ASO) Abs. Latex particles with streptolysin O are agglutinated when mixed with samples containing ASO Abs.

***Ag :**Latex particles coated with streptolysin O.

***Ab :**Antistreptolysin O (ASO) in patient's serum .

Procedure :

Qualitative method:

١- Allow the reagents and samples to reach to room temperature .

٢- Place ٥٠µl of the sample and one drop of each positive and negative controls into separate circles on the slide test .

٣- Shake the reagent gently befor using and add one drop (٥٠µl) next to the samples to be tested.

٤-Mix the drops with a stirrer, spreading them over the entire surface of the circle, and read the result within ٢ minutes .

٢- Semi-Quantitative method:

١- Make serial two fold dilutions of the sample .

٢- Proceed for each dilution as in the qualitative method .

The presence of agglutination indicates an ASO concentration equal or greater than ٢٠٠ IU/ml

[٢] Qualitative determination of Rheumatoid Factors (RF):

Clinical significance :

Rheumatoid factors are a group of Abs directed to determinants in the FC portion of the immunoglobulin G molecule .

Although rheumatoid factors are found in a number of rheumatoid disorders, such as, Systemic Lupus Erythematosus (SLE) ,and Sjögren's syndrome, as well as in nonrheumatoid arthritis (RA), utility as an aid in the diagnosis of rheumatoid arthritis (RA).

Principle

The RF-latex is a slide agglutination test for the qualitative and semi-quantitative detection of RF in human serum. Latex particles coated with human gammaglobulin are agglutinated when mixed with samples containing RF.

***Ag :** Latex particles coated with human gammaglobulin .

***Ab :**Serum containing RF

-Procedure :

Qualitative method:

١- Allow the reagents and samples to reach to room temperature .

٢- Place ٥٠µl of the sample and one drop of each positive and negative controls into separate circles on the slide test .

٣- Shake the RF-latex reagent gently before using and add one drop (٥٠µl) next to the samples to be tested.

٤-Mix the drops with a stirrer, spreading them over the entire surface of the circle, and read the result within ٢ minutes .

٢- Semi-Quantitative method:

١- Make serial two fold dilutions of the sample .

٢- Proceed for each dilution as in the qualitative method .

The presence of agglutination indicates a RF concentration equal or greater than ٨ IU/ml.

[٣]A rapid latex slide test for the detection of CRP in serum :

Tissue-damaging associated with inflammatory diseases, infection and neoplasms are associated with a major accute phase response of the C-reactive protein (CRP) and other acute phase reactants. The CRP response frequently precedes clinical symptoms, including fever, Measuring changes in the concentration of CRP provides useful diagnostic information about how acute

and how serious a disease is. It also allows the assessment of complications during the disease and judgment about the disease genesis

-Principle of the test :

- CRP latex reagent is a suspension of polystyrene particles sensitized with anti-human CRP. When the latex reagent is mixed with a serum containing C-reactive protein, visible agglutination occurs. The latex reagent has been produced so that agglutination will take place only when the level of CRP is greater than ٦ mg/L.

Chromatographic immunoassay :

- **Pregnancy test strip (Urine/Serum):**

Human chorionic gonadotropin (hCG) is a glycoprotein hormone produced by the developing placenta shortly after fertilization. In normal pregnancy, hCG can be detected in both urine and serum as early as ٧ to ١٠ days after conception.

-Principle:

The hCG one step pregnancy test strip (Urine/serum) is a rapid chromatographic immunoassay for the qualitative detection of hCG to aid in the early detection of pregnancy .

- The test uses two lines to indicate results. The test utilized a combination of Abs including a monoclonal hCG Ab to selectivesly detect elevated levels of hCG.
- The control line is composed of goat polyclonal Abs and colloidal gold particles. The assay is conducted by immersing the test strip in a urine or serum specimen and observing the formation of colored lines. The specimen migrates via capillary action along the membrane to react with the colored conjugate .
- **Ag :** hCG in urine or serum samples .

Ab : anti-hCG coated on the membrane

- Immerse the test strip vertically in the urine or serum specimen for at least ١٠-١٥ seconds.
- Place the test strip on a non-absorbent flat surface, start the timer and wait for the colored line(s) to appear .

- Read the result at ٣ minutes when testing a urine specimen, or at ٥ minutes when testing a serum specimen .
- **Positive : Two distinct colored lines appear.** One line should be in the control line region(C) and another line should be in the test line region .
- **Negative : One colored line appears in the control line region (C).** No apparent colored in appears in the test line region (T) .

الاختبار البعدي (Post-Test)

Q١/How Qualitative determination of Rheumatoid Factors (RF):

Q٢ /How Qualitative determination of anti-streptolysin O (ASO).

Q٣/What are rapid latex slide test for the detection of CRP in serum :

Q٤/What are Widal Test

المصادر الاساسية:

-Stewart, J. (٢٠١٢, May ٢٤). Parasitic infections: Pathogenesis and immunity. Retrieved July ٢٨, ٢٠٢٠, from

- G. (n.d.). Immunoengineering. Retrieved June ٢٦, ٢٠٢٠, from

https://bme.gatech.edu/bme/areas/immunoengineering

- Zimmermann, K. (٢٠١٨, October ١٧). Immune System: Diseases, Disorders & Function.

-Abbas, A.K. and Lichtman, A.H. (٢٠٠٣) Cellular and Molecular Immunology, ٤th edn., W.B. Saunders Company, Philadelphia, USA.

-Janeway, C.A., Travers, P., Walport, M. and Shlomchik, M. (٢٠٠١)

Immunobiology, ٥th edn., Garland Publishing, London, UK.

-Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A. (٢٠٠٢) Immunology, ٥th edn., W.H. Freeman, Oxford, UK.

-Playfair, J.H.L. and Lydyard, P.M. (٢٠٠٠) Medical Immunology for Students, ٢nd

-edn. Churchill Livingstone, Edinburgh, UK.Roitt, I.M., Brostoff, J. and Male, D. (eds.) (٢٠٠١) Immunology, ٦th edn., Mosby,London, UK.

-Roitt, I.M. and Delves, P. J. (٢٠٠١) Essential Immunology, ١٠th edn., BlackwellScientific, Oxford, UK.

-Sharon, J. (١٩٩٨) Basic Immunology, William and Wilkins, Baltimore, USA.

روابط مقترحة ذات صلة

-https://my.clevelandclinic.org/health/diseases/٢٤٠٦٧-antigen

-https://my.clevelandclinic.org/health/body/٢٢٩٧١-antibodies

-https://www.youtube.com/watch?si=RZyJETG٨٤ohAdmQr&v=T-١٣_JvoGyE&feature=youtu.be

-https://www.hopkinsmedicine.org/health/conditions-and-diseases/the-immune-system

-https://youtu.be/hIioUzwX٢٥c?si=ed٦j٠lzRc_maBpJd

-https://youtu.be/tc-ZYNSk٨٤U?si=sfqVSNIMxXptxdgu

-https://youtu.be/MglW٠j٤yp١Y?si=TId٠u١٥nu٠G٢٥tpH

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