

الاسئلة و نموذج اجابة امتحان مقرر المناعة 318 لطلاب  
الميكروبيولوجى و كيمياء

**Benha university**

**Immunology**

**Faculty of Science**

**Final examination**

**Botany Department**

**Microbiology students**

**2012-2013**

**Fourth year**

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**Answer the following questions:**

**I- Explain three of the following:**

- a- The degree of immunogenicity of a molecule is influenced by foreignness
- b- Basic units of immunoglobulin structure with only drawing
- c- Interleukin 4
- d- T-independent antigens

**II- Complete the following sentences:**

1- Heterophile antigens stimulate the production of .....

2- Antigens are called superantigens because of their ability to  
Activate ..... Examples of superantigens are .....  
Produced by .....

3- Immunoglobulin prevent adhesion and colonization of .....

4- Hypervariable regions are particular areas within the  
Variable regions that are highly variable in ..... L chain  
Have .....hypervariable regions and H chain have .....  
hypervariable regions.

5- Cytokines regulate not only ..... but also.....

6- Monokines are cytokines produced by .....

7- Lymphokines are cytokines produced by .....

**III- Write on 3 of the following:**

1- lymph nodes

2- Host factor affecting innate immunity

3- Basophils cells

4- T lymphocytes

5- Phagocytosis process

#### **IV: Put true or false:**

1- Intact skin is the 1<sup>st</sup> line of defense against infection. ( )

2- The main function of the lymphatic system is collect and transport blood. ( )

3- The production of blood cells in bone marrow being roughly 4-7 month. ( )

4- The spleen filter lymph. ( )

5- B cells constitute 15-20 of circulating blood lymphocytes. ( )

6- Bile acids interfere with the vital functions of the cell membrane of virus. ( )

7- Different races have different susceptibility to infection.( )

8- Eosinophils have lobed nuclei (two or four lobes). ( )

9- Heparin prevents blood from clotting to allow blood to flow to the area of infection or injury.( )

10- Mast cell can react against and destroy another cell without prior sensitization to it. ( )

11- Monocytes move quickly to site of infection and divide/differentiate into NK cells and mast cells. ( )

12- Inflammation prevent the spread of pathogen into general circulation. ( )

*With my best wishes*

اجابة السؤال الاول

**(A)**

The degree of immunogenicity of a molecule is influenced by several factors. The relationship can be expressed algebraically by the following formula:

**Immunogenicity = (foreignness) (chemical complexity)**  
**(molecular size)**

**A. Foreignness**

1. An antigen must be foreign or alien to the host with which it makes contact. The more foreign, the more powerful antigen.
2. The greater the phylogenetic difference, the more foreign something becomes.

**Antigens exhibit species specificity and according to species there are four kinds of antigens:**

**a. Autologous antigens** are found within the same individual; that is, they are not foreign to that individual.

**b. Syngeneic antigens** are found in genetically identical individuals (e.g., individuals from strain of mice or identical twins).

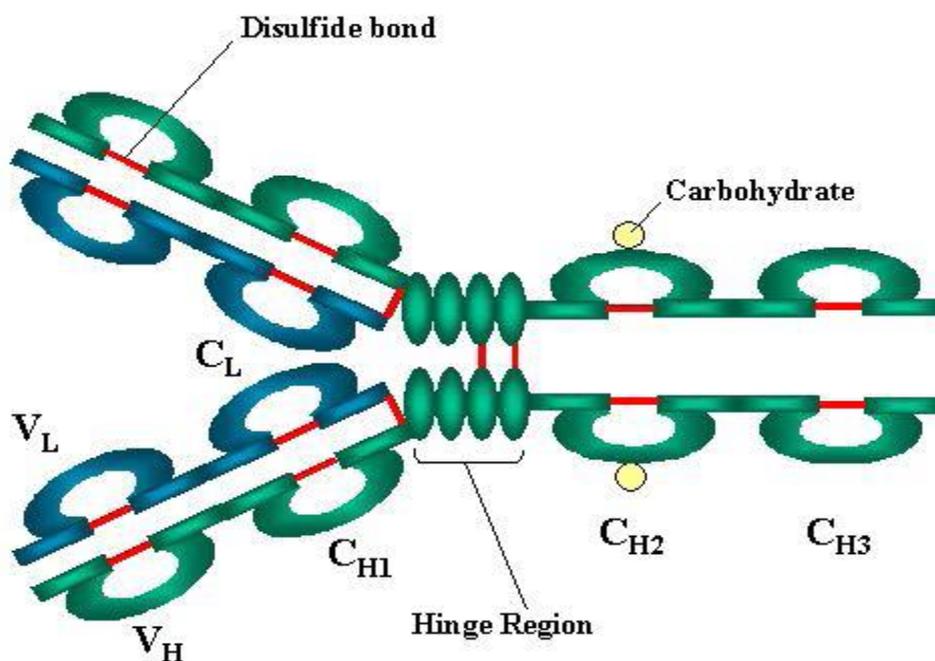
**c. Allogeneic antigens (alloantigens)** are found in genetically dissimilar members of the same species. For example, a kidney transplant from mother to daughter is foreign.

(1) Some alloantigens, called isoantigens, are found in some members of a species and not in others.

(2) The A and B blood group antigens are examples of isoantigens.

**D. Xenogeneic (heterogenic) antigens** are found in different species. For example, a transplant of monkey kidney to humans is called a heterograft or xenografts, and it is foreign. The term heterologous is also sometimes used as a synonym for xenogeneic.

(B)



## **Basic unit (monomer) of Ig**

**(c)**

### **- Interleukin 4 (IL-4)**

- IL-4 is a cytokine produced by Th2 type helper T cells, mast cells, basophils and eosinophils.
- This cytokine can elicit many responses, some of which are associated with allergy.
- It is a growth, stimulated and differentiation factor for B cells becomes a plasma cell secreting IgE and other allergy related antibodies. It is the main cytokine capable of inducing of B cells to the Ig E isotype.
- It is a growth factor for mast cells.
- It inhibits Th1 cell differentiation.
- It inhibition of monokine production by macrophages.
- IL-4 acts with IL-10 in an immunoregulatory manner to decrease the activity of activated macrophages.

**(D)**

## T –independent Antigens:

T-independent antigens are antigens which can directly stimulate the B cells to produce antibody without the requirement for T cell help. In general, polysaccharides are T-independent antigens. The responses to these antigens differ from the responses to other antigens. T-independent antigens are generally more resistant to degradation and thus they persist for longer periods of time and continue to stimulate the immune system.

### اجابة السؤال الثانى

1- Heterophile antigens stimulate the production of heterophile-Abs

2- Antigens are called superantigens because of their ability to

Activate all T-cells. Examples of superantigens are some exotoxins

Produced by *Staphylococcus aureus*

3- Immunoglobulin prevent adhesion and colonization of microorganisms

4- Hypervariable regions are particular areas within the

Variable regions that are highly variable in the amino acids sequence, L chain have three hypervariable regions and H chain have four

5- Cytokines regulate not only local and systemic immune and inflammatory responses but also many other biological processes

6- Monokines are cytokines produced by monocytes

7- Lymphokines are cytokines produced by activated lymphocytes, especially T-helper cells

\*اجابة السؤال الثالث:

**III- Write on 3 of the following:**

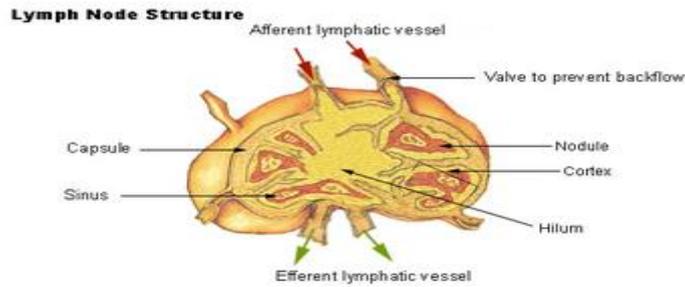
**1- Lymph nodes (Filtering lymph):**

**Lymph nodes** are small, oval, or bean-shaped bodies that occur along lymphatic vessels. A lymph node is an

organized collection of lymphoid tissue, through which the lymph passes on its way to returning to the blood. Lymph nodes are located at intervals along the lymphatic system. Several afferent lymph vessels which drain fluid from the tissues also carry antigens from sites of infection in most parts of the body to the lymph node, where they are trapped and are drained out by an efferent lymph vessel

**Lymph nodes perform three functions:**

- They **filter the lymph**, preventing the spread of microorganisms and toxins that enter interstitial fluids.
- They **destroy** bacteria, toxins, and particulate matter through the phagocytic action of macrophages.
- They produce antibodies through the activity of B cells



A lymph node showing afferent and efferent lymphatic vessels

## 2- Host Factors affecting Innate Immunity:

- **Species.** Different species have different susceptibility to infective agents (man differs from dogs, rats and pigs).
- **Race.** Different races have different susceptibility to infection, e.g., Negroes are more susceptible to tuberculosis and Caucasian is more susceptible to Diphtheria and Gonorrhoea.
- **Age.** Very young or very old people are more susceptible to infections because their immune responsiveness is immature or suboptimal.

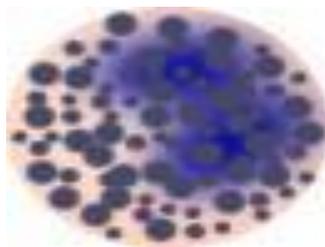
- **Nutrition.** Malnutrition predisposes to infection leading to decrease total leukocyte count and decrease phagocytic activity.
- **Hormonal balance**, e.g., adrenal dysfunction and hypothyroidism decrease resistance to infections.

**3- Basophils:** Are the least common of the [granulocytes](#), representing about 0.01% to 0.3% of circulating [white blood cells](#).

- The name comes from the fact that these leukocytes are basophilic, i.e., they are susceptible to [staining](#) by [basic dyes](#), as shown in the picture.
- Basophils contain large [cytoplasmic](#) granules which obscure the [cell nucleus](#) under the [microscope](#). However, when unstained, the nucleus is visible and it usually has 2 [lobes](#).
- Basophils appear in many specific kinds of [inflammatory](#) reactions, particularly those that cause

allergic symptoms. Basophils contain anticoagulant [heparin](#), which prevents blood from clotting too quickly. They also contain the vasodilator histamine, which promotes blood flow to tissues. They can be found in unusually high numbers at sites of [ectoparasite](#) infection, e.g., [ticks](#). Like [eosinophils](#), basophils play a role in both parasitic infections and allergies.

- They are found in tissues where allergic reactions are occurring and probably contribute to the severity of these reactions.
- Basophils have protein receptors on their cell surface that bind [IgE](#), an immunoglobulin involved in macroparasite defense and [allergy](#).



**Basophils**

#### 4- T lymphocytes

-T cells also called thymus cells or thymocytes belong to a group of white blood cells known as lymphocytes.

-T lymphocytes represent 65-80% of the circulating blood lymphocytes.

-They have long life span (month or years).

- T-cells cells play a vital role in cell-mediated immunity.

Once activated, T-cells secrete chemical messengers called cytokines, which stimulate immune system cells to engulf foreign substances (such as bacteria, viruses, fungi, and allergens) that enter the body.

-They can be distinguished from other lymphocytes, such as B cells and natural killer cells (NK cells), by the presence of a **T cell receptor (TCR)** on the cell surface.

This receptor allows T-cells to identify specific antigens (foreign substances) that enter the body.

- They are called T cells because they mature in the thymus. T-cells are continually produced in the bone marrow. The immature T-cells then migrate through the bloodstream and mature in the thymus gland, which is located in the upper chest.
- There are several types of T-cells, including cytotoxic T-cells, Helper T-cells, memory T-cells, regulatory T-cells, natural killer (NK) T-cells, and Gamma/delta ( $\gamma\delta$ ) T-cells. Each type of T-cell has a distinct function.
- T cells are like the soldiers, destroying the invaders that the intelligence system has identified.

## **5- Phagocytosis**

- Phagocytosis is the [cellular](#) process of engulfing solid particles and bacteria by the [cell membrane](#) and destroyed it.

- The phagocytic cell such as a macrophage may be attracted to a particle like a bacteria or virus by chemical attractant. The most potent macrophage activators are lipopolysaccharides (LPS) from bacteria and gamma interferon (INF- $\gamma$ ) by activated T-cells.

**\*Steps involved in phagocytosis:**

**Step 1:** The phagocytes get activated by the presence of certain particles around them. As soon as they detect a foreign particle, the phagocytes produce surface glycoprotein receptors (**receptors molecules**) that increase their ability to adhere to the surface of the particle (**Adhesion molecules**).

**Step 2:** Phagocytes have intrinsic ability to recognize bacteria (**Recognition**) and damage tissues without destroying normal self-tissue. This process is significantly enhanced by factors (**i.e. opsonins**) that label foreign

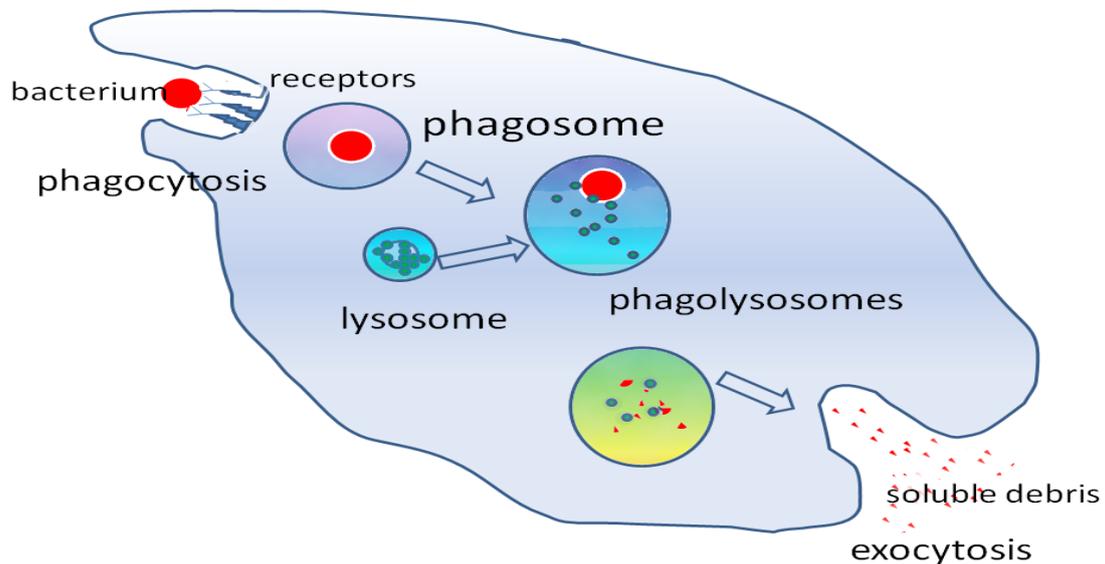
material from the phagocytes. This process is called **opsonization** "enhanced phagocytosis". E.g., IgG 1.

**Step 3:** The phagocyte slowly attaches to the surface of the foreign particle. The cell membrane of the phagocyte begins to expand and forms a phagocytic cup around the foreign particle (**Engulfment**).

**Step 4:** The cell membrane surrounds the foreign particle from all sides to create a vacuole, known as **phagosome** or food vacuole. The phagosome is then passed into the cell for absorption.

**Step 5:** Now comes the role of the **lysosomes**, are cellular [organelles](#) that contain acid [hydrolase](#) enzymes that break down waste materials and cellular debris. These are non-specific. They can be described as the stomach of the cell. The lysosomes break the food

vacuole or **phagosome**, into its component materials (**phagolysosome**). The essential nutrients, if any, are absorbed in the cell, and the rest is expelled as waste matter. In case of the immune system, the cell creates a peroxisome, a special structure that helps the body to get rid of the toxins.



**Phagocytosis figure**

\*اجابة السؤال الرابع:

**IV: Put true or false:**

1- Intact skin is the 1<sup>st</sup> line of defense against infection.  
(**true**)

2- The main function of the lymphatic system is collect and transport blood. (**false**)

3- The production of blood cells in bone marrow being roughly 4-7 month. (**false**)

4- The spleen filter lymph. (**false**)

5- B cells constitute 15-20 of circulating blood lymphocytes.  
(**true**)

6- Bile acids interfere with the vital functions of the cell membrane of virus. (**false**)

7- Different races have different susceptibility to infection. (**true**)

8- Eosinophils have lobed nuclei (two or four lobes). (**true**)

9- Heparin prevents blood from clotting to allow blood to flow to the area of infection or injury. (**true**)

10- Mast cell can react against and destroy another cell without prior sensitization to it. (**false**)

11- Monocytes move quickly to site of infection and divide/differentiate into NK cells and mast cells. (**false**)

12- Inflammation prevent the spread of pathogen into general circulation. (**true**)

