AL MUSTAQBAL UNIVERSITY

College of Pharmacy / Fourth Stage

Public Health

(L 7) Immunization, Herd Immunity & Global Health

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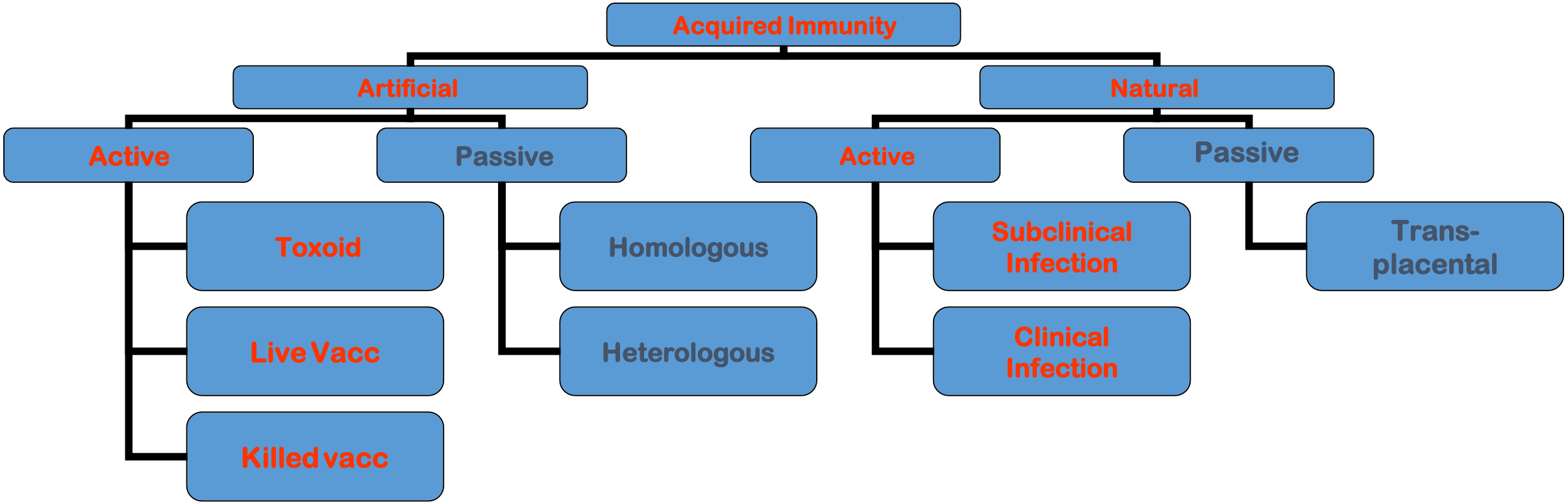
IMMUNITY

Immunity is the body's defense mechanism against harmful pathogens such as viruses, bacteria, and other microorganisms.

It is a complex system that involves various cells, tissues, and organs working together to protect the body from infections and diseases.



How Immunity Works

The immune system is a complex network of cells, tissues, and organs that work together to protect the body from harmful substances such as bacteria, viruses, and cancer cells.
The immune system is divided into two main parts:

Innate immunity is the body's first line of defense against foreign invaders. It includes physical barriers such as the skin and mucous membranes, as well as chemical barriers such as enzymes and acidic environments that can kill or neutralize pathogens.

Adaptive Immunity is a more specific and targeted response to foreign invaders. It involves the production of antibodies and the activation of immune cells that can recognize and destroy specific pathogens.

Adaptive immunity also has **memory**, which means that the immune system can remember and respond more quickly to a pathogen if it is encountered again in the future.

THE IMMUNE SYSTEM:

A. Humoral Immunity:

This type of immunity is due to circulating Abs (Gamma - globulin's also called immunoglobulins).

It is a major defense against bacterial infections.

On stimulation, **B-lymphocytes** divide and its daughter cells are transformed into **plasma-cells**.

The latter secrete the Abs into the circulation.

The types of immunoglobulins are:

IgG: Most Abs to infection belong to this class.

It is widely distributed in the tissue fluids and are equally available in the intra and extravascular spaces.

It can cross the placenta, and so it provides passive immunity to the newborn.

IgM: This is the first type produced by the maturing foetus, and it is the main type responsible for the primary immune response.

It is mainly intravascular but it does not cross the placenta.

(iii) IgA: Found in high concentration in the external secretions: Colostrum, Saliva, tears and intestinal and bronchial secretions. Because of this, IgA is part of the first line of defence against infectious agents.

(iv) IgE: Very low in serum and tissue fluids. It has a particular affinity to fix to tissues and so it is able to sensitize mast cells so that upon contact with Ags, the biologically active material present in mast cells is released. Because of this it is called a "reagin".

v)IgD: Ab-activity has rarely been demonstrated, and the biologic function is uncertain.

B. CELLULAR IMMUNITY: Another way of establishing host resistance is through **T-lymphocytes.** These cells synthesize and release pharmacologically active substances (**"lymphokines")** which can kill cells carrying foreign Ags.
T-lymphocytes also act against the invader by stimulation of macrophages.
This activity of the immune system is known as cell mediated immunity. The peak of activity occurs around the tenth day.

This type of immunity is responsible for **intracellular infection** (due to viruses and some bacteria e.g. Tubercle bacilli) and fungal infection.

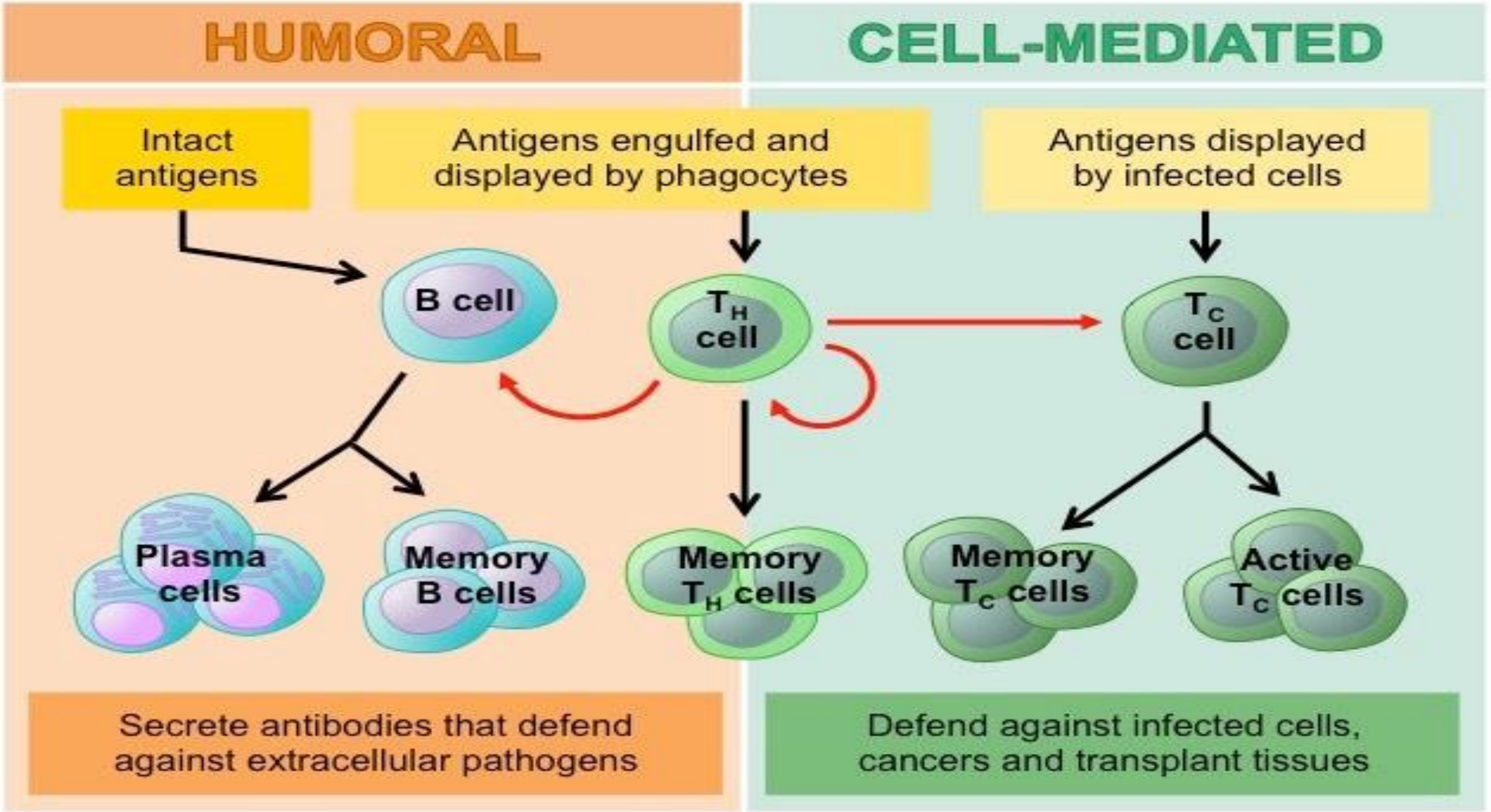
Besides infection, cellular immunity is responsible for **delayed hypersensitivity** reactions, **lysis of tumor cells** and **rejection of tissue or organ transplants**.

C. The complement system:

All vertebrates possess in their serum certain proteins and other factors which participate in the immune response. Complements facilitate the Ağ-AB reactions.

Situations in which production of immunity is depressed include:

Congenital and acquired immune-deficiencies.
Certain infections like mumps and measles.
Presence of passive immunity (maternal Abs).
Treatment with immuno suppressive drugs (e.g. steroids)
Malnutrition Diabetes mellitus Old age


HUMORAL
CELL-MEDIATED
Intact antigens
Antigens engulfed and displayed by phagocytes
Antigens displayed by infected cells
B cell
T_H cell
T_C cell
Plasma cells
Memory B cells
Memory T_H cells
Memory T_C cells
Active T_C cells
Secrete antibodies that defend against extracellular pathogens
Defend against infected cells, cancers and transplant tissues

THE IMMUNE RESPONSE:

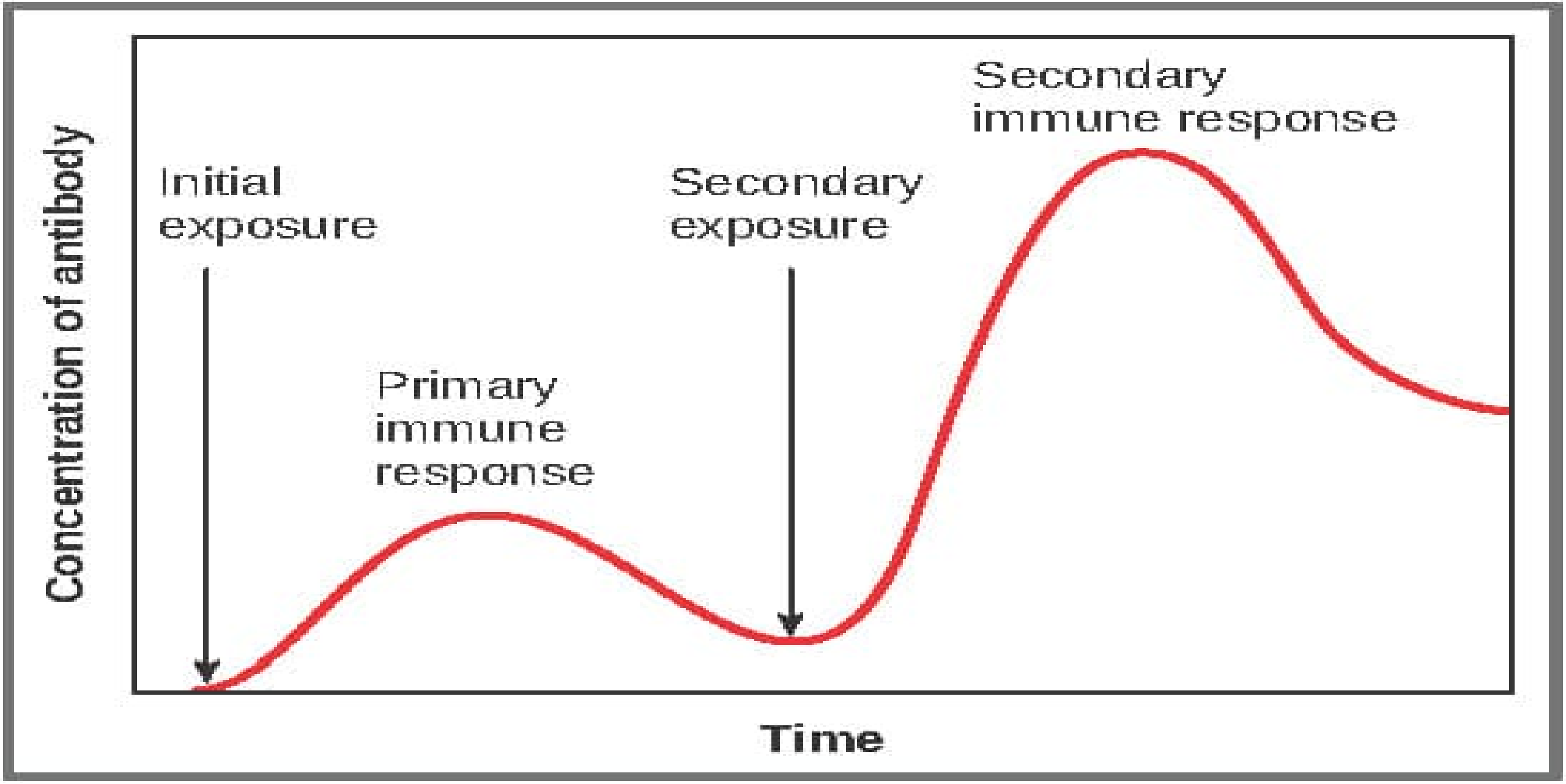
When an antigen (Ag) is introduced into the human body, it stimulates the production of antibodies (Ab). Micro-organisms (and their toxins) and vaccines are antigens which evoke an immune response. The immune response is two types:-

1) **The primary response**: when an Ag is introduced into the body for the first time, there is a latent period of 3-10 days before Abs appear in the blood. A peak is quickly reached and the level of Abs gradually falls over a period of weeks or months.

2) The secondary (booster) response: the response to a booster dose of the same Ag differs in a number of ways from the primary response:

- has a shorter latent period and more rapid production of Abs.
- Abs are produced in abundance and a high level is maintained for a longer period.
- the Abs produced tend to have a greater capacity to bind to the Ags.

The accelerated response is attributed to the immunological memory.



Graph showing the difference in antibody production between the primary and secondary immune respons

IMMUNIZATION

Vaccination and Immunization

These terms are often used interchangeably.

Vaccination and vaccine derive from vaccinia, the virus once used as smallpox vaccine.

Thus, vaccination originally meant inoculation with vaccinia virus to render a person immune to smallpox. Immunization is more inclusive term denoting the process of inducing or providing immunity artificially. Immunization can be active or passive.

Infectious diseases can be prevented by stimulating the individual to develop an active immunologic defense in preparation for meeting the challenge of future natural exposure **(active immunization)** or by supplying preformed human or animal antibody to individuals already exposed or about to be exposed, to certain infectious agents **(passive immunization).**

Active immunization involves administration of all or part of a microorganism or a modified product of that microorganism (e.g. toxoid) to evoke an immunologic response that provides partial or complete protection to the recipient. Vaccines incorporating an intact agent may be either live (usually attenuated) or killed (inactivated).

Types of Vaccines

Live Attenuated (LAV)	**Inactivated** (Killed Antigen)	**Subunit** (Purified Antigen)	**Toxoid** (Inactivated Toxins)	**RNA-Based**
Tuberculosis Oral polio vaccine (OPV) Measles Rotavirus Yellow fever	Whole-cell pertussis (wP) Inactivated polio virus (IPV)	Acellular pertussis (aP) *Haemophilius influenzae* type B (Hib) Pneumococcal (PCV-7, PCV-10, PCV-13) Hepatitis B (HepB)	Tetanus toxoid (TT) Diptheria toxoid	Non-replicating *In vivo* self-replicating *In vivo* dendritic cell non-replicating

Approved vaccines according to WHO

Next-generation

Factors Affecting Immunity

Stress: Chronic stress can weaken the immune system. Stress hormones, such as cortisol, can suppress the immune response, while also promoting inflammation.
Diet: A balanced diet that includes a variety of fruits, vegetables, whole grains, lean proteins, and healthy fats can help support a healthy immune system. Nutrient deficiencies, such as those in vitamin C, vitamin D, and zinc, can impair immune function.
Sleep: Getting enough quality sleep is important for immune function. Lack of sleep can increase the risk of infections and illnesses.
Boosting Immunity:
Eat a healthy and balanced diet
Get enough sleep
Exercise regularly
Manage stress
Avoid smoking and limit alcohol consumption
Practice good hygiene, such as washing your hands regularly and avoiding close contact with people who are sick, to reduce the risk of infection.

جدول اللقاحات الوطني للاطفال في العراق

ضع ✓ عند اعطاء اللقاح	نوع اللقاح ورقم الجرعة	العمر عند التلقيح	تاريخ التلقيح	موعد التلقيح القادم
	الكبد الفايروسي نمط B صغار	خلال اول ٢٤ ساعة من الولادة	/ / ٢٠	/ / ٣٠
	شلل الاطفال الفموي جرعة الصفر	خلال الاسبوع الاول	/ / ٢٠	
	بي سي جي			
	شلل الاطفال الفموي ج١	٢ شهر	/ / ٢٠	/ / ٣٠
	الخماسي الخلوي ج١			
	المكورات الرئوية المقترن ج١			
	الفايروس الدوار ج١			
	شلل الاطفال الفموي ج٢	٤ شهر	/ / ٢٠	/ / ٣٠
	الخماسي ج٢			
	شلل الاطفال الزرقي ج١			
	المكورات الرئوية المقترن ج٢			
	الفايروس الدوار ج٢			
	شلل الاطفال الفموي ج٣	٦ شهر	/ / ٢٠	/ / ٣٠
	الخماسي الخلوي ج٣			
	شلل الاطفال الزرقي ج٢			
	المكورات الرئوية المقترن ج٣			
	الفايروس الدوار ج٣			
	الحصبة المنفردة	٩ شهر	/ / ٢٠	/ / ٣٠
	فيتامين A (١٠٠٠٠٠) وحدة دولية			
	الحصبة المختلطة ج١	١٢ شهر	/ / ٢٠	/ / ٣٠
	شلل الاطفال الفموي (منشطة ١)	١٨ شهر	/ / ٢٠	/ / ٣٠
	اللقاح الثلاثي (منشطة ١)			
	الحصبة المختلطة ج٢			
	فيتامين A (٢٠٠٠٠٠) وحدة دولية			
	شلل الاطفال الفموي (منشطة ٢)	(٤-٦) سنوات	/ / ٢٠	
	اللقاح الثلاثي (منشطة ٢)			
	فيتامين A (٢٠٠٠٠٠) وحدة دولية			

تعليمات هامة :

١. هذه البطاقة التي تعتبر وثيقة مهمة عند التسجيل في المدارس ورياض الاطفال

٢. يرجى الالتزام بموعد التلقيح القادم والمثبت في البطاقة .

٣. ظهور بعض الاعراض البسيطة بعد التلقيح لا يستدعي القلق ويفضل مراجعة المركز الصحي .

وزارة الصحة
مطابع دائرة العيادات الطبية الشعبية

Herd immunity
also known as **community immunity**, is a concept in public health that describes the indirect protection from infectious diseases that occurs when a large proportion of a population becomes immune to the disease.

This immunity can be achieved through **natural infection or vaccination**. When a significant portion of the population is immune, the spread of the disease is effectively limited, protecting those who are vulnerable and unable to be vaccinated or have a weakened immune system.

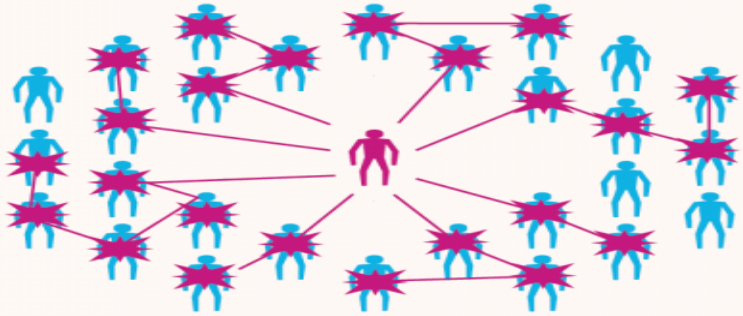
Herd immunity works by interrupting the chain of transmission of infectious diseases. When a person becomes infected with a pathogen, their body develops an immune response to fight off the infection. This immune response includes the production of antibodies, which are proteins that recognize and neutralize the pathogen. Once the infection is cleared, the person becomes immune to the disease, at least for a certain period of time.

In a population with **low immunity**, the pathogen can easily **spread** from person to person, causing outbreaks and epidemics. However, when a large proportion of the population is immune, it is difficult for the pathogen to find susceptible hosts. This reduces the overall transmission of the disease, protecting both the **immune individuals** and those who are **not immune**.

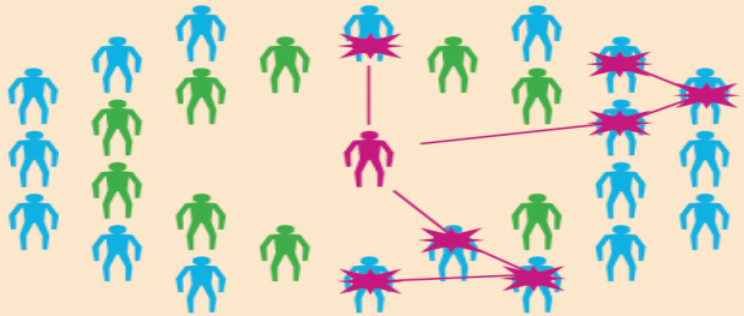
Herd immunity is particularly important for protecting individuals who cannot be vaccinated, such as **infants**, **pregnant women**, and individuals with **certain medical conditions**. These individuals rely on the immunity of the surrounding population to prevent the spread of diseases to them.

It is important to note that herd immunity does not provide 100% protection against the disease. There will always be a small proportion of individuals who are not immune and can still get infected. In order to achieve herd immunity through vaccination, a certain level of vaccine coverage is required. This is known as the **herd immunity threshold**. For highly contagious diseases, such as measles, a high level of vaccine coverage, typically around 95%, is needed to achieve herd immunity.

HOW HERD IMMUNITY WORKS



When no one has immunity, contagion has many opportunities to spread quickly.



The more immunity we have in the system, the less often contagion comes into contact with the susceptible.

Spread of contagious disease is contained.

Global Health

Global health refers to the health of populations in a global context, with an emphasis on low- and middle-income countries. Major issues in global health include infectious diseases, non-communicable diseases, maternal and child health, and access to healthcare services.

Initiatives in global health include vaccination campaigns, disease control programs, and health education and promotion efforts.

Global Health Organizations

World Health Organization (WHO): Leads global health efforts, sets health standards, and coordinates responses to health emergencies.

United Nations Children's Fund (UNICEF): Provides aid and support to children in developing countries, including healthcare services and vaccinations.

Gavi, the Vaccine Alliance: Works to increase access to vaccines in low-income countries and strengthen immunization systems.

The Bill and Melinda Gates Foundation

Global Health Issues

Infectious diseases such as HIV/AIDS, malaria, and tuberculosis.

Non-communicable diseases such as cancer, diabetes, and heart disease.

Maternal and child health, including access to reproductive health services and vaccines.

Mental health and substance abuse.

Nutrition, including malnutrition and obesity.

Global Health Funding has seen a steady increase over the past few decades. In 2018, global health funding reached a record high of $41.1 billion USD.
The majority of funding comes from high-income countries and private foundations. Funding is often directed towards specific diseases, such as HIV/AIDS, malaria, and tuberculosis. There is a need for increased funding for non-communicable diseases and health systems strengthening.

THANK YOU!


Bio-diplomacy
Regional
Organizations
China
National
Biopolitics
Global
Approaches
Impact
Politics
Governance
Coordination
Success
Human
Neoliberal
Health
Pre-Outbreak
Security
Role
Access
Vaccines
Equity
Concerns
Intelligence
Propaganda
Pandemics
Public Health
Disinformation
Feminist Analysis
Human Rights
Effects
Cross-Border
Emergencies
Laws
War
World
Cyberterrorism
Biomedical
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State
Measures
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Persuasion
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Diverse
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Conundrum
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