By Mehwish khan

M.Sc. 3rd sem Biotechnology

Govt. Digvijay Autonomous P.G. college

Humoral Immune Response

Synopsis:-

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Difference Between Primary HIR & Secondary HIR

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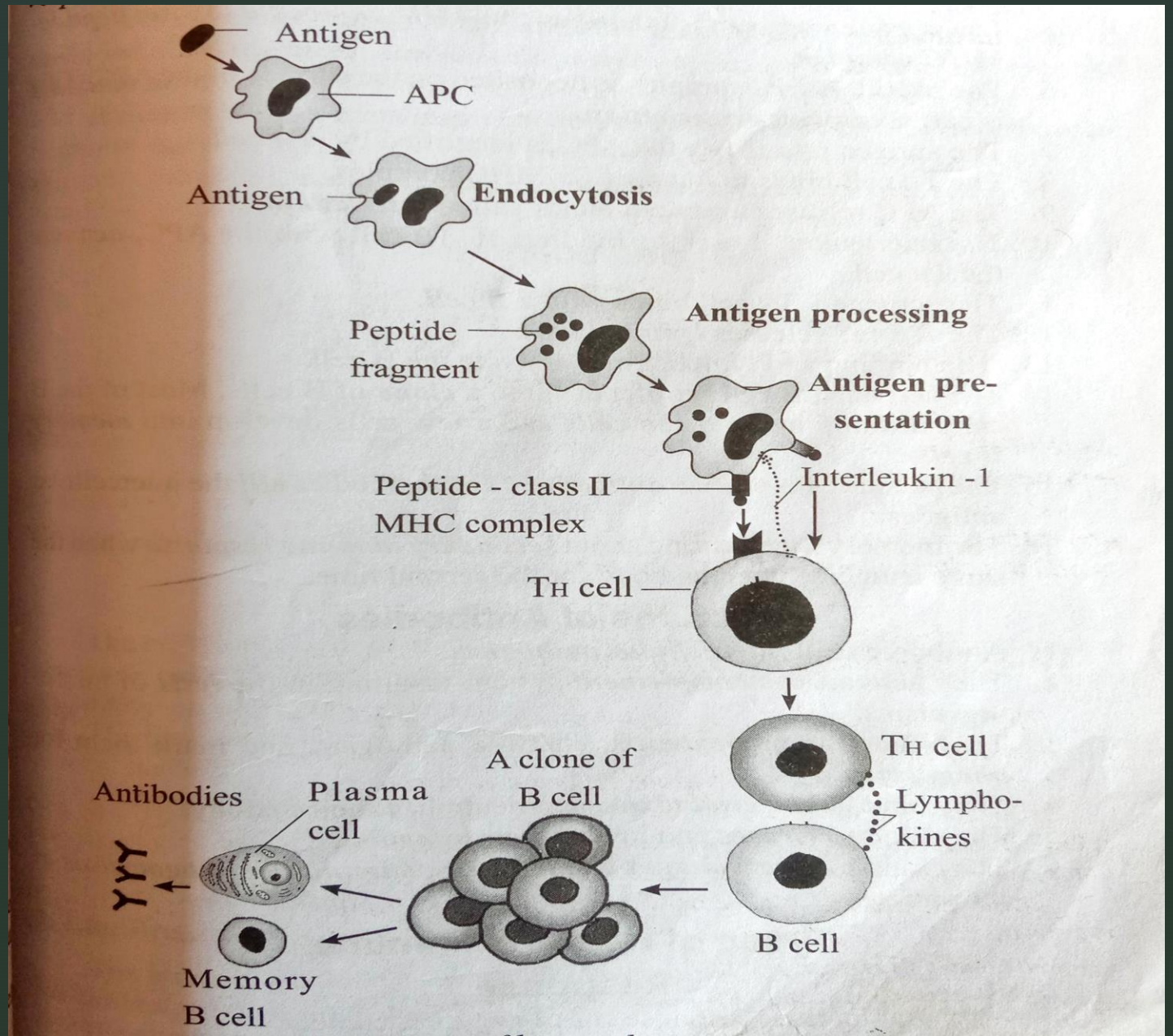
Biological Role of Humoral Immunity

Introduction

- In Humoral Immune Response, the cells fight against the antigen by producing **antibodies.** This immunity is called the **Humoral Immunity** or **Antibody Mediated Immunity.**
- The Destruction of antigens (Ag) by producing antibodies is called **antibody mediated immune response**. As antibodies are present in the body fluids (humors), it is called **humoral immune response**.
- The B-cell alone can't bring about humoral immune response. They need the co-operation of some other cells such as **macrophages, dendritic cells & T helper cells (TH cells).**

Mechanisms


Antigen
APC
Antigen
Endocytosis
Peptide
fragment
Antigen processing
Antigen pre-
sentation
Peptide - class II
MHC complex
Interleukin -1
TH cell
TH cell
Lympho-
kines
A clone of
B cell
Antibodies
Plasma
cell
B cell
Memory
B cell

Steps

Humoral immune response is brought about by the interaction of ***antigens, macrophages, dendritic cells, T cells*** and ***B cells***. It involves the following steps:

1. The antigen enters the body.
2. The antigen is identified by the ***antigen presenting cells (APC).***
3. The APC internalizes (swallows) the antigen by ***endocytosis***.
4. The antigen is ***processed*** and ***degraded*** into ***peptide fragments*** by the APC. This process is called ***antigen processing***.
5. The peptide fragment is loaded on the ***MHC molecule*** to form ***peptide-MHC complex***.
6. The peptide-MHC complex is deposited on the surface of the APC. This is called ***antigen presentation***.
7. The antigen present on the APC is identified by ***TH cell***.
8. The TH cell binds to the peptide-MHC complex.
9. The APC releases a protein factor called ***interleukin -1***.
10. The interleukin -1 and the binding of TH cell with the APC, ***activate*** the TH cell.
11. The activated TH cell binds with a ***B cell***.
12. The TH cell releases ***lymphokines.***
13. The binding and lymphokines activate the B cell.
14. The activated B cell proliferates into a ***clone*** of B cells. Most of the B cells develop into ***plasma cells*** and a few cells develop into ***memory B cells***.
15. The plasma cells secrete ***antibodies***. The antibodies ***kill*** the intercellular antigens.
16. The memory B cells bring about ***secondary immune response*** when the same antigen enters the body for the second time.

Functions

1. Antibodies kill ***intercellular pathogens.***
2. They activate the ***complement*** system resulting in the ***lysis*** of microorganisms.
3. They function as ***opsonins,*** coat the pathogens & mark them for ***phagocytosis.***
4. They bind to ***bacterial toxins*** & neutralize their toxicity.
5. They bind to ***viruses*** & inhibit their ***infection***.

Types of HIR

HIR is of ***two*** types, namely:

1. ***Primary Humoral Immune Response***
2. ***Secondary Humoral Immune Response***

Primary Humoral Immune :- The immune response produced for an antigen for the first time is called primary immune response. The first injection of the antigen producing primary immune response is called **priming dose.**

The humoral immune response results in the production of antibodies in the blood. The amount of antibodies produced by the immune response is called **antibody titre.** The antibody titre plotted against **time** give a sigmoid curve called **immune response curve**. Having **four phases,** namely ***lag phase, log phase, stationary phase and decline phase.***

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Secondary Humoral Immune Response :- The immune response produced by the same antigen entering the body for the second or subsequent time is called ***secondary immune response***. The injection of the same antigen for the second time is called ***secondary dose*** or ***booster dose.*** The secondary immune response also has a ***sigmoid curve*** having ***four phases,*** namely ***lag phase, log phase, stationary phase & decline phase.***

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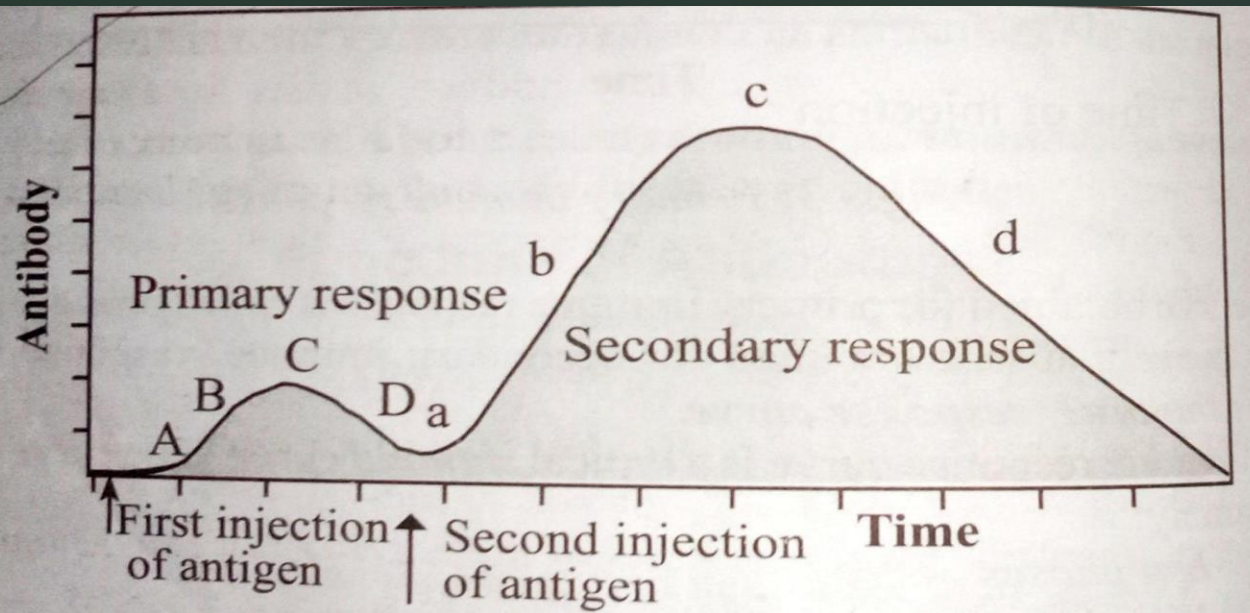

A,a - Lag phase

B,b - Log phase

C,c - Stationary phase

D,d - Decline phase

Fig.9.4: Primary and secondary immune responses.

Difference between PHIR & SHIR

S.No	Primary Humoral Immune Response	Secondary Humoral Immune Response
1.	The immune response produced by the antigen entering into the body for the first time.	The immune response produced by the same antigen entering the body for the second or subsequent time.
2.	The ***lag phase*** is ***long.***	The lag phase is ***short.***
3.	***Stationary phase*** is ***short.***	Stationary phase is ***long***.
4	The amount of antibody is ***low*** (antibody ***titre***).	The amount of antibody is ***high***.
5.	The ***life*** of antibody is ***short*** -2 to 5 days.	The life of antibody is ***long*** 25 days.
6.	***IgM*** antibodies are produced.	***IgG*** antibodies are produced.
7.	Antibody decreases ***quickly.***	Antibody decreases ***slowly***.
8.	***Catabolism*** of antibody is ***more***.	***Catabolism*** of antibody is ***less***.

Factors Influencing The Antibody Formation

The following factors are influencing the antibody formation:-

- Feed back inhibition .
- Adjuvants.
- Route of entry of antigens.
- Dose.
- Nutrition.
- Genetic factor.
- Immuno suppressive agents.

Biological Role of Humoral Immunity

- Humoral immune response kills ***intercellular bacterial*** infections.
- Humoral immunity fights against ***intercellular viral*** infections of respiratory and intestinal tracts.
- It brings about ***immediate type hypersensitivity.*** Example:- Allergy reaction against penicillin.

Thankyou…