

# 4 types of grafts

→ Xenograft  
(from different species).

↳ Isograft  
(from identical twins)

Autograft  
(from the same body)

Allo-graft  
(from two different individuals)

# immunology

revision.

## Function of HLA-I

↳ HLA is not empty.  
its function is the presentation of self peptides and non-self peptides of the cell on the surface of this cell.

- HLA Genes: 6 main genes DP, DQ, DR, B.C.A  $\Rightarrow$  chromosome 6 of every cell.
- DP, DQ, DR, are expressed into proteins called HLA II only on the surface of immune cells.
- B.C.A : are expressed into proteins called HLA I on the surface of nucleated cells.

## Note

since immune cells are nucleated cells, then they have HLA-I on their surface and HLA-II.

↳ the graft is acceptable in the cases of autograft and isograft.

However, it's rejected in the case of allo-graft. Graft rejection takes place after one week.

the conditions of acceptance:

- some blood group compatibility between a donor and recipient of a graft.
- compatibility between HLA molecules.

conclusion of document d  
page 114 book

Bs & clinical show how e'  
origin of B and T lymphocytes

Lymphoid stem cell and bone marrow.

Pluripotent Stem cell.

Myeloid stem cell.

↓

Granulocytes

Mast cells

Bind T lymphocytes.

Monocytes

Monocytes

SIR: have antigenic receptors

NST R:  
no antigenic receptors.

## types of cells (non specific immune response)

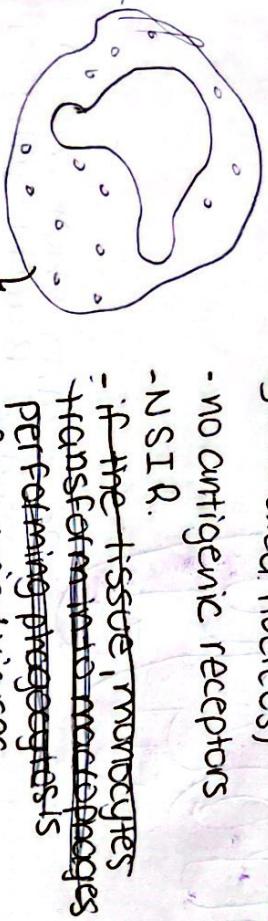
### (a) monocytes :

- horse shoe shaped nucleus.
- no antigenic receptors
- NSIR.

- if the tissues, monocytes transform into macrophage
- performing phagocytosis

## Origin of leukocytes (WBC)

(b) Granulocytes : - multilobed nucleus (granulated nucleus)



- no antigenic receptors

- NSIR.

- if the tissue monocytes

transform into macrophages performing phagocytosis

of bacteria viruses.

granulo  
cytes

- 3 types: ① neutrophil.

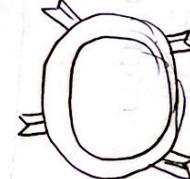
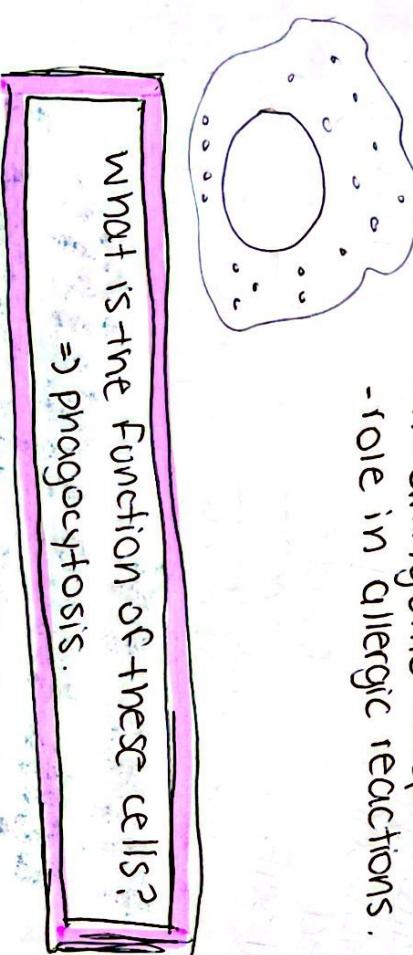
② eosinophil.

③ Basophil.

c) Mast cells : - round nucleus

- no antigenic receptor.

- role in allergic reactions.



(a) B lymphocytes

B lymphocyte.

(b) T lymphocytes

- large round nucleus occupying most of the cytoplasm

- occupying most of the cytoplasm

- secrete antibodies

after differentiation.

- after their activation, they differentiate into plasma cells

that secrete antibodies neutralizing the foreign body.

- agents of humoral specific immune response.

(c) T lymphocytes

= 2 types of T lymphocytes.

① T<sub>H</sub> or TH cells.

- large round nucleus occupying most of the cytoplasm

- TCR called CD4 "manager"

- they activate B and T<sub>C</sub> cells.

function - activate HSI R and CMSIR

② T<sub>C</sub> or Tc cells.

- large round nucleus occupying most of the cytoplasm.

- TCR called CD8.

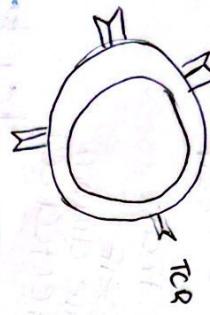
= kill the infected or modified self cells (cancerous, allograft, virus).

- cell mediated SI R.

## BoT T lymphocytes (SIR)

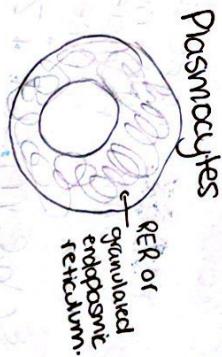
# B lymphocytes versus plasma cells

B lymphocytes.



Characteristics of plasma cells:

- these features differentiate plasma cells or plasma cells which has a more developed endoplasmic reticulum and a larger cytoplasm.
- to secrete antibodies/proteins



The BL transforms differentiates into plasma cells or plasma cells which has a more developed endoplasmic reticulum and a larger cytoplasm.

Antibody = Immunoglobulin.

Characteristics of antibody

- Y-shaped.
- in the constant region: the effector region is found and it binds to specific membrane receptor (IgG binds to macrophage)
- 2 antigen binding sites.
- constant and variable regions.

## Lymphoid Organs

1° lymphoid organs

⇒ site of production and maturation of leukocytes

⇒ site of immune response triggered against antigens

↓  
bone marrow

thymus

↓  
site of production of neutrophiles

↓  
spleen

lymph

2° lymphoid organs

⇒ site of immune response triggered against antigens

→ lymph nodes

Mrs. soha's notes  
Written by Aisha.A.N

Explain how the plasma cell is a cell adapted to the secretion of these molecules (2 or 3 I)

The size of plasma cells is bigger than that of lymphocytes

12 μm > 9.3 μm

These cells have a well developed cytoplasm rich in RER involved in protein synthesis; And since antibodies and proteins. Therefore the plasma cell is a cell adapted to the secretion of antibodies.

the difference between antigen and antigenic determinant (epitope)

An antigen is the substance recognized by the immune system as being as non-self while antigenic determinants (parts) of the antigen, or epitopes are molecules

Lyne antigen may carry many antigenic determinants which bind to antigen binding sites

# cross reaction

↳ is the process of binding of one type of antibody to 2 different antigens sharing a common epitope.  
 (lambda has el. antibody yet 3 base amino acid antigen bind to self epitope)

## double recognition

→ when TCR + 3 base self-HLA carrying non-self peptide.

- ① non-self peptide
- ② self-HLA

## explain how TL recognizes the antigens

→ unlike B cells, T cells cannot recognize the antigen directly in this intact form.

- double recognition
- ① non-self peptide
- ② self-HLA

the antigen has to be processed, fragmented, and presented by self HLA on the surface of either infected cells or macrophage or mutated ones in order to be recognized by T lymphocytes.

T<sub>4</sub>: self HLA-II  
 T<sub>8</sub>: self HLA-I  
 non-self peptide.

## Differences Between Antibodies and TCR

- ① Antibodies

- 4 polypeptide chains

- Y shaped

- can be secreted in plasma by plasmocytes

- 2 antigen binding sites.

- binds directly to

① soluble antigen → O  
 or  
 ② cellular antigen → O

- ③ TCR.

- 2 polypeptide chains.

- Rod shaped.

- TCR : only on the surface of

T lymphocytes

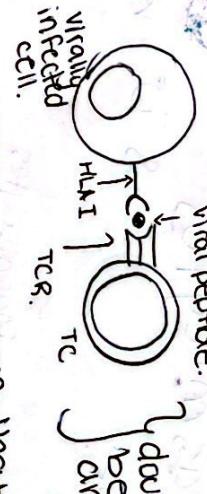
- 1 antigen binding site.

- double recognition

- ① self HLA
- ② non-self peptide

what would they ask us to explain the double recognition

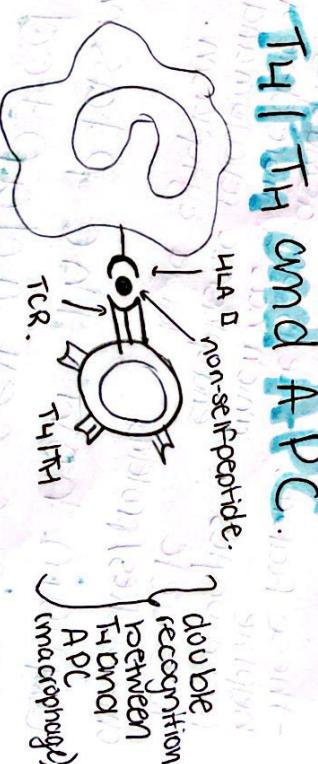
SCHEMATIZE THE DOUBLE RECOGNITION BETWEEN T<sub>C</sub> AND INFECTED CELL



**note** TCR on T<sub>C</sub>

make sure that HLA + non-self peptide are drawn on the infected cell

SCHEMATIZE THE DOUBLE RECOGNITION BETWEEN T<sub>H</sub> AND APC



HLA II non-self peptide.

double recognition between two domains

Mrs. Soha's notes  
 Written by Aisha A. Nemri

when asked about the type of specific immune response

(Identify)

① Humoral

- since amount of antibodies increases (valves units if available)

• since antibodies are factors of humoral

- $\Rightarrow$  Humoral.

② cell mediated.

• presence / increase of TC.

- TC effectors of cell-mediated.
- cell mediated.

**Identifying the type of the specific immune response revealed by the results of document one** (2019 1<sup>st</sup>).

since the amount of antibodies increases

from 0 at the first day of infection to  $\approx 50000$  as time increased from 5 to 13 day. and

the predominant bodies are the factors of humoral SIR. Then the type of immune response is humoral specific immune response.

# Biology

**explain why both SIR are triggered against a virus**

① Humoral: neutralization of virus by antibodies then opsonization.

**Summary**

② cell mediated where TC kills the host cells infected by this virus.

**triggered against a virus and that triggered against a bacterium**

**SIR by macrophage**

① In the infection site the phagocyte perform phagocytosis of the antigen.

② This phagocyte migrates to the nearest lymph node where it becomes APC.

③ In the lymph node double recognition. between HLA II - non self peptide on phagocyte . TCR of TH.

④ Only TH that makes the

double recognition is activated then proliferated

different ways to ask for induction of macrophages by LPS.

↳ explain the mode of action of the macrophages that permits the proliferation of T<sub>4</sub> lymphocytes (2017 II).

↳ specify the consequence of the absence of macrophages on the specific immune response (2017 II).

the induction of specific immune response ceases because reactivation of T<sub>4</sub> lymphocytes necessitates its binding to APC. So in the absence of activated T<sub>4</sub> lymphocytes no more secretion of interleukin 2 takes place which is responsible for launching the specific cell mediated immune response. Moreover, no interleukin 2 secretion takes place which is responsible for launching the humoral specific immune response.

↳ explain the necessity of the 15 days time delay to obtain the agglutination of SRBC by the serum of rabbits immunized against SRBC (2020).

15 days is the time delay necessary for the induction of a humoral immune response during which:

(Continued)

→ the macrophage has to recognize the toxin in phagocytote it, transforms into APC to stimulate TH that also needs time to multiply, differentiate, become interleukin secreting cells and secrete IL4.

→ activation of B lymphocytes by IL4 secreted by activated T<sub>4</sub> lymphocytes

→ following their multiplication and differentiation to plasma cells that secrete anti-SRBC antibodies.

## Supernatant

medium of culture containing all molecules without cells.

Usually used to show that a relationship is through molecules

each time in exp.  
IL alone, IL alone  $\Rightarrow$  no response.  
macrophage + IL and  
TL  $\Rightarrow$  response.  
 $\Rightarrow$  cooperation.

as long as antibody is bound to the antigen, the

complement does not need to be specific for lysis to occur.

(the action of the antibody binds to a specific antigen using its variable region.

the action of the complement is not specific; different complements perform complement cascade after the formation of immune complex)

(when antibody binds to antigen on the surface of large intruder)

### target of TC.

(double recognition: modified self) infected or modified body cells

(double recognition).

### target of antibodies.

(directly) circulating antigens, free microbes, antigens on the surface of cells.

# immunotherapy

## elimination of infected host cells

## vaccination

secondary response.  
rapid.  
long lasting  
amplified

① double recognition.

TcR (TC) with HLA-I + non-self peptide (infected cell).

② Release of perforin poly perforin channel

③ Granzymes: DNA degradation.

↳ is the injection of a killed microbe in order to stimulate the immune system. The injected microbe leads to the formation of memory cells and creation of immunological memory which will protect the body through secondary immune response serotherapy?

## why DNA degradation kills the cell?

a brief note.

Mrs.Soha  
Written by Aisha

## Immune response.

	N SIR	SIR	Humoral SIR	Cell mediated SIR.
Effector	granulocyte, macrophage, and mast-cell.			
membrane antigenic receptor	none	BCR, antibody	TCR.	TL.
+targeted pathogen	Bacteria Virus	-soluble antigen -cellular antigen -Intracellular microbes.	-cancer cell -allograft.	
mechanism	phagocytosis. neutralization opsonization.		cytotoxicity	
passive transfer	No	serum		
latency or delay.	Few hours.	blood cells		
Memory	No	15 days	15 days	
Efficiency.	Average.		yes	excellent.

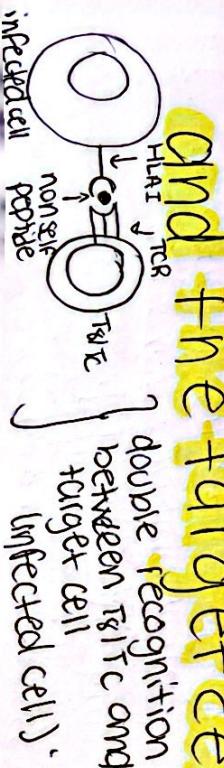
Explain the following statement:

B-lymph antibodies recognize non-self, while T-lymphocytes recognize the modified self

Antibodies recognize the non-self because they are able to bind to a soluble circulating antigen, or to a surface of a foreign cell.

T-lymphocytes recognize an antigenic peptide presented by a self HLA molecule on the surface of body cells such as macrophage or infected cell. HLA + non-self peptide are recognized as modified.

Draw a scheme showing the molecules involved in the recognition taking place between the activated T<sub>8</sub> cell and the target cell.



## Summary of immune response

the clinical signs of inflammatory reactions:

→ redness, heat  
edema and pain

Phagocytosis: it's a type of a non-specific immune response

**Formulate 3 hypotheses explaining the failure of phagocytic in digesting the microbe**

① The phagocytes may not recognize the bacteria

② The microbe resists the digestive enzymes of the phagocytes.

therefore this antigen is attached by a HSIR  $\Delta^4$  dies.

⇒ document 2 reveals the secretions of large amounts of antibodies and since antibodies are the effectors of the HSIR. Therefore the HSIR triggered

③ (a) Explain document 10 page 144.  
A<sub>2</sub> survives after the injection by tetanus toxin and serum and extracted from a mouse A<sub>1</sub> which was injected by tetanus toxin. However, mouse A<sub>3</sub> died after injecting it with tetanus toxins and cells extracted from the blood of the same mouse A<sub>1</sub>, since the antibodies in the serum were able to protect the animal as the neutralize the tetanus toxin and therefore this antigen is attached by a HSIR  $\Delta^4$  dies.

(b) Identify the nature of the SIR revealed in document 2 (2014 II).

# IMMUNOLOGY - TWO TYPES

## Proliferation of B cells

→ when the macrophage phagocytizes the antigen, it presents the non-self peptide on the surface of HLA-II. After the double recognition between this macrophage (APC) and TH in the lymph node, a specific TH gets activated, proliferated, and differentiated into interleukin 4 which secretes interleukin 4 which activates and proliferates B cells.

## Explain why nude mice don't have a normal immunity

nude mice, are devoid of T lymphocytes. Interleukin 4 secreted by the activated TH is important in the proliferation of B cells which are responsible for the HSIR. Therefore, the absence of TH cells leads to the absence of BL proliferation and consequently to the absence of the normal SIR.

## Proliferation of Tc cells

when macrophage phagocytizes the antigen, it presents the non-self peptide on the surface of HLA II. After the double recognition between this macrophage (APC) and TH in the lymph node, a specific TH gets activated, proliferated, and differentiated into interleukin 2 which secretes interleukin 2 which activates and proliferates Tc cells.

## In the large intruder And the small intruder

→ the action of the complement is not specific; different complement cascade after the formation of immune (when antibody binds to antigen on the surface of large intruder)

note: the action of the antibody is specific; each antibody binds to a specific antigen using its variable region.

Mrs. Soha  
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# IMMUNOLOGY

based on  
doc a and b and  
your knowledge. Justify the 3 characteristics of the secondary immune response

or explain the  
3 characteristics of  
the 2° IR.

## DIFFERENCES BETWEEN VACCINATION and SEROTHERAPY

Therapy	Vaccination	Serotherapy
Substance injected	Attenuated toxin or microbes	Prepared antibodies
origin of antibodies produced	Endogenous, produced by the body	Exogenous, prepared outside the body
Type of immunity	Active	Passive
Latency or delay	1-2 weeks	few hours
duration of protection	several years	2 weeks
Objective	preventive	curative
immunological memory	Yes	No.

Rapid : the primary immune response need 2 weeks because of the time needed by the macrophage to recognize the toxin, phagocytes it transforms into APC to stimulate Th that also need time to multiply, differentiate become interleukin secreting cells and secrete IL4 to stimulate B cells to multiply then differentiate to plasmocytes and start secreting antibodies. The secondary immune responses already memory B cells that multiply and differentiate amplified : document b shows that the number of effector cells in the secondary immune response is greater than in the primary IR.

long lasting : the number of memory cells in the secondary IR is greater than that in the primary IR.