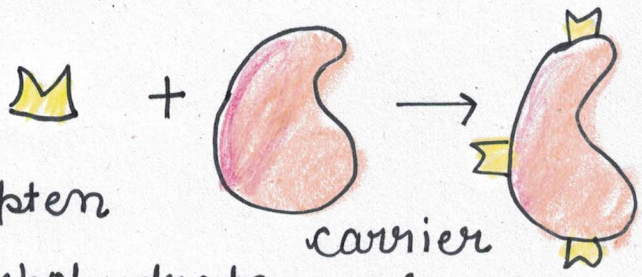
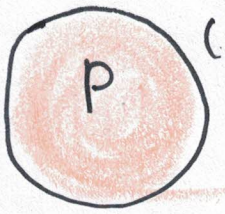
Human Health and Disease

Antigen





(A) → Antigen

Antiserum, Antivenom } → contain Antibody

Vaccine, Toxoid } → contain Antigen

Antiserum :

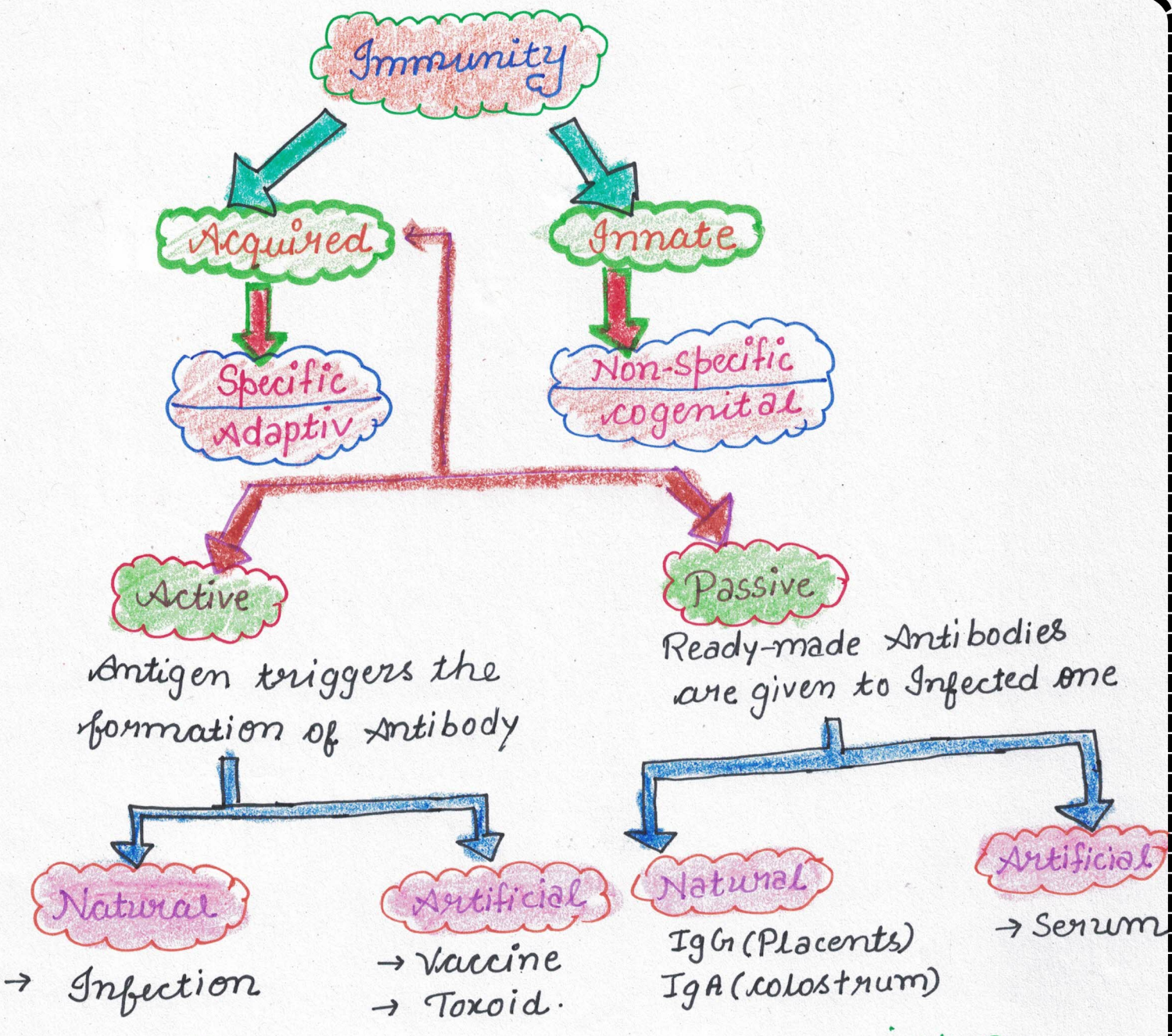
Serum of any animal which contains antibodies against a specific pathogen or toxin is termed as Antiserum.

Eg Anti Tetanus Serum (ATS)

⇝ It remain active maximum upto 6 months after injecting it into body.

Preparation

- Minute Quantity of detoxified toxin is injected in the body of horse.
- Immune system of horse prepares antibodies against the toxins.
- Serum of horse containing these antibodies is isolated and purified termed as Antiserum.



Immunity

Resistance of Body against a pathogen or disease.

INNATE IMMUNITY

It is a non-specific type of defence, that is present at the time of Birth. There are different type of barries to resist the Energy of foreign agents into our body.

Physical / Anatomical barrier

(i) Skin (ii) Mucosa

Physiological Barrier:

(i) fever (ii) PH of body (iii) Secretions.

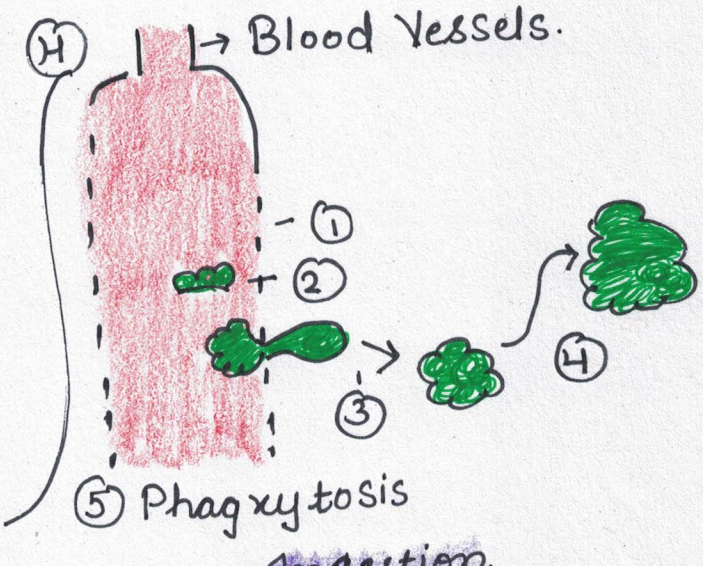
Cellular Barrier:

⇝ Poly morpho → Nuclear leukocytes (PMNL - neutrophills) monocytes, Natural killer cell (N-K cells) in blood.

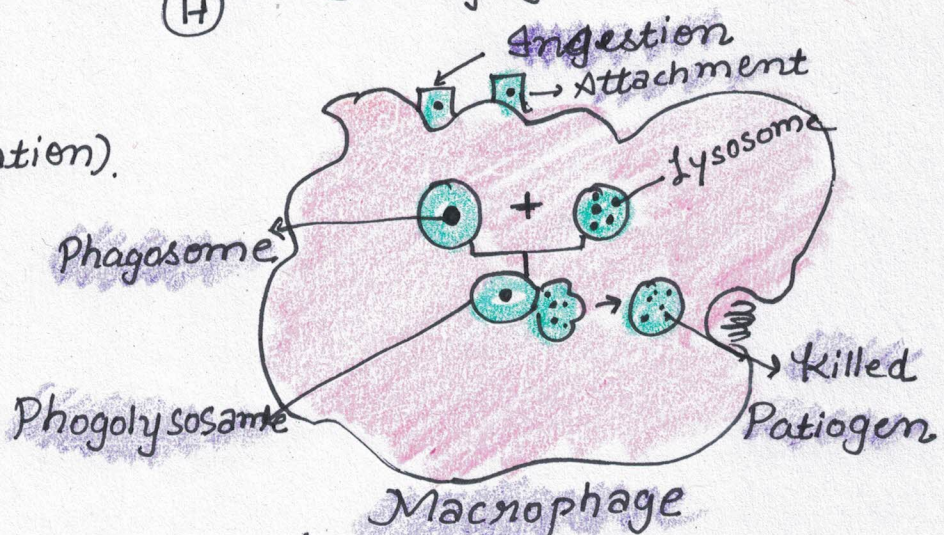
⇝ Macrophages in tissue.

Phagocytic cells

Entry of Pathagens
↓
Release Toxin
↓
Stimulate most cells
↓
Release Histamine



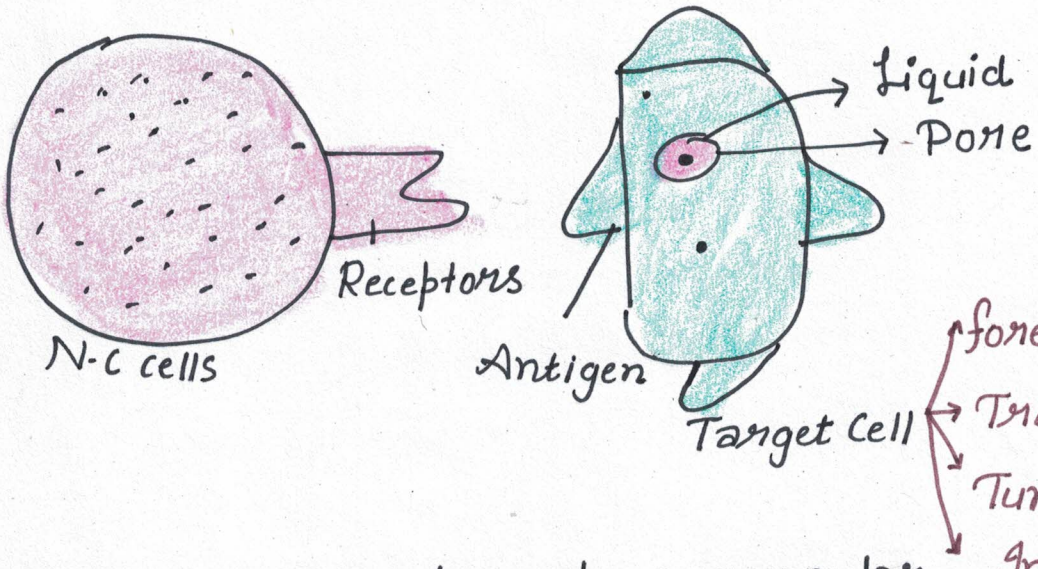
- Vesodilation
- Adesion
- Diapedesis (Migration).
- chemotoxins



Most of the bacteria are killed in phagolisosom by the hydrolytic, Enzymes this is called intracellular killing of bacterium.

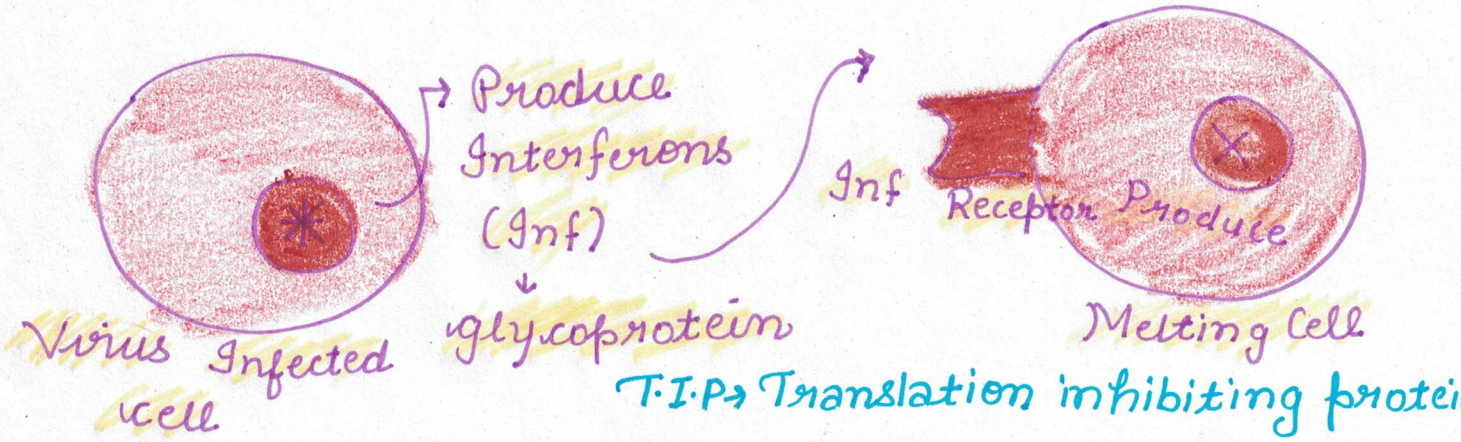
B. Non-Phagocytic cells:-

Natural killer cell (N-C-cells)



★ N.K cells are also termed as granular lymphocytes because they are derived from some stem cells which form lymphocytes.

CYTOKINE BARRIER



Inf. are produced by virus infected cell and they protect healthy cells from further viral Injection.

~~Infections~~ Interferons never kill the virus they only inhibit the growth of Virus.

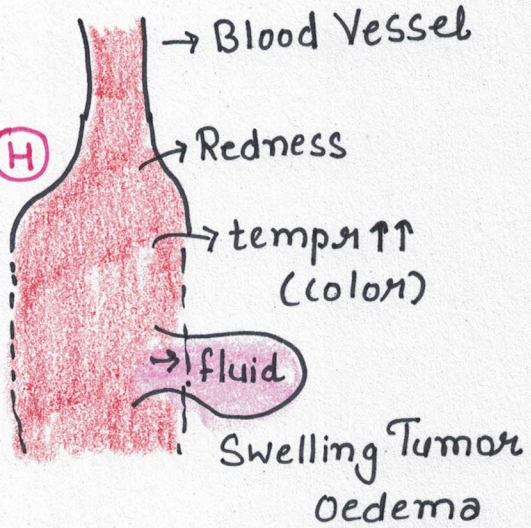
Interferons are species specific but they are not Virus Specific.

Inflammation

Injury
↓
Local tissue damage
↓
Release (H) and (PG)

→ Pain
Dolor

(H) →



Acquired Immunity

FEATURES:-

Specificity Acquired Immunity is Specific for Specific micro-organism.

Diversity This system recognises the vast Variety of Micro-Organism.

Discrimination between Self and non-Self It can recognise self (body or tissue) and non-Self (foreign tissue and Respond According to them).

Immunological Memory

Primary Immune Response

Secondary Immune Response.

Immunological Memory

Primary Immune Response :-

- when any antigen Enters the body for the first time the Response is primary immune Response
- This response is Very weak, slow and less Amount of Antibodies are formed.
- chances of diseases are more

→ During this Response immunological Memory is formed inthe form of specific Receptors or lymphocytes

Secondary Immune Response :-

- when the same antigen Enters the body for the second time the response is Secondary Immune response
- This response is very strong, rapid and large amount of Antibodies are formed
- chances of diseases are less

→ This response is based on Immunological Memory so it is termed as Anamnestic Response.

Based on Memory.

Tm → killer

Bm → B plasma → forms Antibodies

Lymphoid Organs

Primary

- origin + maturation (+ Multiplication) of lymphocytes

Example Bone Marrow
Thymus

In these organs immature lymphocytes are converted into antigen sensitive lymphocytes.

Secondary

- Storage + Multiplication of Lymphocyte

Example Spleen, Lymph. nodes, tonsils, payer's Pattoches, appendix, Malt.

These organs provide the spte for the Interaction of lymphocyte with the Antigen.

DEVELOPMENT OF LYMPHOCYTES

Thymus → Maturation + Multiplication → T - lymphocyte (Thymus)

Bone Marrow → lymphocyte precursor cells (Committed stem cells) (L.P.C).

→ Maturation + Multiplication → B-lymphocytes
- ↑ Bursa of fabricious
- ↑ To blood
- → B plasma
- → B Memory

Secondary lymphoid Organs (Storage + Multiplication)

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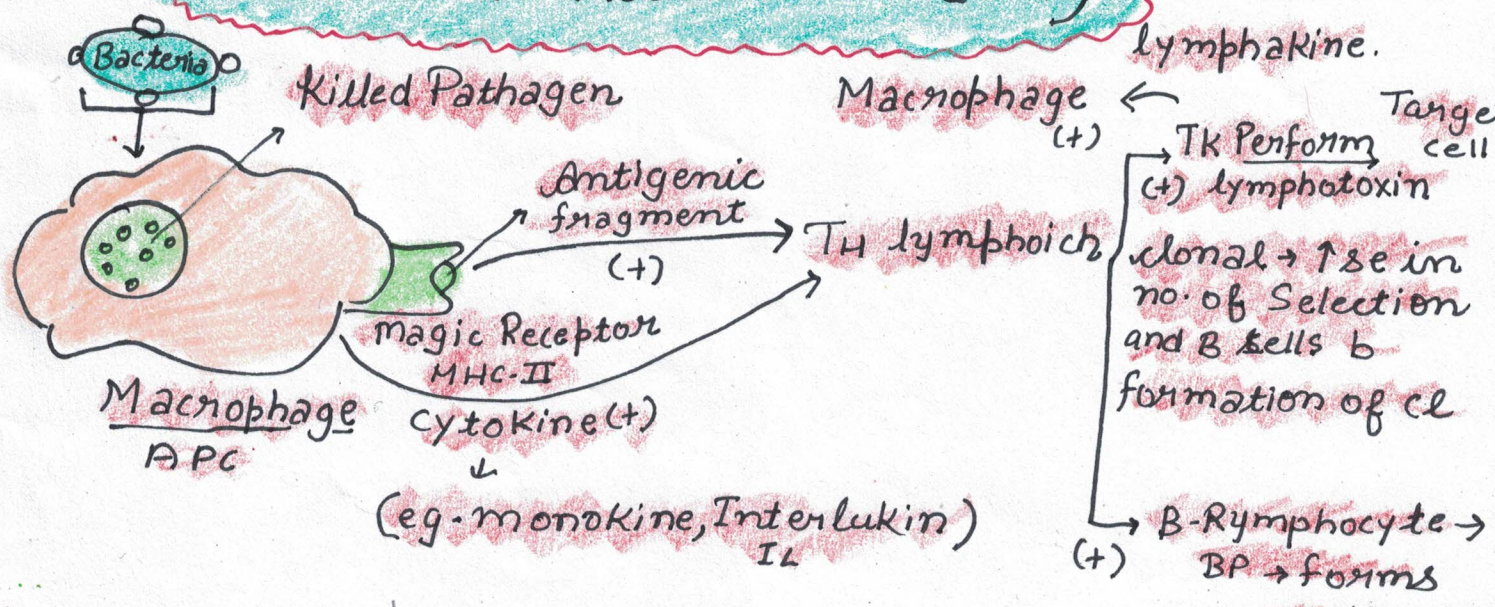
Cells of Active Immunity:

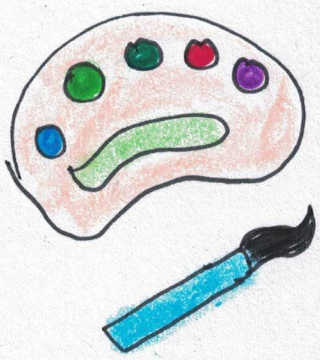
- Antigen Presenting cells (APc)
  - Macrophages
  - Dentritic cells (Longerhan's) cell
  - B-lymphocyte.
- Lymphocyte.
  - T
    - T-killer/cytotoxic (TK/c)
    - Thelper (TH)
    - Tsuppressor (Ts)
    - Tmemory (Tm)
  - B
    - B Plasma forms-Antibod
    - B Memory (Bm)

Function of Active Immunity



Tm → Tk
→ Ts

Bm → B plasma
↓
forms Antibodies



Cluster of Differention (CD)

] cluster of Proteins

Eg:- CD-4 cell → TH (T4 cells)
CD-8 cell → TK (T8 cells)

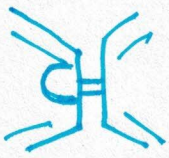
Extrinsic Antigen MHC-II → TH (CD-4 cell)
(Eg → Bacteria)

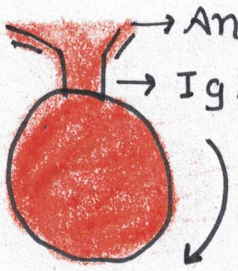
Intrinsic Antigen MHC-I → TK (CD-8 cell)
(Eg → Virus, cancer cell)

No. of Paratopes

IgG → monomer → 2
IgA → Dimer → 4
IgM → pentamer → 10
IgD → Monomer → 2
IgE → Monomer → 2

J-chain is present in IgA and IgM and it is required for Joining the Monomers together.





B-plasma → forms Antibodies (G, A, M, D, E)

Acute Infection → IgM → Stimulate B Plasma → forms → IgG

Chronic Infection → IgG

★ first protection against pathogen is provided by innate Immunity.

★ Better protection against pathagen is provided by Acquired Immunity

Sequence of Effectiveness of Immunity

CMI > AMI > Innate Immunity

Vaccine — It includes only Active immunity

Immunisation — It includes both Active and Passive immunity.

Vaccination (Vacca)

Vaccination is based on Immunological memory.

I Generation Vaccine :-

chemicals
- formalin
- B-propiolactone.

Pathogen → Pathogenecity → disease causing power

Pathogen → Antigenecity → Ability to Activate immune system.

Antigen.

Toxoid

Toxin → Toxicity ← chemicals

Toxin → Antigenecity

Antigen

Disadvantage:-

If pathogenecity is not removed completely then Symptoms of disease may Appear in the Person.

DPT → Antigen → (A) → Im

T.T → (A) → Im ↑↑↑ (Tm → Bm)

ATS → Ig

II Generation Vaccine:-

(P)(A) → Gene for Antigen Isolated.

↓

Transfer of this gene to E-coli & yeast

↓

formation of Antigen in E.coli & Yeast.

↓

Isolation of Antigen.

↓

used as II Generation Vaccine.

Eg - Hepatitis - B - Vaccine → In yeast

Frequent Booster dose is Required to Maintain Immundogical Memory.

III Generation Vaccine

PA Gene for Antigen Isolated

↓

formation of Identical Gene in Lab (Synthetic Gene)

↓

Transfer of this gene to human body.

↓

formation of Antigen in human body

Eg:- Blood Cancer (Leukemia)

Advantage

- frequent Booster dose is not required as the antibodies are formed by the person itself

Allergy

Entry of Allergen in Body

↓

Ige ↑↑↑↑

↓

Stimulates most cells and basophil

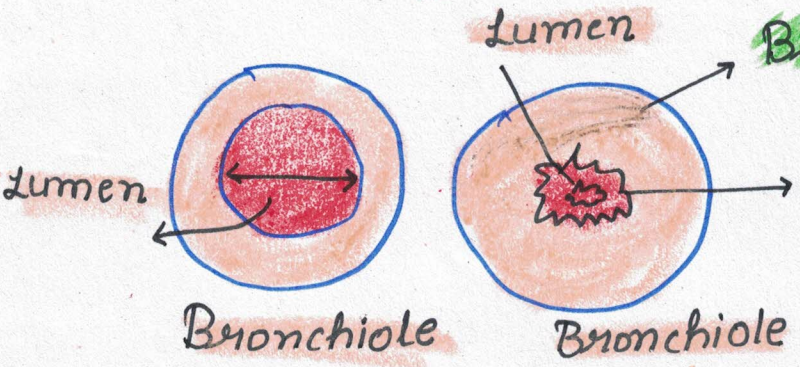
↓

Release histamine and Serotonic

↓

Cause Allergy

Bronchial Asthma



Bronchospasm
(i) Bronchodilators
Decomposition of Mucus
(ii) Steroid → Contisol
(iii) Ahtibiotics → To Prevent Secondary infection caused by Bacteria

Anaphylatic Shock :-

Entry of Allergian in Blood (Penicillim)

↓

IgE ↑↑↑↑

↓

Stimulate most cells and basophils ↑↑↑

↓

Release (H) ↑↑↑↑↑

(H) → Blood Vessels

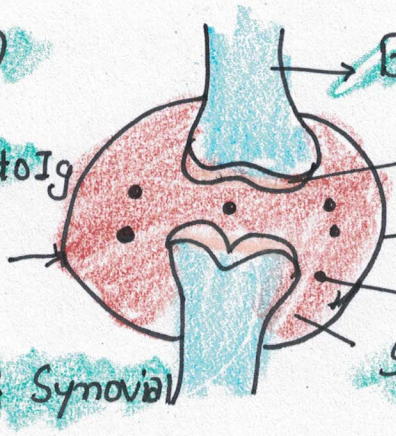
→ Vasodilation → B.P ↓↓↓

→ loose → Blood → B.P ↓↓↓
Volume ↓↓↓

Auto-Immune Disorder :-

Rhewmatoid Arthritis :-

(Af - Igm)



formation of AutoIg against synoval Membrane

↓

Inflamation of Synovial Membrane.

↓

Synovial fluid ↑↑↑

↓

Pressure ↑↑↑ → Pain

- When Inflamation of synovial membrane Increases It Secreates abnormal hard granular particles termed as pannus.
- These pannus damage the 'Articular' 'cartilage' when the person moves his joint.
- Abnormal fibrous tissue is deposited at the damaged part causing stiffness.
- finally, calcium is deposited and the joint becomes immovable.

Sex Chromosome Aneuploidy

Sperm Ovum

22+y 22+x

44+xy

Normal Male

Additional copy of x-chromosomes.

Sperm Ovum

22+xy 22+x

44+xxy

Sperm Ovum

22+y 22+xx

44+xxy

Kinefetter's Syndrome.

Rare Case :- 44+xxxy (It's a possibility)

- Such an Individual has overall Masculine development however Gynaecomastia is also Expressed.
- Such Individual are sterile.

Sperm	Ovum
22+x	20+x

→ 44+xx → Normal female

Sperm	Ovum
22+0	22+x

→ 44+x0

Sperm	Ovum
22+x	22+0

→ 44+x0

(44+x0) → Turner's Syndrome

- Absence of one of the x-chromosome
- Such females are sterile, Webbed neck, sheild chest.
- Lack of Secondary Sexual characters.

Super Male

Sperm	Ovum
22+yy	22+x

→ 44+xyy

Super female

Sperm	Ovum
22+x	22+xx

→ 44+xxx

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Disease

- Co-genital
- Acquired
  - Infectious or communicable
    - Contagious
    - Non-Contageous
  - Non-Infectious are non-communicable

(AIDS)

Pathogenecity