Historical Perspective Of Immunology

Learning Objectives

- Immunology & immune system
- History of Immunology
- Importance of Immunology
- Humoral & cellular immunity theory
- Recognition of foreign substances by immune system

Immunology

- Immunology is the study of the immune system and is a very important branch of the medical and biological sciences.
- The immune system protects us from infection through various lines of defense.
- If the immune system is not functioning as it should, it can result in disease, such as autoimmunity, allergy and cancer.

Immune System.

- The immune system is a complex network of cells and proteins that defends the body against infection.
- The immune system keeps a record of every microbe it has ever defeated so it can recognize and destroy the microbe quickly if it enters the body again.

Historical Perspective Of Immunology

- “Immunis” is a Latin word which means” exempt”. The term “Immunology” is derived from it.

- **Plague in Athens:**
  Thucydides, historian of Peloponnesian war mentioned that only those who have recovered from the plague could nurse the sick because they wouldn’t contract the disease again.

Vaccination Studies Led The Way To Immunology

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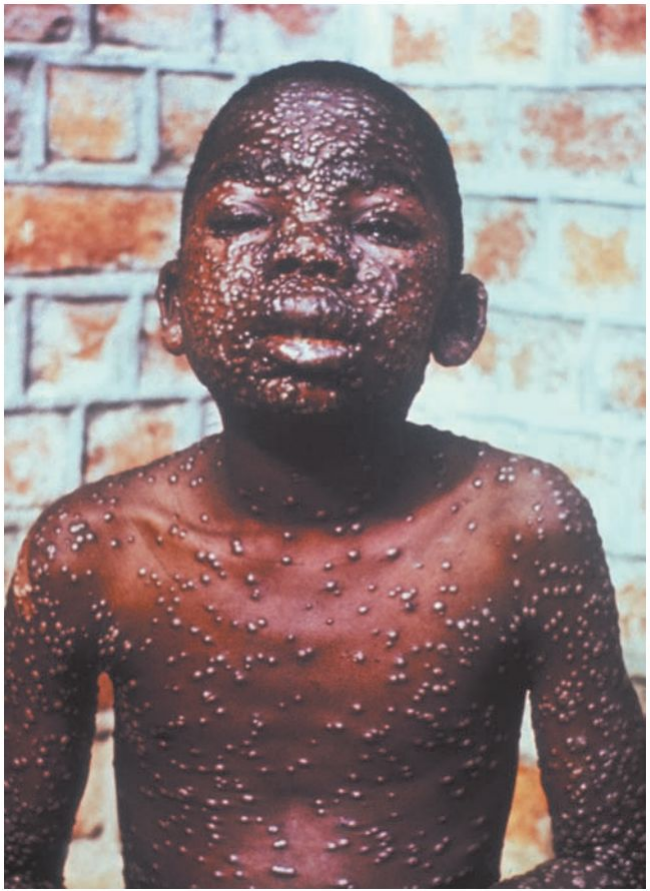
Chinese And Turks:

- In 15 century, Chinese and Turks tried to prevent smallpox by using dried crusts from smallpox pustules.
- By inhaling or inserting it to the cuts in skin.
- On seeing positive results, a British ambassador in Constantinople tried this on her kids.

Edward Jenner:

- He stated that introducing fluids from a cowpox pustules into people (Inoculating them) might protect them from smallpox.
- He experimented on an 8 year old boy by inoculating him with cowpox and then with smallpox.

An African boy with smallpox



Vaccination Is An Ongoing, Worldwide Enterprise

Louis Pasteur:

- He grew bacteria that causes cholera and injected it in chickens, which developed fatal Cholera.
- He resumed the experiment after his vacation and used old cultures to inoculate chickens.
- They became sick but recovered from it.
- He concluded that weak or attenuated strains can be used to provide immunity against the disease.
- Pasteur called them “Vaccine”.
- “Vacca” is a Latin word for “cow”

Classic Experiment Of Louis Pasteur

- Pasteur performed experiment on two group of sheep, using “Bacillus anthracis” .
- He used heat killed bacteria to inoculate one group of sheep.
- Then he used virulent strains on both vaccinated and unvaccinated groups.
- He found that only the vaccinated group survived the virulent strain.
- This was start of the discipline “Immunology”
- Pasteur first vaccinated a boy, bitten by rabid dog.

Immunology Is About More Than Just Vaccines And Infectious Diseases

Importance Of Immunology

- Immunology is above more than just infectious diseases and vaccines

It is used for treatment to boost, inhibit or redirect efforts of immune cells to treat different diseases

For example

- Autoimmune diseases
- Cancer
- Allergy
- Other chronic disorders

- It highlights the interconnected nature of body systems, providing insight into areas such as
  - Cell Biology
  - Human genetics
  - Metabolism.

Immunity Involves Both Humoral And Cellular Components

Humoral And Cellular Components Of Immunology

Humoral And cellular Immunity Theory

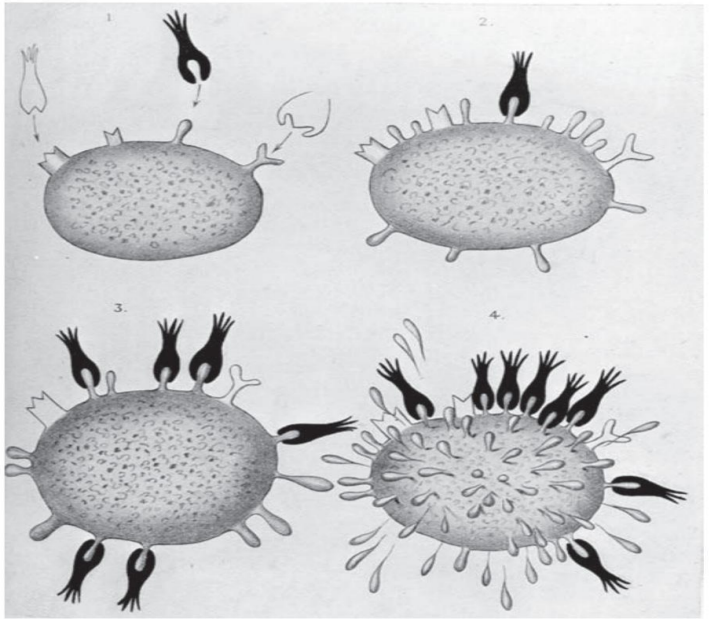
- Some scientists thought that immunity is mediated by cells while other argued that it is a soluble agent.
- In 1890, Emil Von Behring and Kitasato won Nobel prize for demonstrating that serum (non cellular) component recovered from coagulated blood of previously diphtheria immunized people could transfer the immune state to unimmunized people.
- Antitoxins, Precipitin, Agglutinine and antibodies are example of humoral immunity.
- Elie Metchnikoff demonstrated that cells also contribute to immune state of animals.
- For example: Phagocytes.

How Are Foreign Substances Recognized By The Immune System?

Recognition Of Foreign Substances By Immune System

- In 1900, Jules Bordet expanded concept that any foreign material can serve as antigen.
- Karl stated that any non self organic material could induce production of antibodies.
- Paul Ehrlich proposed a theory that cell expresses different receptors which can bind to infectious agents.

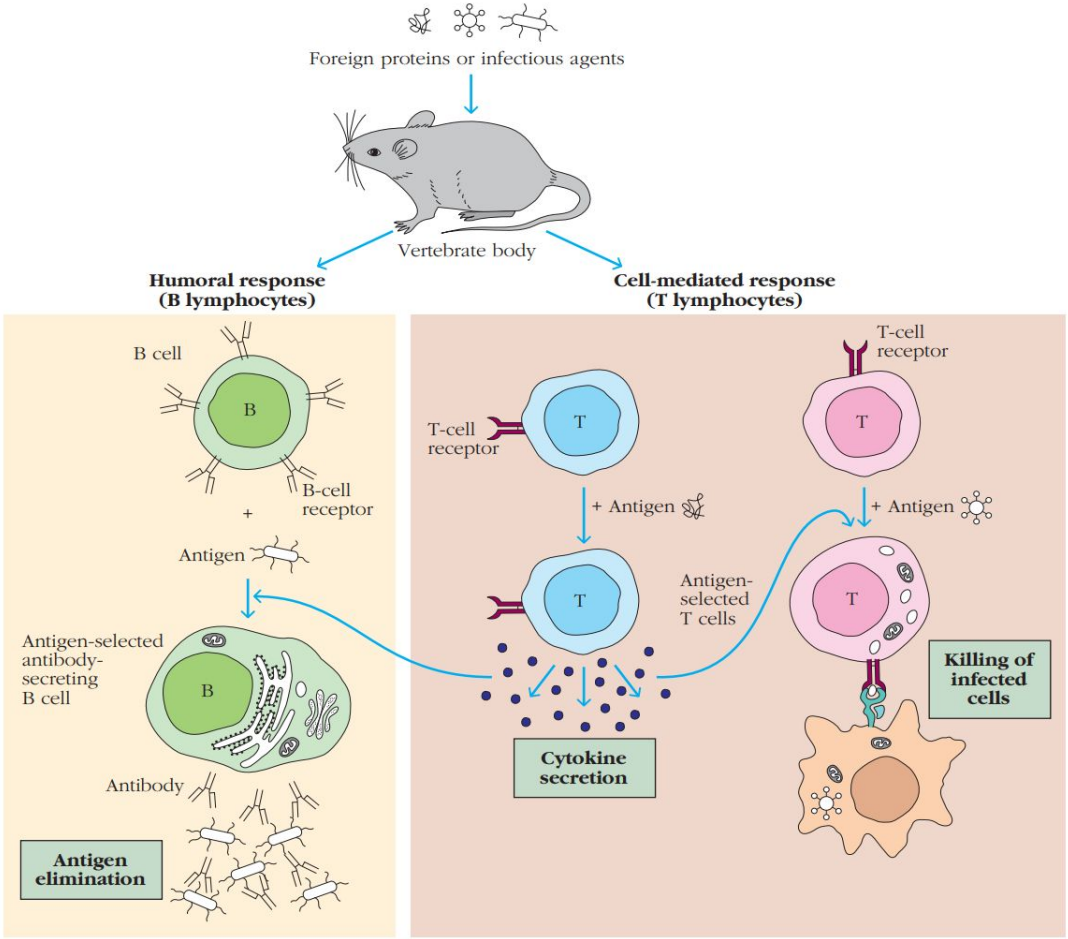
Paul Ehrlich's Presentation Of Side Chain Theory



Instructional Theory

- Another theory proposed for recognition of foreign substances was that a particular antigen would serve as a template, around which antibody would fold.
- This theory was postulated by Friedrich Breinl and Flex.

Clonal Selection Theory



Clonal Selection Theory

- B cells produce antibodies, a soluble version of their receptor protein, which bind to foreign proteins, flagging them for destruction.
- T cells, which come in several different forms, also use their surface-bound T-cell receptors to sense antigen.
- These cells can perform a range of different functions once selected by antigen encounter.

❖ The secretion of soluble compounds to aid other white blood cells (such as B lymphocytes)

❖ The destruction of infected host cells.