Introduction to Immunology

What is immunity?

It is the ability of an organism to resist a particular infection or toxin by the action of specific antibodies or sensitized white blood cells.

Antibody:	a blood protein produced in response to and counteracting a specific antigen (foreign biological material).
Sensitized:	cells that can detect something and respond accordingly.

-- In simple words, **Immunity** means **protection from disease**, especially infectious disease (caused by microorganisms).

-- Cells and molecules involved in such protection constitute the **immune system**.

-- The response to introduction of a foreign agent is known as the **immune response**.

-- Not all immune responses protect from disease; some foreign agents, such as the **allergens, cause disease** as a consequence of inducing *excessive* (more than normal) immune response.

Example is allergy to pollen grains of some trees seen every year in Islamabad.

-- Some individuals mount immune responses to their **own** tissues as if they were foreign agents leading to **autoimmune** diseases which are quite common.

-- Most individuals do not suffer from autoimmune disease because they have developed **tolerance** towards their own **(self)** tissues.

Tolerance is a state of **unresponsiveness** to a specific antigen or group of antigens.

HISTORY

- The **earliest** known reference to immunity was during the **plague of Athens in 430 BC**.

  Thucydides noted that people who had recovered from a previous attack of the disease could nurse the sick without contracting the illness a second time.

- During 10^{th}-15^{th} century **Chinese** and **Turks** developed variolation.

Variolation is immunizing patients against smallpox by infecting them with substance from the pustules of patients with a mild form of the disease (variola minor). The disease then usually occurs in a less-dangerous form than when contracted naturally.

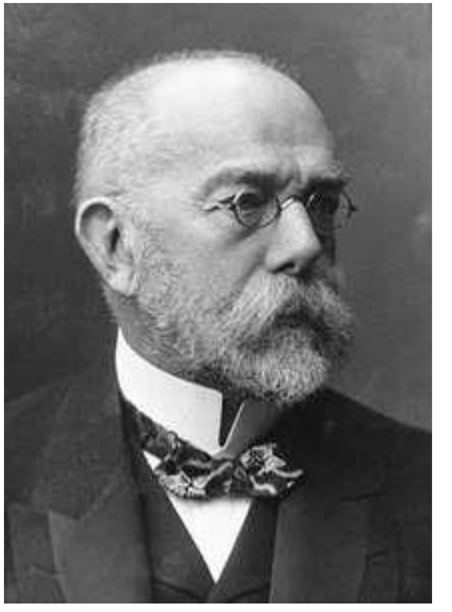
- In 1798, **Edward Jenner** gave concept of vaccination.

In 1796, Jenner deliberately infected a boy, James Phipps, with cowpox from an infected cow. When the boy recovered, Jenner injected him with smallpox under his skin. James Phipps didn't catch smallpox.

- **Louis Pasteur** (1870's) is credited with beginning of immunology as a discipline and origins of the term **vaccine.**

- **First human vaccine** was prepared in **1885**: It was attenuated (weakened pathogen) rabies virus.

It was not until **Robert Koch's** 1891 proofs, for which he was awarded a Nobel Prize in 1905, that **microorganisms were confirmed as the cause of infectious disease.**



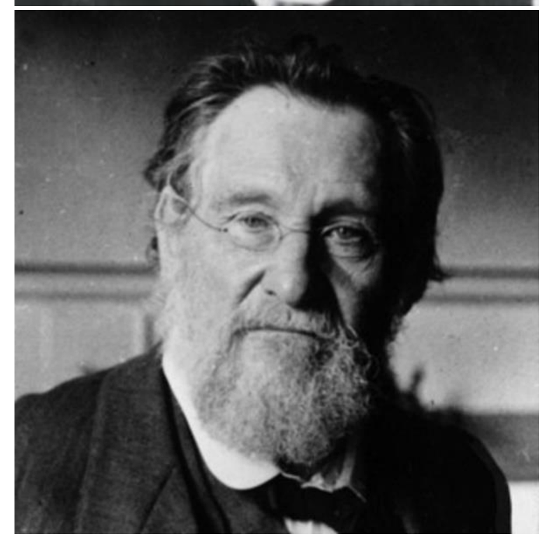
Viruses were confirmed as human pathogens in 1901, with the discovery of the yellow fever virus by **Walter Reed**.

- Immunology made great advances towards the end of the 19th century, through rapid developments, in the study of **humoral (antibody based) immunity** and **cellular immunity**.

- Particularly important was the work of **Paul Ehrlich**, who explained the **specificity** of the **antigen-antibody reaction**.

His contributions to the understanding of **humoral immunity** were recognized by the award of a **Nobel Prize in 1908.**

It was jointly awarded to the founder of **cellular immunology, Elie Metchnikoff**.



Overview of Innate and Adaptive Immunity

The normal individual has **two** levels of defence against foreign agents:

-- **Natural** or **innate** is present in neonatal (newborn) animals and in invertebrates. This is also referred to as **non-specific** or **broadly specific** immunity.

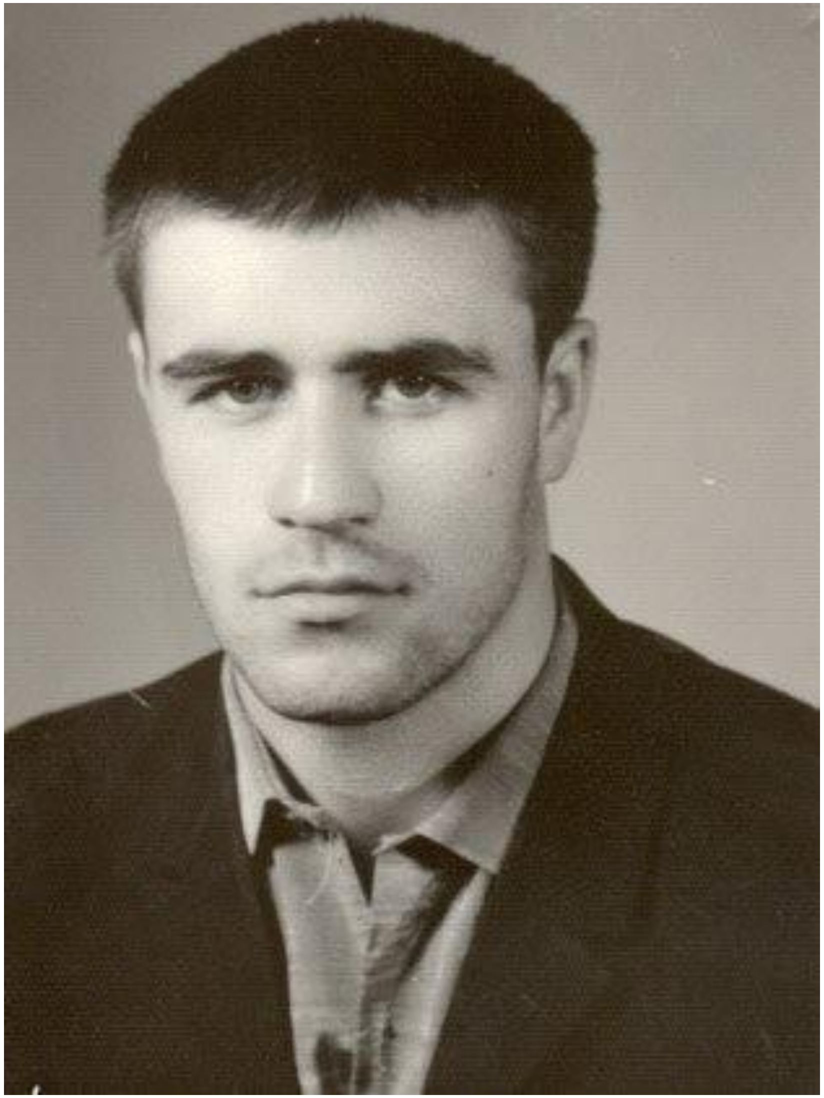
-- **Adaptive** or **acquired** immunity is **confined to vertebrates.**

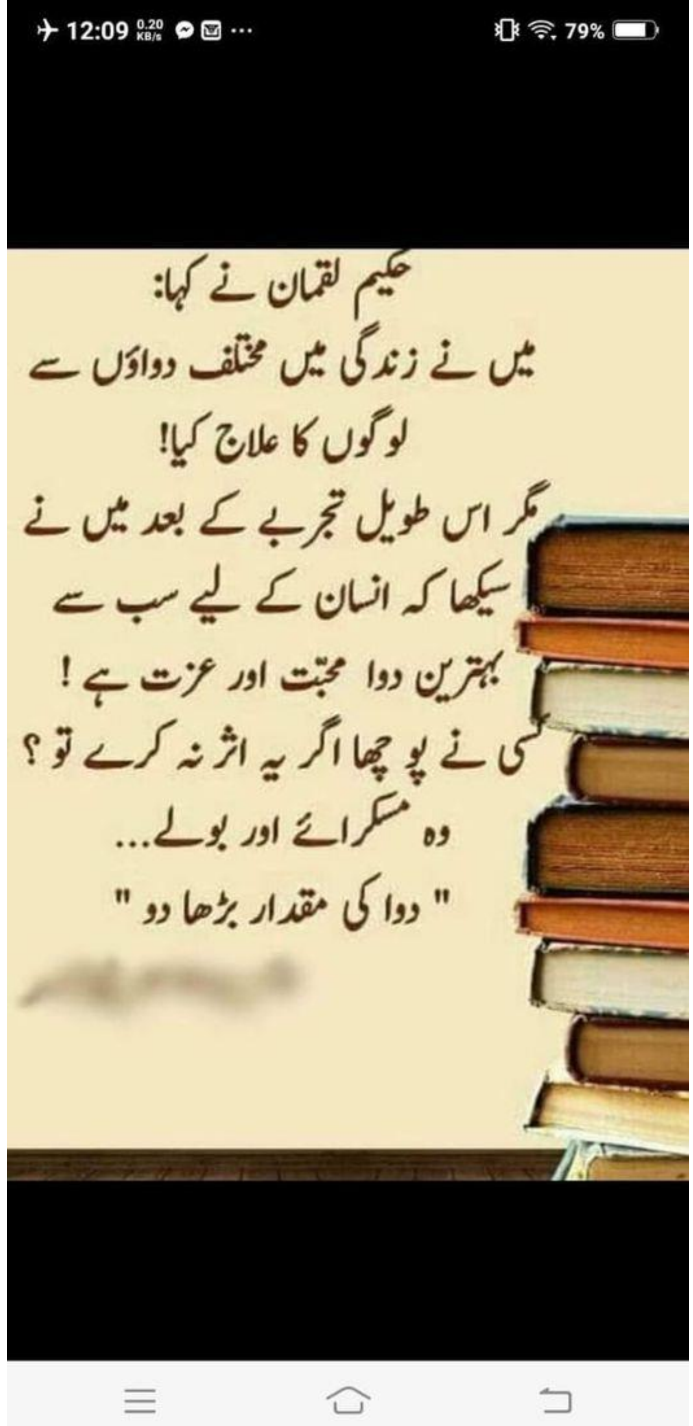
TABLE 1-3 Comparison of adaptive and innate immunity

	Innate	Adaptive
Response time	Hours	Days
Specificity	Limited and fixed	Highly diverse, improves during the course of immune response
Response to repeat infection	Identical to primary response	Much more rapid than primary response

Components of the Immune System

- Innate
  - Humoral
    - complement, interferon, TNF etc.
  - Cellular
    - macrophages, neutrophils
- Adaptive
  - Humoral
    - antibodies, cytokines
  - Cellular
    - T & B cells; other effector cells and dendritic cells

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حکیم لقمان نے کہا:
میں نے زندگی میں مختلف دواؤں سے
لوگوں کا علاج کیا!
مگر اس طویل تجربے کے بعد میں نے
سیکھا کہ انسان کے لیے سب سے
بہترین دوا محبت اور عزت ہے !
کسی نے پوچھا اگر یہ اثر نہ کرے تو ؟
وہ مسکرائے اور بولے...
" دوا کی مقدار بڑھا دو "

What is

934,752,213,849,592,189,365,634

in words?

934,752,213,849,592,189,365,634

Nine hundred thirty-four sextillion,

seven hundred fifty-two quintillion,

two hundred thirteen quadrillion,

eight hundred forty-nine trillion,

five hundred ninety-two billion,

one hundred eighty-nine million,

three hundred sixty-five thousand,

six hundred thirty-four.


Thank You!