

MSc III Sem – Life Sciences

Course – Virology

Brief History

The History of Viruses / Virology

- Viral diseases have affected humans for many centuries.
- Perhaps the first written record of a virus infection consists of a *hieroglyph* from Memphis, the capital of ancient Egypt, drawn in approximately 3700BC, which depicts a temple priest called **Ruma** showing typical clinical signs of paralytic poliomyelitis.



The History of Viruses / Virology

- Smallpox was *endemic* in China by 1000BC. In response, the practice of **variolation** was developed.
- Recognized that survivors of smallpox outbreaks were protected from subsequent infection.
 - **variolation** involved inhalation of the dried crusts from smallpox lesions, or in later modifications, inoculation of the pus from a lesion into a scratch on the forearm of a child.



The History of Viruses / Virology: Smallpox

- In 1717 the wife of an English ambassador to the **Ottoman Empire**, observed local women inoculating their children against Smallpox.
- In the late 18th century, **Edward Jenner** observed and studied Miss Sarah Nelmes, a milkmaid who had previously caught Cowpox and was subsequently found to be immune to Smallpox, a similar, but devastating virus.
- On 14th May 1796, **Edward Jenner** used cowpox-infected material obtained from the hand of Sarah Nemes, a milkmaid from his home village of Berkley in Gloucestershire to successfully vaccinate 8 year old James Phipps.

The History of Viruses / Virology

- On 1st July 1796, Jenner challenged the boy by deliberately inoculating him with material from a real case of smallpox!
- **He did not become infected !!!**
- ***Jenner developed the first vaccine***, based on these findings, and smallpox is currently all but wiped out.
- Although initially controversial, vaccination against smallpox was almost universally adopted worldwide during the 19th century.
- *Cartoon by James Gillray, 1802.*



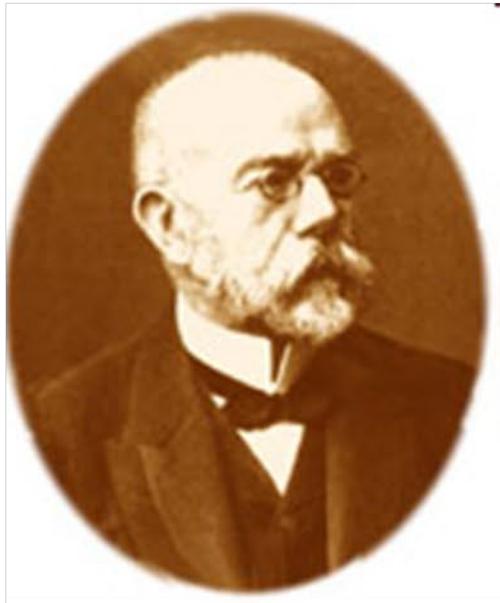
Edward Jenner

- Vaccinations
- Cowpox
 - cross protection against small pox
 - Variola virus
 - Major
 - Blisters
 - Blindness
 - Death
 - Minor
 - Poxviridae
 - dsDNA

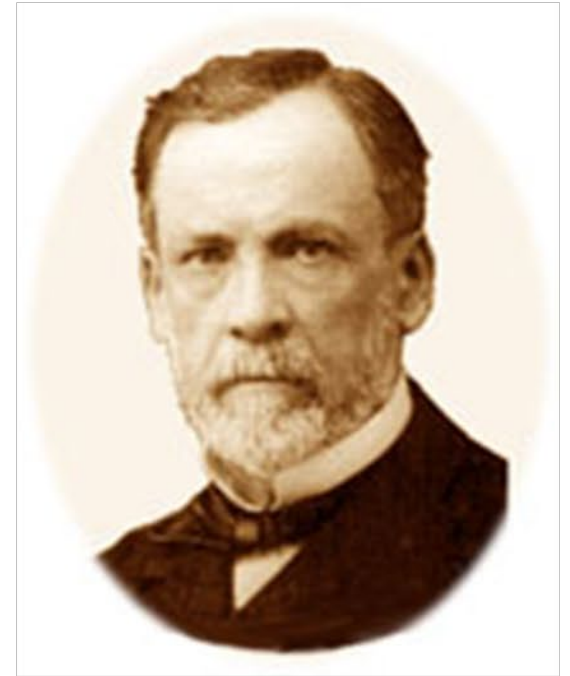


The History of Viruses / Virology

- However, it was not until **Robert Koch & Louis Pasteur** jointly proposed the 'germ theory' of disease in the 1880s that the significance of these organisms became apparent.



**Robert Koch
(1843-1910)**



**Louis Pasteur
(1822-1895)**

- Can you relate with Pasteur's name for your refrigerator?

The History of Viruses / Virology: Koch's postulates

Koch defined the four famous criteria now known as **Koch's postulates** which are still generally regarded as the proof that an infectious agent is responsible for a specific disease:

- **The agent must be present in every case of the disease.**
- **The agent must be isolated from the host & grown in vitro.**
- **The disease must be reproduced when a pure culture of the agent is inoculated into a healthy susceptible host.**
- **The same agent must be recovered once again from the experimentally infected host.**

The History of Viruses / Virology

- In the late 19th century **Charles Chamberland** developed a porcelain filter. This filter was used to study the first documented virus, ***tobacco mosaic virus***.
- Shortly afterwards, **Dimitri Ivanovski** published experiments showing that crushed leaf extracts of infected tobacco plants were still infectious even after filtering the bacteria from the solution.
- At about the same time, several others documented filterable disease-causing agents, with several independent experiments showing that viruses were different from bacteria, yet they could also cause disease in living organisms.
- These experiments showed that viruses are orders of magnitudes smaller than bacteria.
- **The term *virus* was coined in 1898 by the Dutch microbiologist Martinus Beijerinck.**

The History of Viruses / Virology

- In the early 20th century, **Frederick Twort** discovered that bacteria could be attacked by viruses.
- **Felix d'Herelle**, working independently, showed that a preparation of viruses caused areas of cellular death on thin cell cultures spread on agar.
- Counting the dead areas allowed him to estimate the original number of viruses in the suspension.
- The invention of Electron microscopy provided the first look at viruses. In **1935 Wendell Stanley crystallized the tobacco mosaic virus** and found it to be mostly protein.
- A short time later the virus was separated into protein and nucleic acid parts.

Viruses and Virology

Virus: Viruses are the obligate intracellular element that cannot replicate independently of a living (host) cell

Virology: the study of viruses

Virus particle (virion): extracellular form of a virus

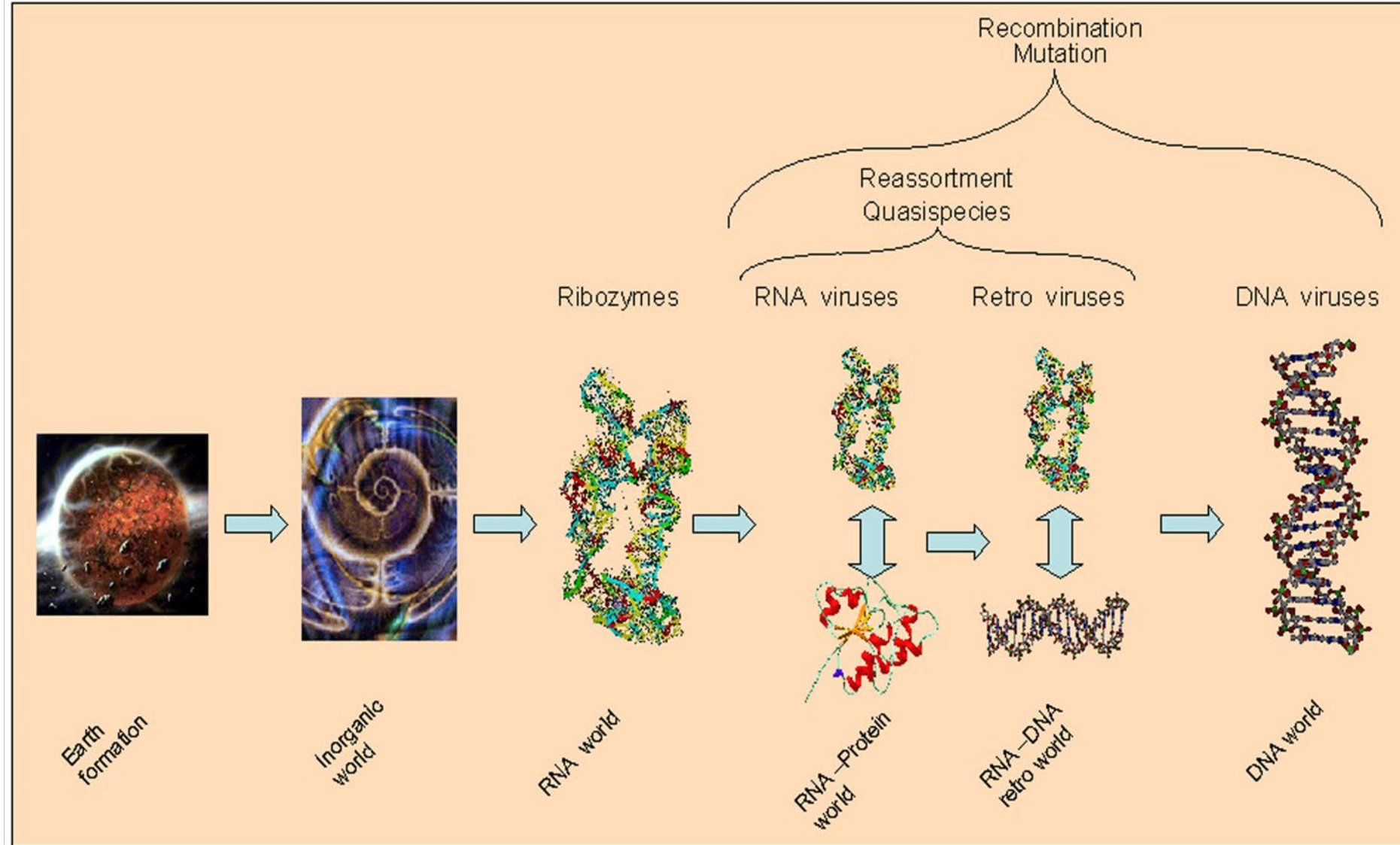
Exists outside host and facilitates transmission from one host cell to another

Contains nucleic acid genome surrounded by a protein coat and, in some cases, other layers of material

Viruses

- Define
- Classification
 - Group
 - NA
 - Family
 - -viridae
 - Genus
 - -virus
 - Species
 - Name

Summary figure: Schematic representation of the evolution of viruses and evolutionary forces acting on them



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