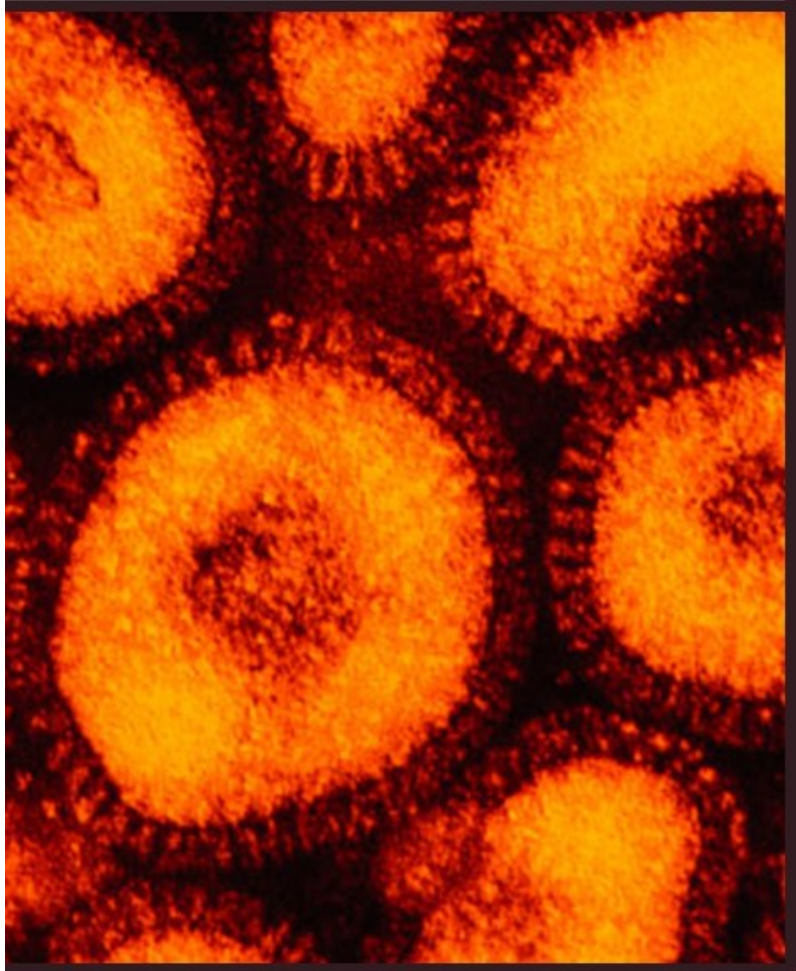
PG Courses (M. V. Sc.) Date: 19 January 2021



VMC 604:GENERAL VIROLOGY

TOPIC: HISTORY OF VIROLOGY

Dr Manoj Kumar

Assistant Professor

Department of Veterinary Microbiology

Bihar Veterinary College, Patna

The History of Viruses / Virology

- Viral diseases such as rabies have affected humans for many centuries.
- Perhaps the first written record of a virus infection consists of a heiroglyph 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.
  - *What's endemic?*
- 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

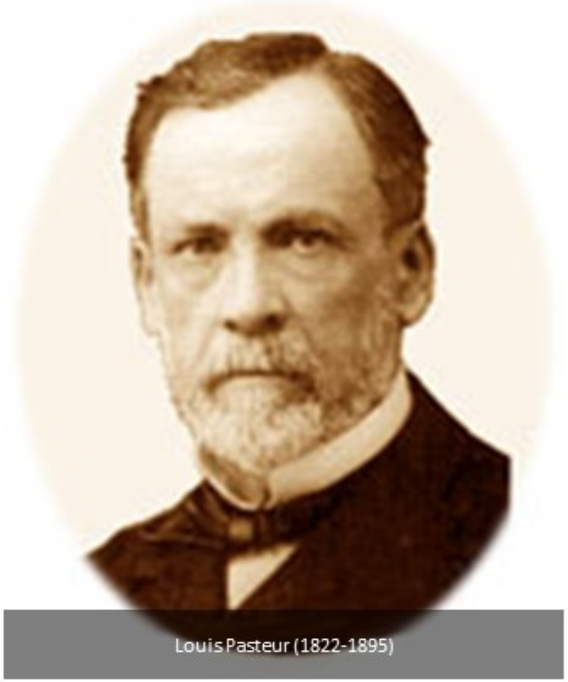
- In 1717 the wife of an English ambassador to the Ottoman Empire, observed local women inoculating their children against Smallpox.
- In the late 18th century, Edward Jenner observed and studied Miss Sarah Nelmes, a milkmaid who had previously caught Cowpox and was subsequently found to be immune to 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: Smallpox

- 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. (Read the Demon in the Freezer)

The History of Viruses / Virology: Smallpox

- Although initially controversial, vaccination against smallpox was almost universally adopted worldwide during the 19th century.
- *Cartoon by James Gillray, 1802.*



Louis Pasteur (1822-1895)

Robert Koch (1843-1910)

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.

- Where should you be familiar with Pasteur's name in your refrigerator?

The History of Viruses / Virology

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** (1892) 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*** (Latin for "poison") was coined by the Dutch microbiologist **Martinus Beijerinck in 1898**.

- Beijerinck developed the concept of a filterable virus he called *contagium vivum fluidum* (Beijerinck 1898)
- In the same year (1898) it was shown by Loeffler and Frosch to be caused by a submicroscopic, filterable transmissible agent, smaller than any known bacteria. The agent causing FMD was thus the first virus of vertebrates to be discovered, soon after the discovery of tobacco mosaic virus of plants.

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** crystallised 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.

The “New” Molecular Biology is founded on Virology

- Understand cellular functions such as DNA (SV40) replication and repair,
- RNA splicing (adenoviruses),
- translation (picornaviruses, poliovirus),
- protein-protein interactions,
- gene expression (retroviruses),

- Cancer and malignancy (Tumor viruses, papilloma and oncogene carrying retroviruses).

The Origin of Viruses.

- Three possible origins:
  - Products of regressive evolution from free living cells. Best candidate are the Poxviruses.
  - Derived from cellular genetic material that has acquired the capacity to exist and function independently.
  - Leftovers from the pre-biotic RNA world.