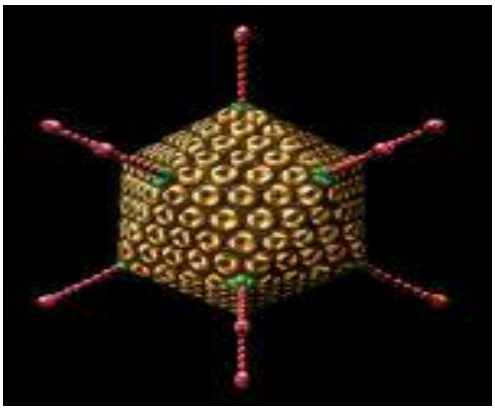
Lecture 7

Introduction to Viruses

Introduction

Virus, parasite with a noncellular structure composed mainly of nucleic acid within a protein coat. Most viruses are too small (100–2,000 Angstrom units) to be seen with the light microscope and thus must be studied by electron microscopes. In one stage of their life cycle, in which they are free and infectious, virus particles do not carry out the functions of living cells, such as respiration and growth; in the other stage, however, viruses enter living plant, animal, or bacterial cells and make use of the host cell's chemical energy and its protein- and nucleic acid–synthesizing ability to replicate themselves. Over 5,000 species of viruses have been discovered.



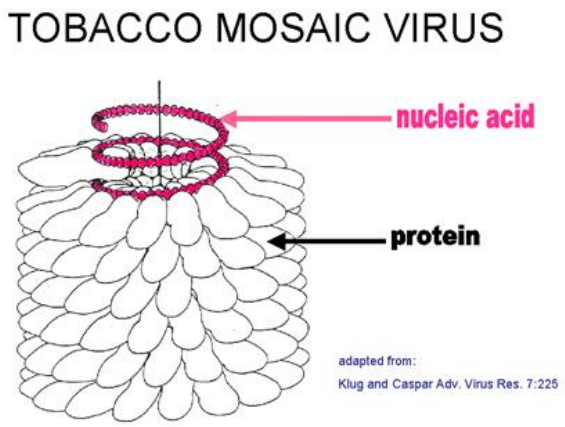
Discovery of Viruses

In 1884 the French microbiologist Charles Chamberland invented a filter, known today as the Chamberland filter or Chamberland–Pasteur filter that has pores smaller than bacteria. Thus he could pass a solution containing bacteria through the filter and completely remove them from the solution. In the early 1890s the Russian biologist Dmitri Ivanovsky used this filter to study what became known as the tobacco mosaic virus. His experiments showed that extracts from the crushed leaves of infected tobacco plants remain infectious after filtration.

At the same time several other scientists proved that, although these agents (later called *viruses*) were different from bacteria, they could still cause disease, and they were about one hundredth the size of bacteria. In 1899 the Dutch microbiologist Martinus Beijerinck observed that the agent multiplied only in dividing cells. Having failed to demonstrate its particulate nature he called it a "*contagium vivum fluidum*", a "soluble living germ".

Tobacco Mosaic Virus

Wendell Stanley (1935) crystallized sap from diseased tobacco plants. TMV is made up of a piece of nucleic acid (ribonucleic acid; RNA) and a surrounding protein coat. The complete virus is a submicroscopic, rigid, rod-shaped particle. Once inside the plant cell, the protein coat falls away and nucleic acid portion directs the plant cell to produce more virus nucleic acid and virus protein, disrupting the normal activity of the cell. TMV can multiply only inside a living cell but it can survive in a dormant state in dead tissue, retaining its ability to infect growing plants for years after the infected plant part died. Most other viruses die when the plant tissue dies.



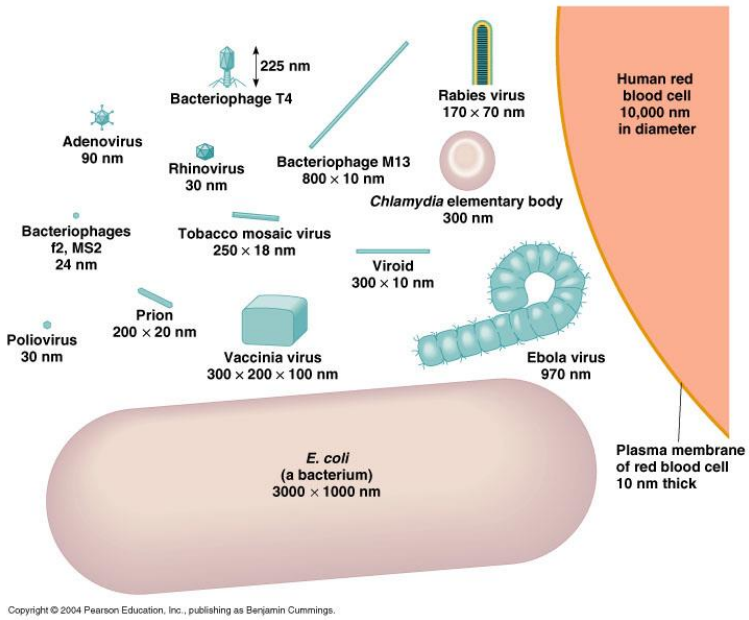
Smallpox disease

Smallpox was an infectious disease caused by either of two virus variants, *Variola major* and *Variola minor*. The disease is also known by the Latin names *Variola* or *Variola Vera*, derived from *various* ("spotted") or *varus* ("pimple"). The disease was originally known in English as the "pox" or "red plague" the term "smallpox" was first used in Britain in the 15th century to distinguish Variola from the "great pox" (syphilis).The last naturally occurring case of smallpox (*Variola minor*) was diagnosed on 26 October 1977. Vaccine was developed against smallpox by Edward Jenner (1796).

Size

Viruses are among the smallest infectious agents, and most of them can only be seen by electron microscopy. Most viruses cannot be seen by light microscopy (in other words, they are sub-microscopic their sizes range from 20 to 300 nm. They are so small that it would take 30,000 to 750,000 of them, side by side, to stretch to one cm. By contrast bacterial sizes are typically around 1 micrometer (1000 nm) in diameter and the cells of higher organisms a few tens of micrometers.

Range of Viral Size



Viral diseases

Some viruses cause disease such as:

Disease	Agnet involved
–Smallpox	By *Variola major* and *Variola minor*
–Measles	By *paramyxovirus* of the genus *Morbillivirus*
–Mononucleosis	By the Epstein–Barr virus
–Influenza	By the family Orthomyxoviridae, the influenza viruses
–Colds	By rhinovirus
–Warts	By one of the types of human papillomavirus (HPV)
–AIDS	By HIV
–Ebola	Caused by an ebolavirus

Taxonomy of viruses

Virus classification is the process of naming viruses and placing them into a taxonomic system. Viruses are mainly classified by phenotypic characteristics, such as morphology, nucleic acid type, and mode of replication, host organisms, and the type of disease they cause. Currently there are two main schemes used for the classification of viruses: 1. The International Committee on Taxonomy of Viruses (ICTV) system and 2. Baltimore classification system, which places viruses into one of seven groups. Accompanying this broad method of classification are specific naming conventions and further classification guidelines set out by the ICTV.

- Viridae used as *Family* names
- Virus is used as *Genus* names

Some Examples

- Herpesviridae
- Herpesvirus
- Human herpes virus 1, HHV 2, HHV 3
- Retroviridae
- Lentivir
- Human Immunodeficiency Virus 1, HIV 2

Prions

A prion is an infectious agent thought to be the cause of the transmissible spongiform encephalopathy (TSEs). It is composed entirely of protein material, called PrP (short for prion protein), that can fold in multiple, structurally distinct ways, at least one of which is transmissible to other prion proteins, leading to disease that is similar to viral infection. Prions Causes neuronal degeneration. Mad cow disease is an example of prions.

Reference:
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https://en.wikipedia.org/wiki/Introduction_to_viruses#Discovery
https://en.wikipedia.org/wiki/Smallpox
https://en.wikipedia.org/wiki/Introduction_to_viruses#Size
http://www.slideshare.net/bikramkdas/viral-taxonomy
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