



Lecture One – *part 2*

Why We Study Virology?

By

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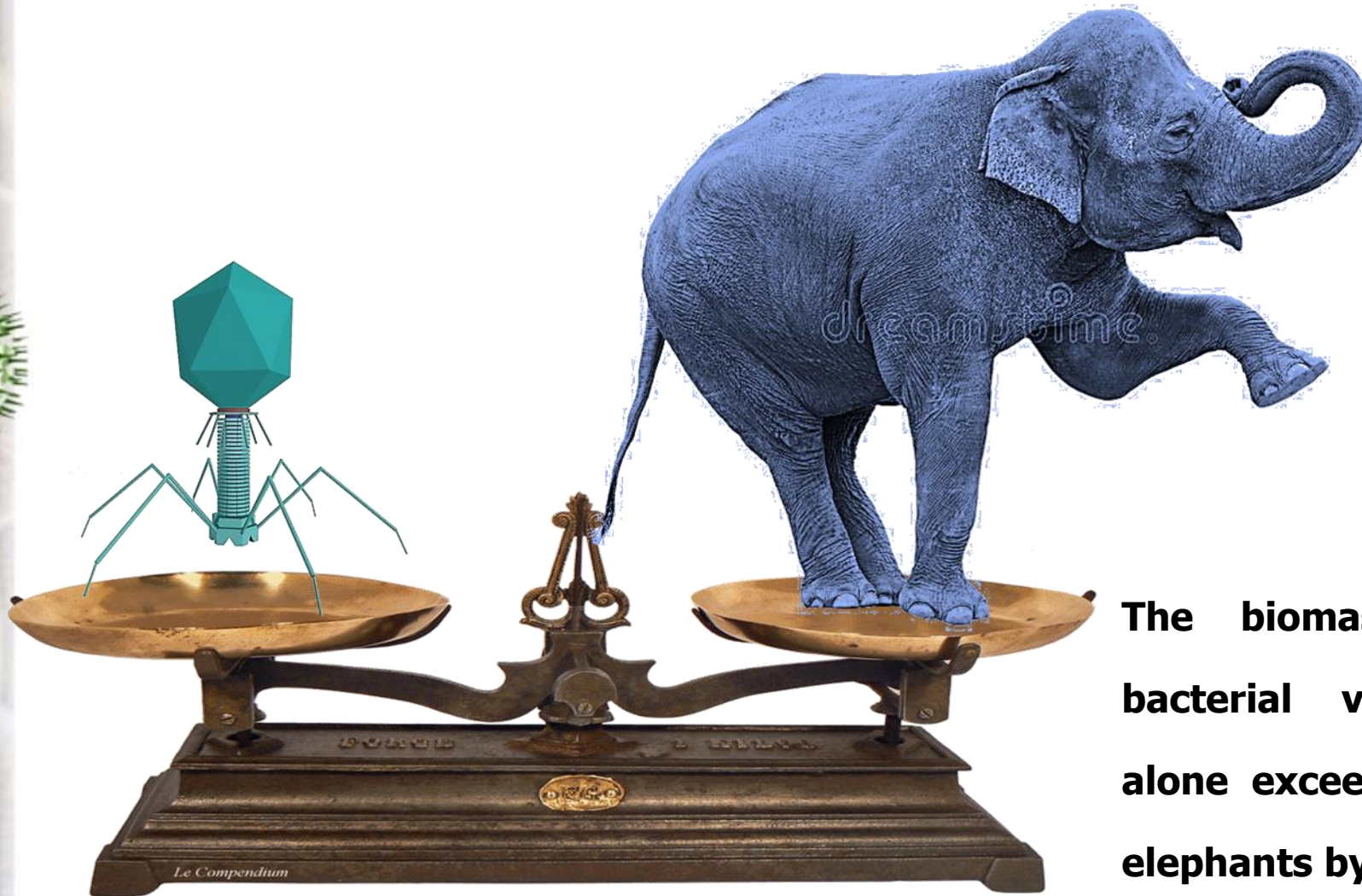
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Some astounding numbers

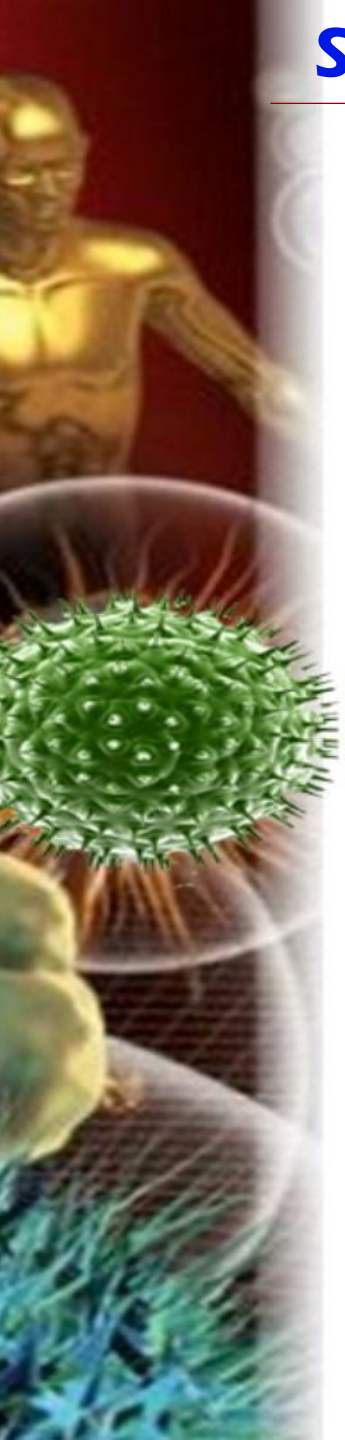
- ▶ **Viruses are the most abundant entities in the biosphere.**



The biomass on our planet of bacterial viruses (Bacteriophages) alone exceeds that of all of Earth's elephants by more than 1,000-fold.

Some astounding numbers

- There are more than 10^{30} **bacteriophage** particles in the world's oceans, enough to extend out into space for **200 million light-years** if arranged head to tail.
- Whales infected with *Calicivirus* excrete more than 10^{13} **Calicivirus** particles daily.
- The average human body contains approximately 10^{13} **cells**, but these are outnumbered **10-fold** by bacteria and as much as **100-fold** by virus particles.



Why We Study Viruses?

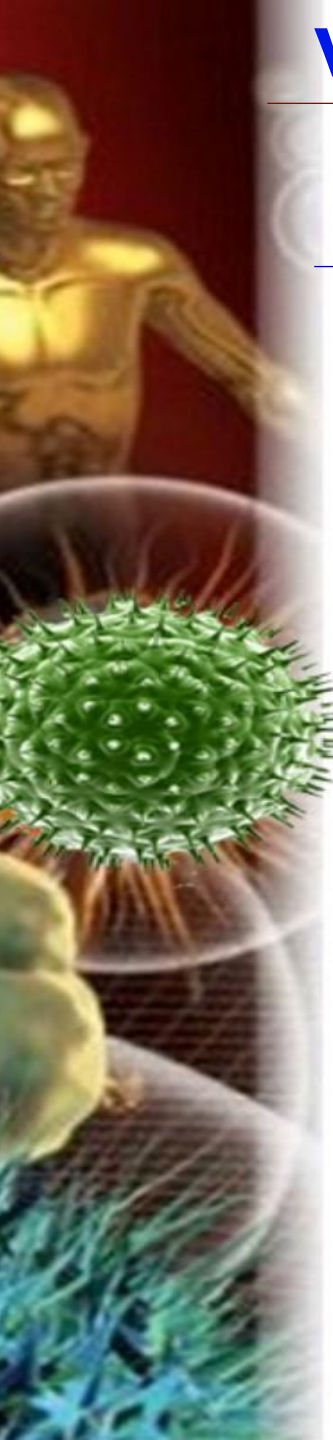
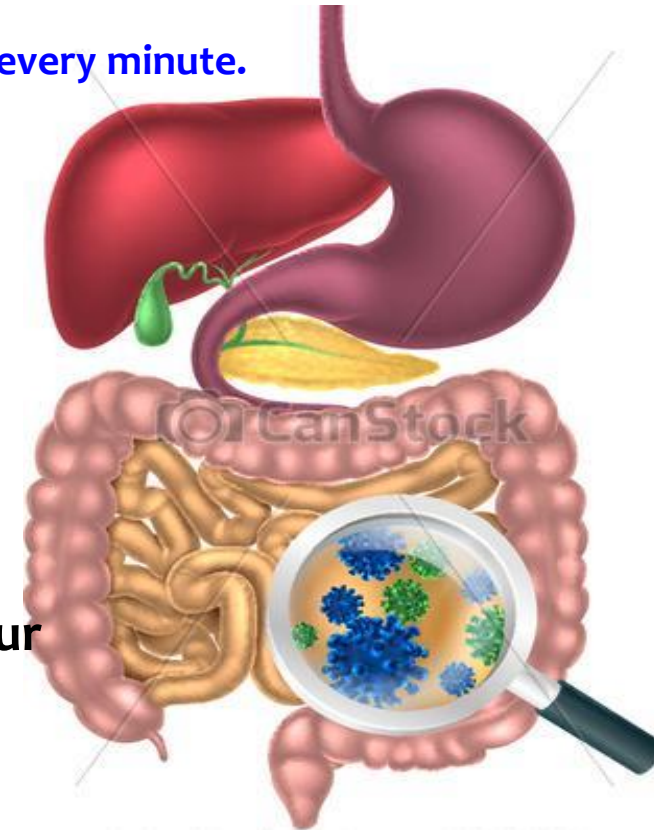
1- Viruses are Everywhere

- All living things encounter billions of virus particles every day.

For example,

- * They enter our lungs during inspiration in the 6 liters of air each of us inhales every minute.
- * They enter our digestive systems with the food we eat.
- * They are transferred to our eyes, mouths, and other points of entry from the surfaces we touch and the people with whom we interact.

- Our bodies are reservoirs for viruses that reside in our respiratory, gastrointestinal, and urogenital tracts.



Why We Study Viruses?

2- Viruses are important disease-causing agents

- The vast majority of viruses that infect us have little or no impact on our health or well-being (immune system).
- Despite such defenses, some of the most devastating human diseases have been or still are caused by viruses.
- Viruses are responsible for approximately **20% of the human cancer burden**.
- Annually, there are millions of children die due to viral infections of the respiratory and gastrointestinal tracts.

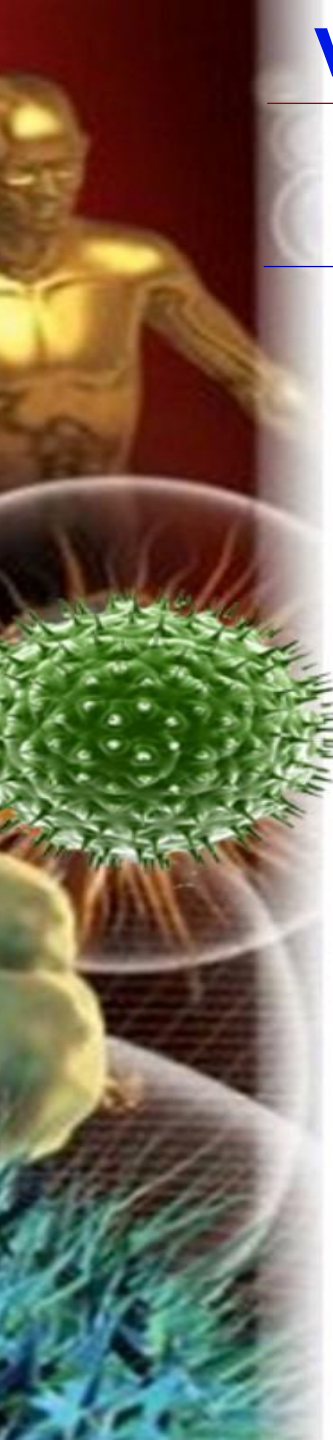


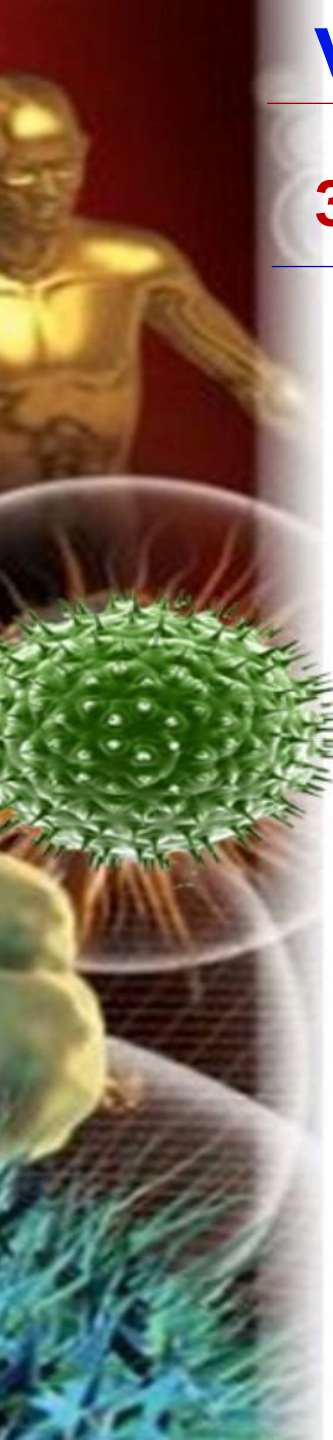
Table 1.1 Some human diseases caused by viruses

Disease	Virus	Family
Acquired immunodeficiency syndrome (AIDS)	HIV-1	Retrovirus
Cervical carcinoma	Human papillomavirus types 16, 18, 31	Papillomavirus
Chickenpox	Varicella virus	Herpesvirus
“Cold sores”	Herpes simplex virus type 1	Herpesvirus
Common cold	Adenoviruses Coronaviruses Rhinoviruses	Adenovirus Coronavirus Picornavirus
Diarrhea	Norwalk virus Rotaviruses	Calicivirus Reovirus
Genital herpes	Herpes simplex virus type 2	Herpesvirus
Hemorrhagic fevers	Dengue virus Ebola and Marburg viruses Lassa fever virus	Flavivirus Filovirus Arenavirus
Hepatitis	Hepatitis A virus Hepatitis B virus Hepatitis C virus	Picornavirus Hepadnavirus Flavivirus
Influenza	Influenza A and B virus	Othomyxovirus
Measles	Measles virus	Paramyxovirus
Mononucleosis	Epstein–Barr virus Cytomegalovirus	Herpesvirus Herpesvirus
Mumps	Mumps virus	Paramyxovirus
Poliomyelitis	Poliovirus types 1, 2, and 3	Picornavirus
Rabies encephalitis	Rabies virus	Rhabdovirus
Severe acute respiratory syndrome (SARS)	SARS coronavirus	Coronavirus
Smallpox	Variola virus	Poxvirus
Warts	Human papillomavirus types 1, 2, 4	Papillomavirus
Yellow fever	Yellow fever virus	Flavivirus

Why We Study Viruses?

3- Viruses can Cross Species Boundaries

- Although viruses generally have a limited host range, they can spread across species barriers (Switch Hosts).
- In addition to the AIDS pandemic, the highly fatal Ebola hemorrhagic fever and the severe acute respiratory syndrome (SARS) are recent examples of viral diseases to emerge from zoonotic infections.



Why We Study Viruses?

4- Viruses can be Beneficial



A

Ocean's food chain

- Viral infections in the ocean kill **20 to 40%** of marine microbes daily, converting these living organisms into **particulate matter**, as well as **carbon dioxide** and other **gases** that affect the climate of the earth.

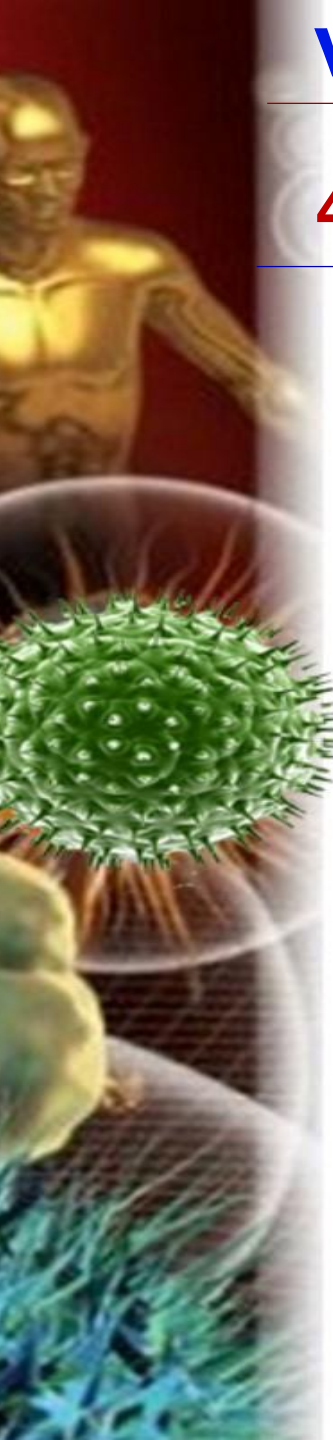
B

Viral vectors

- Also being used to treat human disease via “gene therapy,” in which functional genes delivered by viral vectors compensate for faulty genes in the host cells.

C

Vaccines



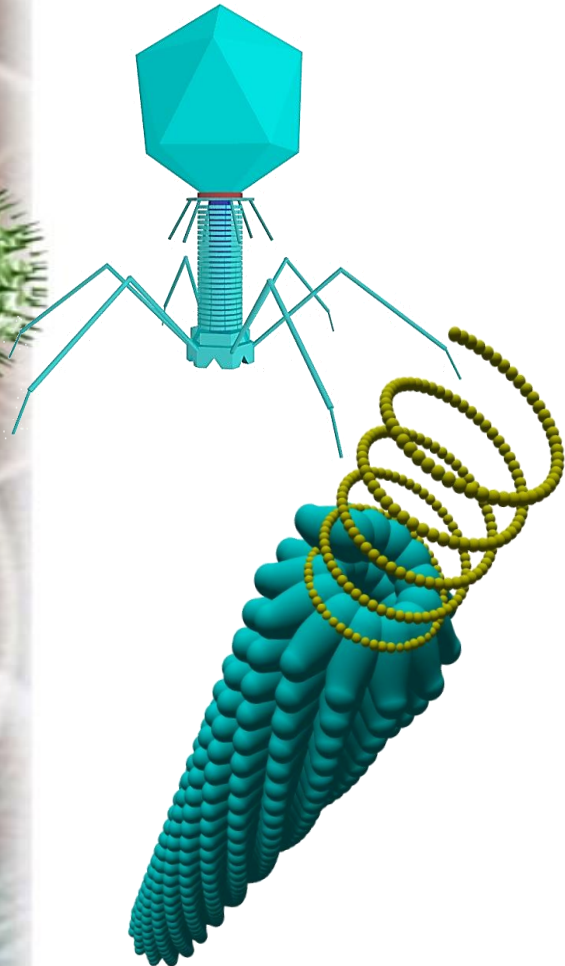
Why We Study Viruses?



D

Viruses are Unique

Tools to Study Biology

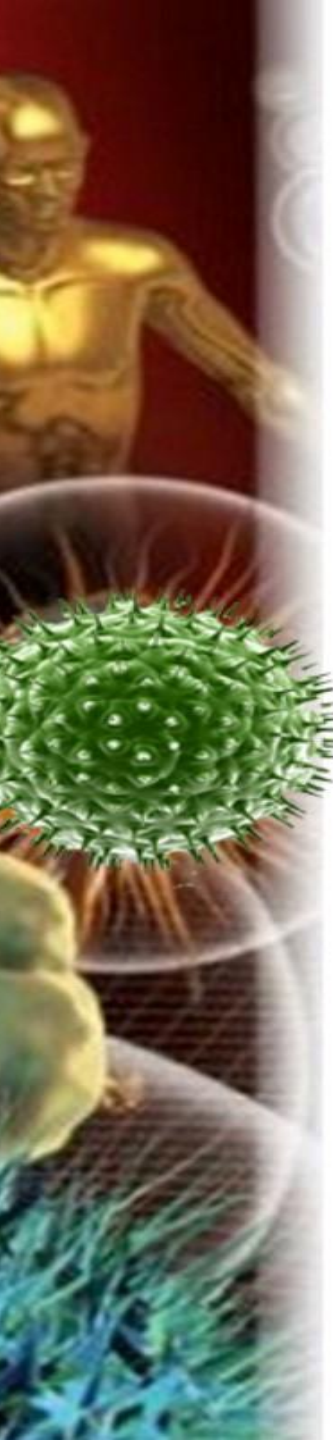


- Bacteriophages studies laid the foundations of modern molecular biology.
- Crystallization of TMV was a landmark in structural biology.
- Animal viruses studies established many fundamental principles of cellular function, including the presence of intervening sequences in eukaryotic genes.
- The study of cancer (transforming) viruses revealed the genetic basis of this disease.

Reviewing of Learning outcomes

By the end of this lecture students should

- Be aware of the history of virology.
- Be aware of the importance of virology in shaping the human history.
- Recognize the history of vaccinology.
- Recognize the milestone achievements in the field of virology.
- Have the knowledge “why we study virology”.





Thank
You