

VIRUS

The annual S&T poster for everyone
"One S&T Poster for Every Household"

Small size, Big impact

① What is a virus?

A virus is a small infectious agent made up of genetic material (DNA or RNA) and biological molecules, such as proteins. To replicate, a virus must enter the cell of a living organism and use that cell's structures and functions. In the case of influenza virus, 100 to 10,000 virus particles are released from a single virus-infected cell.

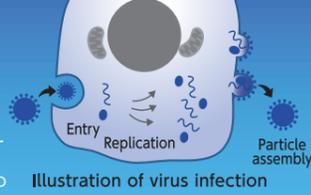
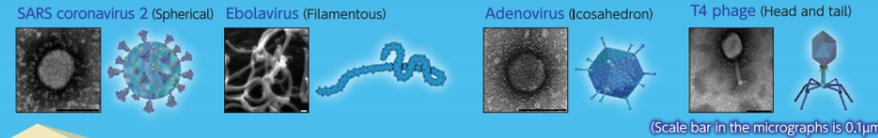


Illustration of virus infection

1µm (micrometer) is 1/1000 of 1mm.

(Left) Electron micrograph (Right) Illustration

② Diverse virus particles as seen by electron microscopes



(Scale bar in the micrographs is 0.1µm)

③ How are viruses different from bacteria?

	Virus	Bacteria
Living organism?	Has characteristics of both living and non-living organisms	Single-cell organism
How do they replicate?	Relies on host cell's machinery	Does not rely on other cell's machinery*
Prevention	Vaccination, such as influenza vaccine	Vaccination, such as pneumococcal vaccine
Treatment	Antiviral drugs and neutralizing antibodies e.g., Oseltamivir	Antibacterial drugs e.g., penicillin

④ Size of viruses

Let's compare

Virus (5cm)

Diameter of hair (24 µm)

If the diameter of a hair is the length of a tennis court, SARS coronavirus is about the size of a tennis ball.

- SARS coronavirus 2: 0.1 µm
- Herpes simplex virus: 0.2 µm
- Ebolavirus: 0.1 µm (diameter), 5 µm (length)
- Giant virus (Mimivirus): 0.8 µm
- Phage: 0.3 µm
- Bacteria (*Escherichia coli*): 1-5 µm

*If the width of a poster is equal to the diameter of a hair, the virus particles are equal to the size of the illustrations.

Viruses in nature

Many viruses are found on Earth, and they are involved in a variety of natural phenomena.

From nature to human society

Viruses enter human society from nature and can cause disease in humans.

Infectious disease in human society

The societal infrastructure that monitors and controls the spread of viruses protects our lives.

Research and application of viruses

Viruses are often seen as dangerous invaders, but they can be used for beneficial technology.

History of human and viruses

Since ancient times, people have prayed to transcendent beings for the end of infectious diseases.

As science and medicine have advanced, preventative and therapeutic measures have been developed.

The oldest evidence of human viral disease?

There are signs of smallpox-like disease found in the mummy of Ramses V of Egypt (12th century BC).

The Great Buddha and bean throwing

The Great Buddha and bean throwing on Setsubun are said to symbolize the prayer and wish for the end of infectious diseases.

Pioneer of vaccine development

In 1796, Edward Jenner developed the first vaccine against smallpox.

The first photo of a virus

In 1935, Wendell M. Stanley crystallized tobacco mosaic virus. In 1938, Ernst Ruska and his colleagues used an electron microscope to capture it on film.

Pandemic history

Pandemics have been repeatedly caused by the emergence of viruses new to humans.

History of pandemic influenza

1918 flu pandemic, 1957/1958 flu pandemic, 1968 flu pandemic, 2009 H1N1 pandemic

Before the common era

Ancient books record viral disease!

Man'yōshū and *Nihon-Shoki* record viral diseases. The record of a plant viral disease found in *Man'yōshū* is the oldest ever discovered.

~ 17th century

Viral disease in livestock

Rinderpest has also had an impact on human society since ancient times.

1700

Discovery of virus

In 1892, Dmitri Ivanovsky discovered a filterable agent that caused disease in tobacco plants. The agent was later named "virus," from the Latin word for "poison."

18th ~ 20th century

The first eradication of infectious disease!

In 1980, the World Health Organization (WHO) declared smallpox eradicated.

2000

COVID-19 pandemic

Even in modern society, with improved public health, a pandemic in 2020 triggered severe social and economic impacts.

21st century ~ What's next?

For a better future

Controlling viral disease is a global challenge. Better understanding of viruses is the first step for a greater future.

- What viruses are present on Earth?
- How do viruses impact human society?
- Which viruses are beneficial to us?

Let's remember viruses as we consider a better society!

Learn more on a special website!

