

## Lesson 3 Living With Viruses

### The Varied World of Viruses

It appears that viruses exist solely to bring suffering to humanity. The 1918 influenza pandemic is estimated to have killed 50 to 100 million people. Smallpox claimed the lives of a further 200 million people in the 20th century alone, according to estimates. And of course, the recent COVID-19 pandemic has taken several million lives, affecting almost every aspect of human life worldwide.

Outbreaks of viral diseases are frequently linked to contact with wild animals such as bats. Such contacts allow new viruses to enter human bodies that have no prior immunity to such viruses. Historically, natural barriers such as mountains and forests prevented animal viruses from infecting humans. Industrialization has destroyed these barriers, and climate change has pushed some wild animals out of their original habitats. These changes have resulted in an increase in interactions between human and wild animals, meaning more opportunities for the viruses present in wild animals to spread to humans. This is the primary reason for scientists' concern that pandemics may increase in the future. Then, is the virus truly a harmful presence to humans? Not necessarily.

### Keepers of the Earth

What is less commonly known is that viruses play crucial roles in supporting much of life on Earth. This is because researchers have only recently begun investigating the viruses that sustain us and the planet, instead of just those that harm us. Therefore, scientists have much more to learn about viruses than they currently know. What they do know is that viruses act as the primary regulators of bacterial and insect populations.

Since viruses do not have reproductive functions on their own, they steal the reproductive functions of other organisms to multiply. Some types of viruses use bacteria. When the virus continues to multiply inside the bacteria, the bacteria eventually die, and the newly produced viruses go on to infect other bacteria. This whole process helps viruses control the excessive growth of certain bacteria.

The greater significance of viruses infecting bacteria is that they play a vital role in supplying oxygen to our planet. About half of the oxygen on Earth is produced by plankton in the oceans, and the primary food source for these plankton is nutrients released from bacteria killed by viral infections. If viruses did not infect and kill bacteria, there would be no bacterial remains, leading to a lack of plankton. Without plankton, half of Earth's oxygen would disappear. In short, without viruses, the lack of oxygen would make it impossible for humans to survive.

Insect species populations are also regulated by viruses. When a specific type of insect increases excessively, the viruses that infect those insects also increase, reducing their numbers. This, in turn, creates room for other types of insects to flourish.

Considering the chain of food in nature, it would not be difficult to assume that viruses fulfill important functions in regulating other species. We have just started to understand their various roles in the ecosystem.

## Helpers of Evolution

Another less recognized role of viruses is their contribution to the evolution of life on Earth. When a virus infects a reproductive cell of its host, such as an egg or sperm, the viral DNA may be passed down to the host's offspring. The insertion of new DNA into genomes is a significant mechanism of evolution. Without viruses, in other words, the evolutionary potential for all life on the planet would be impacted.

One example of viruses' contributions to evolution is their role in the development of the placenta in mammals. A placenta is a complex organ that helps the fetus grow securely inside its mother's body. It facilitates the exchange of oxygen, nutrients, and waste products while protecting the fetus from the mother's immune system. In the early days of evolution, female animals had to leave their offspring in one location, like eggs in a nest, making them vulnerable to predators. After the emergence of the placenta, females were able to carry their young inside their bodies safely from one location to another. Viruses that infected our remote ancestors more than 130 million years ago have been reported to have served a key function in the development of this vital organ.

## Means for Cures

As scientific knowledge about viruses continues to expand, new opportunities for utilizing them in the battle against diseases are arising. Of notable interest are the areas of gene therapy and cancer treatment. Genes can be compared to instruction guides that govern how our bodies function. Sometimes, people are born with genetic disorders, which can lead to health problems. Gene therapy steps in to fix these issues. The essence of gene therapy lies in delivering corrected genetic instructions to a patient's cells, enabling them to function properly. In this process, specially modified viruses are used as one of the carriers of the genetic instructions. If the patient's cells function properly, it can potentially help the body fight off certain diseases.

Using viruses to treat cancer, another use of viruses, is based on the notion of utilizing their natural ability to infect and kill cells. If successful, viruses can be manipulated to specifically target and destroy cancer cells while leaving healthy cells unharmed. The use of viruses in gene therapy and cancer treatment is still in the early stages. However, many researchers are involved in hundreds of projects with the goal of discovering cures for diseases that were once thought to be incurable.

We have yet to find out how many virus types even exist, let alone the characteristics of each of them. The more we learn about viruses, however, the better equipped we will be to use certain viruses for beneficial purposes and to develop defenses against viruses that could lead to the next pandemic. More than that, learning more about viral diversity will help us reach a deeper understanding of the working of our planet, ecosystems, and our own bodies.

## 3과 Further Reading

**The Strange Mask of the Plague Doctor**

When a deadly disease called the plague killed many people in Europe in the 1600s, some doctors wore a strange costume to treat the sick. The costume had a long coat with polish on it and pants and boots that were attached. Their shirts were fastened, and they wore hats and gloves made of goat skin. The doctors also had a stick that they used to touch or push away the sick people.

The most unusual part of the costume was the mask: It had glasses and a long nose like a bird's beak, which was filled with herbs and other things that smelled good. The doctors thought that the plague was caused by bad air that could disrupt the body's internal balance. They hoped that the herbs in the mask would filter the air and protect them from getting sick.

But they were wrong. The plague was caused by bacteria that could spread from animals to people. The bacteria could also spread through flea bites or contact with sick people. The doctors' costume and methods did not really protect them from the plague.

Things have greatly changed since then. With modern medicine, we detect and counter bacteria and viruses swiftly. Protective gear protects us during virus research and patient treatment. Yet, our reliance on brave doctors and scientists remains unchanged, as they combat unseen enemies to protect humanity.