

# THE CHILDREN'S ILLUSTRATED GUIDE TO EPIDEMIOLOGY AND HEALTHCARE

小大人的公衛素養課：  
科學脈絡 X 人文歷史，  
流行病學 X 預防醫學 ——  
後疫情時代的必備圖文知識書

*COVID-19 has had a huge influence on our lives over the last few years. When fighting a pandemic like this, an understanding of epidemiology is essential. From the history of pandemics to basic scientific concepts and prevention methods, this book includes everything you need to know about public health.*

Epidemics have influenced human lives for thousands of years, whether it be smallpox, the Black Death, cholera, malaria, or indeed our most recent epidemic: COVID-19. They require society to work together as a whole to get them under control, which is why public health literacy is so important, especially in a globalized world.

In this book, a renowned epidemiologist joins forces with a popular children's science writer to present the public health knowledge that's essential for young people to know today. The first chapter starts with the history of epidemics, from ancient Egypt to modern times. Readers can see how diseases have been a threat to human life for millennia, and how scientific developments have gradually changed the way people treat epidemics.

The second chapter talks about the basic concepts of influenza, including the different categories of the virus, how the infection



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progresses in the body over time, and how to prevent catching it. Chapter three shifts the focus to society as a whole, using graphics and examples to explain: vaccines, social distancing, widespread testing, community spread, and other common terms we see in news. Finally, the last chapter looks to the future to see how cutting-edge technology like AI, big data, and robots have helped fight epidemics, and how we can adjust to a “new normal” after our current pandemic.

With lively illustrations and detailed explanations which feature examples and infographics, *The Children's Illustrated Guide to Epidemiology and Healthcare* is an essential book for children who have grown up during the pandemic, so that they don't just understand our current situation but can also take measures to prevent future challenges.

### Text by Chen Chien-Jen 陳建仁

Chen Chien-Jen is a Taiwanese epidemiologist who is known for his work on Blackfoot disease and liver cancer. He received his doctorate degree in human genetics and epidemiology from Johns Hopkins University and served as Minister of Health during the SARS crisis in Taiwan in 2003. He has served as the Vice President of Taiwan from 2016 to 2020 and was the vice president of Academia Sinica from 2011 to 2015.

### Text by Ami Hu 胡妙芬

Ami Hu is a freelance children's science educator and writer. When she's not teaching or writing, she can be found curating science exhibitions, hosting radio shows, and translating. Her books include children's non-fiction titles such as *The Funnest Chemistry Class in Science History*, as well as the comic book *Duckbill the Animal Detective* and the picture book *T-Rex Time Machine*, among others.

### Illustrated by Hui

Hui graduated from National Taiwan University of Arts, and now works as a freelance illustrator. Her work can be found in children's magazines, textbooks, and lifestyle publications.

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## CHAPTER 1

# A History of Mankind's Struggle with Infectious Diseases

The history of mankind is an eternal race against infectious disease. Pestilence can strike anywhere, and at any time, bringing horror, darkness and death. Throughout human history, terrible epidemics have wiped out peoples, caused countries to fall, and greatly influenced the movement of people, changes in systems and the outcomes of wars. When the plague broke out, everyone from street hawker to king was afraid of catching it. But at the same time, infectious diseases have also contributed to human progress, scientific development and advances in medicine. Over long years of fighting infectious disease, mankind has, step by step, moved from defenselessness to triumph.

# Curse of the Pharaohs?

## 3000 years ago, smallpox was prevalent in Egypt

Smallpox is a very old infectious disease. At least 3000 years ago, in ancient Egypt, smallpox had already taken countless lives. Even the pharaohs, who were thought to be gods living among humans, could not escape its clutches.

In ancient times, people believed that smallpox was an angry god that punished humans. People who got smallpox ended up blind, deformed or facially scarred, or died.

In about 1000 BC smallpox was introduced to India by an Egyptian trader. A thousand years after that Indians introduced it to China. Smallpox ravaged India and China, killing countless people, especially young children. Parents were terrified their children might catch it. Five hundred years later it spread from China to Japan. According to historical records, between 735 and 737, smallpox killed one third of the entire population of Japan.

Even the Pharaohs caught smallpox...it was terrible!

Oh, God, please don't let me get smallpox!

In ancient India, people believed that smallpox was brought by the god, Shitala. Shitala carried a broom in one hand and a bottle of holy water in the other. The broom was to spread smallpox, and the holy water to soothe the sufferers. People prepared food and water for Shitala and worshipped her. In China, people believed that the Pox Lady brought smallpox, while in Japan and Africa people called it the Smallpox Demon.

Throughout human history, kings as well as commoners died of smallpox: for example, the 16th-century Inca ruler Huayna Capac. In the 18th century, Peter II of Russia and Louis XV of France both died of smallpox. The mummy of the ancient Egyptian pharaoh Rameses V was found to be covered in pustules and pox scars, suggestive of smallpox. He is the earliest known sufferer of smallpox in the world.



# The milkmaid didn't get smallpox

## Beating smallpox with cowpox

Smallpox raged around the world for 4000-5000 years, and mankind could not find a way to stop it. But for a long time, there was a saying in English villages that milkmaids did not catch smallpox. A doctor, Edward Jenner (1749-1823) investigated this claim, and established that milkmaids who had caught cowpox from cows, did not subsequently catch smallpox. In 1796, Jenner carried out a daring experiment. He infected an eight-year-old boy with cowpox, then half a year later, planted some scabs from a smallpox victim on the boy. The boy did not develop smallpox — he was immune to the terrible disease!

News of the success spread and people all over the world tried to replicate Dr. Jenner's brilliant experiment.



### The cowpox vaccination experiment



1 A milkmaid was infected with cowpox, and developed a pustule on her skin.



2 Dr. Jenner vaccinated the boy with some pus from the woman's pustules.



3 The little boy became slightly ill, and developed some cowpox pustules on his skin.



4 Six months later, Dr. Jenner removed some scabs from a smallpox sufferer.



5 Dr. Jenner placed the scabs on the boy.



6 The cowpox vaccine protected the boy and he didn't get sick!

At first, people weren't sure whether to trust Dr. Jenner's cowpox vaccination. Some people mocked him and joked that a cow might grow out of the wound! But Dr. Jenner was confident, and even vaccinated his own children to show that they wouldn't get smallpox. Within a few years, over 100,000 people were vaccinated in Britain, and thereafter in Europe, Canada and South America. In 1853, for the first time, a law was passed making it compulsory for all people to receive the

cowpox vaccination. As a result, smallpox was gradually eradicated from the UK.

But not everyone in the world was lucky enough to be vaccinated, and even in the 20th century, 10-15 million people were catching smallpox each year, and 2 million were dying of it. It was realized that smallpox could not be completely eradicated unless all the countries of the world united to contain it. In 1967, the WHO launched an aggressive campaign to isolate everyone infected with smallpox and vaccinate all those who had been in contact with them. By 1980, smallpox had been eradicated worldwide. It was the first time in history that mankind had defeated an epidemic.



# Is leprosy a punishment from God?

## From discrimination to gentle care for a sick man

If you were to ask what is the most discriminated against and misunderstood disease in history, the answer would have to be leprosy. Leprosy is a disease that causes people to lose consciousness, and become so deformed that they were once considered as monsters, cruelly treated and abandoned by society. More than 2,000 years ago, the laws of the Qin Dynasty in ancient China stated that lepers were criminals and had to be killed or buried alive. The Bible also records that in Old Testament times lepers were considered “unclean” and were required by law to live in the wilderness, away from others, and to wear a bell to warn people to stay away. Later on, many leper colonies and leprosy hospitals were established around the world, where lepers were locked up and left to fend for themselves, isolated from the world.

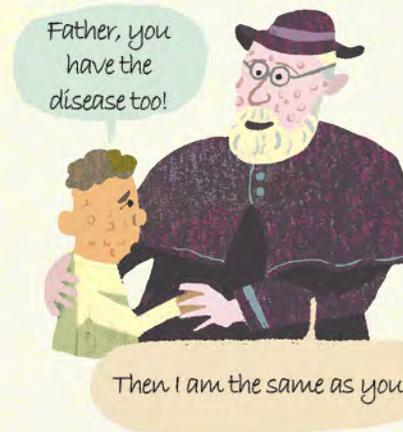
Fortunately, there were many good-hearted people who treated lepers kindly. By the 19th century, it was finally understood that leprosy was caused by the bacterium called *Mycobacterium leprae*. After that, leprosy was no longer an incurable disease. Treated with antibiotics and care, people could recover.

There are still about 10 new cases of leprosy in Taiwan each year. However, if patients are treated early with medication, they can recover completely with no residual effects.



### Dr. Hansen discovers the leprosy bacterium

In ancient Europe, many people believed that lepers were punished by the gods for their evil deeds, and as the punishment was justified, they did not deserve sympathy. There were also people who believed that leprosy was inherited or caused by inhaling a miasma. But Dr. Gerhard Henrik Armauer Hansen (1841-1912), a Norwegian, did not agree. His discovery of *Mycobacterium leprae* in 1873 proved that leprosy was in fact a bacterial infection. This important discovery brought an end to discrimination against leprosy patients and an understanding of the correct way to avoid the disease. Later, also to avoid discrimination, the medical profession used Dr. Hansen's name for leprosy, calling it “Hansen's disease”.



### Father Damien lives and dies with Hansen's disease

Father Damien (1840-1889) was a Belgian Catholic priest who, as a young man, volunteered to save people with Hansen's disease in a quarantined area on the island of Molokai in Hawaii. At the time, the sick people on the island had been abandoned and were living a miserable life left to their own devices. Father Damien embraced them with open arms, built churches and schools for them, and taught them to read so that they could live happily and with dignity. But because he was always treating the sick or dressing their wounds, Father Damien eventually caught Hansen's disease and died. His story touched countless people and inspired many more to sacrifice their lives for those with Hansen's disease.



### Sister Martin devotes her life to patients with Hansen's disease

Sister Elviva Valentín Martin (1922-2012) came to Taiwan in 1953. In 1962 she began to devote her life to caring for patients with Hansen's disease in the Lo-Sheng Sanatorium and Hospital. She never felt it was a hardship. She was particularly devoted to the more serious patients: bathing them, cutting their nails, changing their clothes, talking to them and being with them when they died, which was a great comfort to them.

# Dancing with Death in the Middle Ages

## The Black Death in Europe

In 1346, a mysterious disease reached Europe along trade routes from Asia and killed 60% of Europeans in just seven years. Eight out of ten people who caught this terrible disease died in agony. It was called the Black Death because black patches appeared on their skin, due to subcutaneous bleeding. Every day thousands of people died in agony from this disease in cities across Europe.

The Black Death caused fear and panic, the streets were piled with corpses, the air was filled with sadness, terror and grief. No one knew where this disease had come from, or how to prevent it. A few people pointed the finger at innocent people, suspecting beggars, lepers, pagans and other outsiders for bringing it in. Some places suspected that Jews had poisoned the water in wells and attacked them, and even burned innocent Jews alive.

In Europe, under the shadow of the Black Death, doctors started wearing a "beaked mask". To avoid being infected, they would examine their patients using long sticks, and wore protective gloves, long boots, a beaked mask and a waxed coat. But these outfits and masks were useless, and many doctors with beaked masks died of the Black Death.

Scenes of the Black Death appeared in paintings of the late Middle Ages, often with the title Dance of Death.



### Map showing the spread of the Black Death



Between 1347 and 1353, the Black Death spread at an alarming rate throughout Europe, with only a few areas unaffected. (The spread of the Black Death is shown in purple.)