Jonas Salk

A Reading A–Z Level Y Leveled Book
Word Count: 1,745

Connections

Writing

Time magazine named Jonas Salk one of the most important people of the twentieth century. Do you agree? Take a stance. Write a letter to *Time* magazine voicing your opinion. Include details from the text to support your claim.

Science

Explain how antibodies work to make the body immune to disease. Include a labeled diagram of an antibody with your explanation.

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Jonas Salk

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Focus Question

How did Jonas Salk achieve his goal of making a difference for humanity?

Words to Know

crippled	placebo
devastating	polio
epidemic	quarantined
field trial	strains
immune	vaccine
paralyzed	vocal

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Correlation

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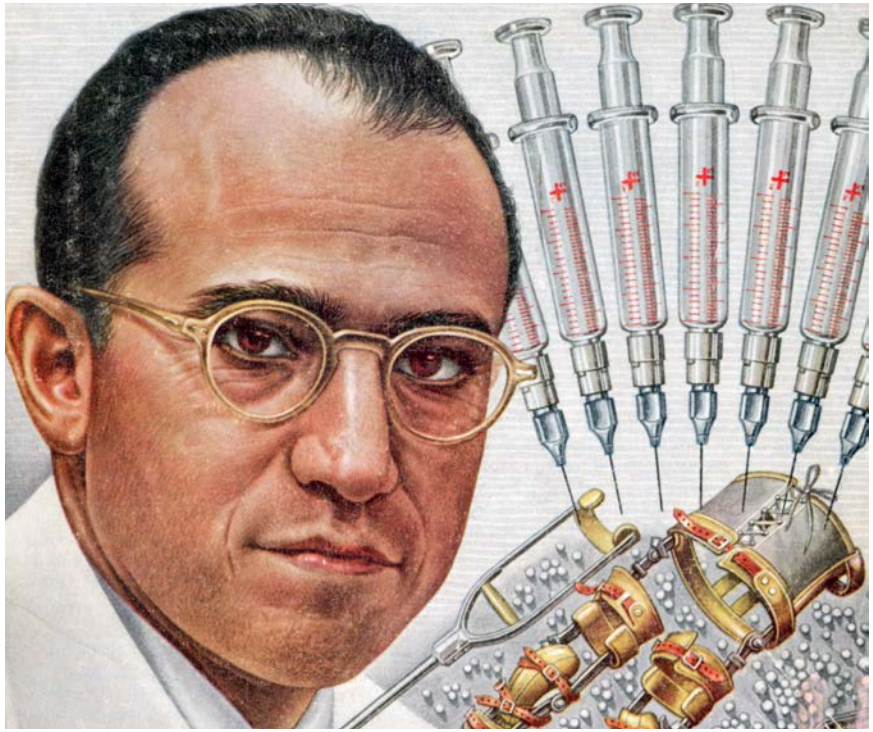

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Signs warned people to stay away from areas stricken by polio.

Summer Terror

In the spring of 1953, parents in the United States braced for another season of terror. *Poliomyelitis*, or **polio**, had sickened nearly fifty-seven thousand people the previous summer. The disease had left twenty thousand people, mostly children, **crippled** and another three thousand dead.

In most cases, the poliovirus caused cold-like symptoms, but in some cases the virus **paralyzed** the arms and legs. In the worst cases, it paralyzed the chest muscles so people could not breathe.

People avoided large crowds, and police **quarantined** homes and took sick children to hospitals, where they stayed for months—even years.

There was one hope. Dr. Jonas Salk told the nation that a **vaccine** for polio was on the way.

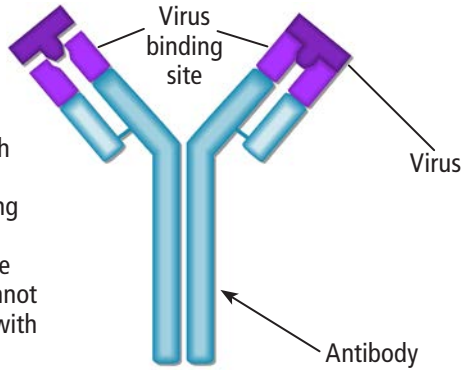
How to Make a Difference

Jonas Salk, born in New York in 1914, was a good student who entered Townsend Harris Hall, a high school for gifted students, when he was twelve. Salk then went on to City College of New York by age sixteen. He wanted to do something to help humanity, and he wanted to become a medical researcher to fight diseases.

Salk finished his studies just as the United States entered World War II. The military needed a vaccine to protect soldiers from influenza (flu) and other respiratory illnesses because a flu **epidemic** had killed more than forty thousand U.S. soldiers during World War I. Dr. Thomas Francis at the University of Michigan received money for research to develop a flu vaccine and hired Salk to work in his lab.

The U.S. Army began influenza vaccinations in 1943.

How Antibodies Work



Antibodies bind with viruses to stop the viruses from infecting the body. Once the viruses bind with the antibodies, they cannot break off and bind with other healthy cells.

When exposed to a virus, the body protects itself by producing special proteins called *antibodies*. These antibodies bind with the viruses and bacteria to help the body fight illnesses. A vaccine causes the body to produce antibodies, in most cases without giving it the disease. Salk developed a test to count the number of antibodies in the blood, which allowed researchers to tell how well a vaccine worked without having to wait for someone to get sick.

To make the vaccine, the researchers had to kill the flu virus carefully. If the outside shape of the virus was damaged, the body would not recognize the virus and make antibodies. The team was successful in producing a killed-virus flu vaccine that saved thousands of lives.

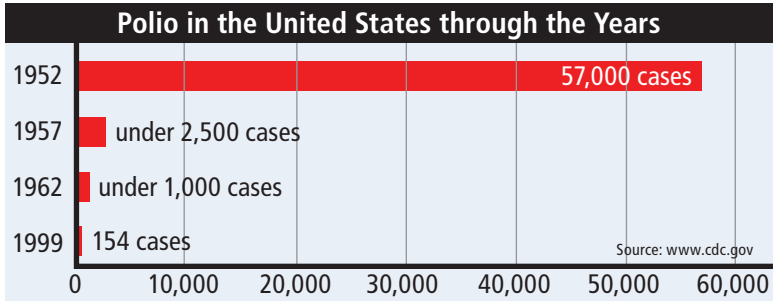
Now thirty-two years old, Salk went to work as the head of the Virus Research Laboratory at the University of Pittsburgh.

Doing Things His Way

The National Foundation for Infantile Paralysis (NFIP), which raised money for polio survivors, wanted to fund research on a polio vaccine. Basil O'Connor, head of the foundation, was impressed with Salk's eagerness to get things done and gave Salk money for research.

The first step to a polio vaccine was to discover how many types of poliovirus existed. If there were dozens of types, as there are with the common cold virus, a single vaccine would not protect people.

Poliovirus was hard to work with. Only humans get polio naturally, but monkeys can be infected with it in a laboratory. Traditionally, finding out how many **strains** of a virus there were required months or years of work. Researchers infected monkeys with one type of polio and then waited months to see if the monkeys got sick or recovered before infecting them with new strains.



Salk wanted to try something new. He wanted to give a monkey a light dose of an unknown strain of polio. The monkey wouldn't get sick but would produce antibodies against that type of polio. Then, when given a known type of polio, its blood would flood with antibodies if the monkey was **immune**. If the virus grew, it meant the strain was another type.

Most of the scientists at the NFIP conference that year, including Dr. Albert Sabin, a well-known and **vocal** polio researcher, scoffed at the new idea, and the NFIP decided to fund the traditional typing method.

Back in his lab, Salk worked overtime to try both methods. He found that the new method worked, was faster, and required far fewer monkeys. He then successfully tested for antibodies in tissue cultures, which are living material grown outside the body. Using these new methods, Salk's team determined that there were only three types of polio in one year instead of the expected three years.

Scientists grow virus samples in glass plates called *petri dishes*, which fit under microscopes.

Dead or Alive?

In 1950, most scientists believed that only a live-virus vaccine could give people long-lasting protection from polio. A live-virus vaccine involves scientists developing a weak virus to put in a vaccine. When injected, the weak virus causes the body to produce antibodies, in most cases without causing the disease.

Salk believed that a killed-virus vaccine, like the one he and Francis had produced for the flu, would work just as well—plus, it was safer. A killed virus could never give someone polio.

The NFIP decided to fund both methods. With a team of fifty researchers, Salk went to work, but it was not an easy task to kill the poliovirus without damaging it. They used the same chemical used to kill the flu virus, experimenting with different temperatures and strengths to kill the poliovirus. They had to make sure the method was perfect. Viruses are tiny—a million of them can line up in one inch. Just one live poliovirus in the vaccine could cause the deadly disease.

As Salk's team worked, the beds in the hospital above the lab filled with sick children.

The First Tests

By 1952, Salk had a vaccine that worked on monkeys, but did he dare try it on children? Attempts at polio vaccines in the 1930s had **devastating** effects: vaccinated children developed polio.

Jonas Salk evaluated hundreds of vials of vaccine in his lab at the University of Pittsburgh.

Salk first tested the vaccine on children who had survived polio because these children could not get the disease again. It worked. The vaccinated children showed an increase of antibodies in their blood. Next, he vaccinated children who had not had polio. They developed antibodies to protect them from the disease, and they had no ill effects. He prepared to present his results at the next NFIP meeting.

Albert Sabin worked with his staff at the University of Cincinnati.

Word leaked out about Salk's work, and people started visiting the lab to get more information. The interruptions made it hard to concentrate, so O'Connor urged Salk to explain the project on the radio one time instead of giving many interviews. People were so excited that a vaccine was close that Salk became famous overnight.

Sabin and other researchers were furious. Salk had mentioned other research in his interview, but they thought he was trying to take all the credit. They claimed that real scientists presented their research at formal scientific meetings—not on the radio!

Salk ignored them and went back to work as polio sickened another thirty-five thousand people in 1953.

The Trial

When Salk was sure he had a safe vaccine, he vaccinated himself, his family, and workers in the lab. O'Connor pushed for a huge **field trial** of the vaccine before the next summer, which meant vaccinating hundreds of thousands of children. Salk agreed. If they delayed, thousands more children were likely to get polio.

O'Connor went to work finding children to take the vaccine, organizing thousands of health-care workers, and raising money. Salk's lab could not make enough vaccine in time for the trial. He taught large drug manufacturers the precise method of killing the virus so they could produce the vaccine. The process was so difficult that only two of the five manufacturers succeeded in time to make vaccine for the start of the trial.

Almost two million children were involved in the trial. Some received the vaccine, some a **placebo**, and the rest were tracked as a control

Children lined up for the polio trials in 1954.

Thomas Francis spoke for an hour and forty minutes before announcing that Salk's vaccine worked.

group. Then came the months of waiting to see if the vaccine worked. Dr. Thomas Francis, Salk's old boss, collected and analyzed the results. Salk was about to become a national hero—or a villain.

On April 12, 1955, millions of people listened to the radio and on department store speakers. Francis announced at the NFIP meeting, "The vaccine works. It is safe, effective, and potent."

Reporters ran to announce the news, church bells rang, and people cheered in the streets.

Salk rose quietly to give his speech. He thanked past polio researchers, the volunteers, and those who had donated money. However, he forgot to mention the names of his team members.

Forgetting to give credit to his team members angered many other scientists; some never forgave him. But Salk was a hero to most people. He was interviewed on the radio and for newspapers. People sent him money and gifts. He gave everything to the NFIP and returned to his lab to improve the vaccine.

What Went Wrong

With summer coming, the NFIP began distributing free vaccine from all five manufacturers. The first signs of trouble came when some children given the vaccine got polio. The vaccine distribution was suspended.

Salk didn't panic; he knew that the vaccine, if properly prepared, was safe. Investigators soon tracked the problem to one manufacturer that had not properly killed the virus. That vaccine was pulled, and the vaccinations continued.

Many children preferred to receive the vaccine on a sugar cube rather than a series of shots.

By 1962, the number of polio cases in the United States dropped to fewer than one thousand. Salk's vaccine worked, but it was expensive to produce. That year the United States approved Sabin's live-virus vaccine. It was cheaper than the killed-virus vaccine. Plus, it was given on a sugar cube instead of in a series of shots. By 1979, most of the few remaining cases of polio were traced to the live-virus vaccine. After 2000, the United States decided to use only the killed-virus vaccine. Salk had developed the first polio vaccine, and his vaccine finally eliminated the disease in the United States.

New Challenges

Salk went on to tackle new challenges. In 1960, he founded the Salk Institute as a place for scientists to work for the good of humanity. He researched diseases such as cancer and HIV/AIDS until his death in 1995. Today, the Salk Institute does cutting-edge medical research and has produced several Nobel Prize winners.

Salk did not receive a Nobel Prize. At the time, many scientists agreed with Sabin when he said that Salk's work was "pure kitchen chemistry. He didn't discover anything." Salk was the only major polio researcher never elected to the National Academy of Sciences.

Signs sent the message that people were rewarded with lollipops for being vaccinated.

Salk received thanks from his country and the world for saving thousands of children from the crippling disease. *Time* magazine named him one of the hundred most important people of the twentieth century. He brought together discoveries from decades of polio research. He also used new ideas to develop the first polio vaccine.

Salk achieved his goal of making a difference for humanity.

Glossary

crippled *(adj.)* disabled or unable to walk normally because of an illness or injury (p. 4)

devastating *(adj.)* causing great physical or emotional damage (p. 10)

epidemic *(n.)* the rapid spread of a disease within a community (p. 5)

field trial *(n.)* a test of a new product or process in its intended situation to determine its effectiveness (p. 12)

immune *(adj.)* protected from a disease (p. 8)

paralyzed *(v.)* caused one or more parts of a body to become unable to move (p. 4)

placebo *(n.)* a pill or substance that has no physical effect on a patient, often used as a control in experiments testing another substance, such as a drug (p. 12)

polio *(n.)* an acute viral disease that attacks skeletal muscle and the spinal cord (p. 4)

quarantined *(v.)* isolated to prevent the spread of disease (p. 4)

strains *(n.)* groups of viral organisms of the same species (p. 7)

vaccine *(n.)* a medicine made of weak or dead microbes that teaches the body to fight stronger microbes of the same type (p. 4)

vocal *(adj.)* outspoken; expressing strong opinions (p. 8)