Jonas Salk

A Reading A–Z Level Z2 Leveled Book
Word Count: 2,345

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.

pharmaceutical *(adj.)* having to do with drugs used for medicine (p. 14)

placebo *(n.)* a pill or substance that has no actual effect on a patient, often used as a control in experiments testing another substance, such as a drug (p. 14)

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

prestigious *(adj.)* honored, respected, or held in high standing (p. 18)

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

recruited *(v.)* brought someone in to join (p. 7)

strain *(n.)* a group 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)

Jonas Salk

Written by Cynthia Kennedy Henzel

www.readinga-z.com

Focus Question

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

Words to Know

contagious
devastating
epidemic
field trial
grant
immunity
paralyzed
pharmaceutical
placebo
polio
prestigious
quarantined
recruited
strain
vaccine

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Correlation

LEVEL Z2	
Fountas & Pinnell	Y–Z
Reading Recovery	N/A
DRA	70+

Glossary

contagious *(adj.)* able to spread through contact with people or other living things (p. 4)

devastating *(adj.)* causing great physical or emotional damage (p. 11)

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. 13)

grant *(n.)* a formal gift of land or money from a government or other institution that is to be used for a particular purpose, such as research (p. 6)

immunity *(n.)* resistance to disease or illness (p. 10)

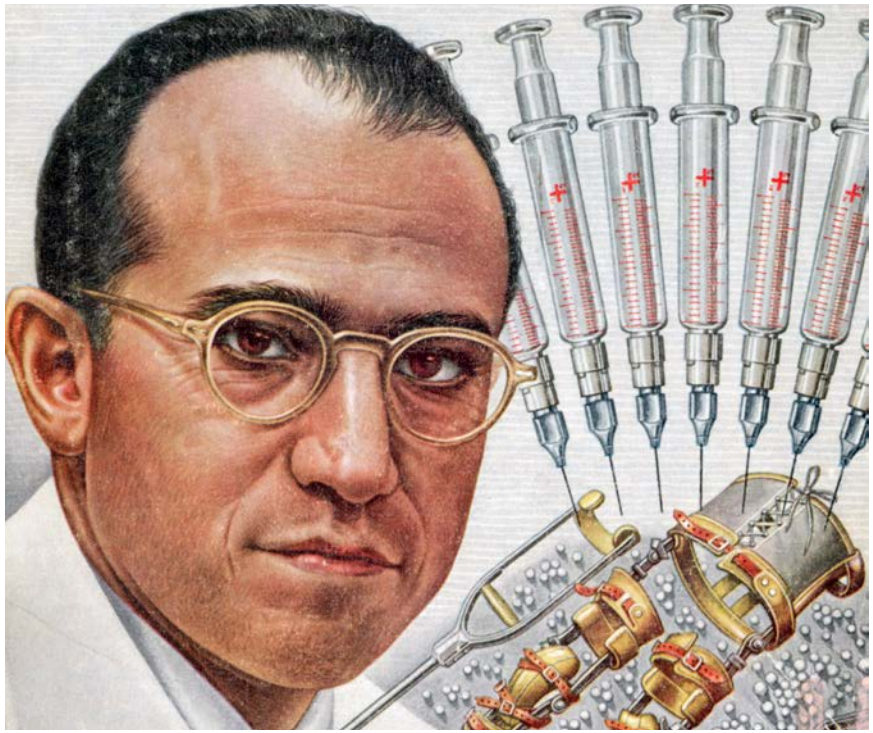
paralyzed *(v.)* caused one or more parts of a body to become unable to move (p. 4)

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

Salk brought together discoveries from decades of polio research and applied new ideas to create the first polio vaccine, saving thousands of children from the crippling disease. For that, he received thanks from a grateful country, the president, Congress, and the rest of the world. *Time* magazine named him one of the hundred most important people of the twentieth century, and his image was placed on a U.S. stamp.

Salk's son claimed that the greatest gift Salk gave to the world was the belief that medical research should "address problems of humankind" and "make a difference." Salk certainly achieved his goal.

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



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

Summer Terror

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

In most cases, the poliovirus caused cold-like symptoms as it passed from the mouth through the digestive system. However, if the virus entered the blood, it damaged nerves that controlled muscles in the arms and legs. In the worst cases, it **paralyzed** the chest muscles that controlled breathing.

People avoided swimming pools and large crowds. 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.

By 1962, the number of polio cases decreased to fewer than one thousand. Salk's vaccine was effective but expensive to produce. That year, the United States approved Sabin's live-virus vaccine and, being cheaper than the killed-virus vaccine and given on a sugar cube instead of in a series of shots, it became the more popular vaccine. The last cases of naturally occurring polio in the United States were in 1979; most remaining cases were traced to the live-virus vaccine since the live virus can mutate in the intestines and cause the disease in a small number of people treated with the vaccine. In 2000, the United States decided to use only the killed-virus vaccine. Salk had not only developed the first polio vaccine, his vaccine finally eliminated the disease in the country.

New Challenges

Salk was not content to give speeches and accept awards; in 1960, he founded the Salk Institute as a place for scientists to work for the good of humanity. He continued his own work there, researching diseases such as cancer and HIV/AIDS and writing five books dealing with problems of society. He worked until his death in 1995. Today, the Salk Institute does cutting-edge research in biology, genetics, and neurology, and has produced several Nobel Prize winners.

Still, the public mobbed Salk for interviews and sent him money and gifts. He gave everything to NFIP and returned to his lab to perfect the vaccine.

What Went Wrong

With the trial results positive and summer coming, the NFIP began distributing free vaccine from all five manufacturers. The first sign of trouble came within weeks when some children given the vaccine got polio. Sabin, who was still working on a live-virus vaccine, voiced the concerns of many when he declared that the production and distribution "must be stopped until the vaccine can be made consistently safe."

Signs at vaccination stations advised people on a daily basis of how many suffered serious effects from being vaccinated.

Salk didn't panic because he knew the vaccine, if properly prepared, was safe. Investigators soon tracked the problem to one manufacturer that had not followed the instructions to kill the virus, so that manufacturer's vaccine was pulled and the vaccinations continued.

How to Make a Difference

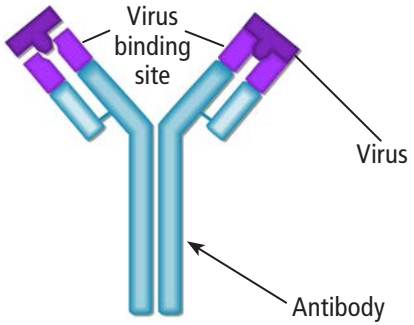
Jonas Salk, born in New York in 1914, was two years old when the first **epidemic** of polio hit the United States. His parents were Russian Jewish immigrants who pushed their three sons to do well.

Salk 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, so he planned to study law and then run for Congress. But after his first chemistry class, he knew he wanted to become a medical researcher and fight diseases.


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

Salk finished his studies just as the United States entered World War II. The military was interested in medical research because more than forty thousand U.S. soldiers had died in World War I from influenza—the flu—and other respiratory illnesses, so it wanted to protect the troops.

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.

Dr. Thomas Francis at the University of Michigan received a **grant** to develop a flu vaccine and hired Salk to work in his lab. Salk knew that when exposed to a virus, the body protects itself by producing special proteins called *antibodies* to fight the disease. Salk developed a test to detect the number of antibodies in blood. Researchers could tell how well a vaccine worked by counting antibodies in the blood instead of waiting for symptoms to appear.

The researchers used a chemical called *formalin* to kill the flu virus without changing the way it looked on the outside; as a result, the body would still recognize the virus and develop antibodies. It worked. The team in Michigan produced a killed-virus flu vaccine that saved thousands of lives and couldn't cause the flu.

Now thirty-two years old, Salk accepted a job to run his own lab as head of the Virus Research Laboratory at the University of Pittsburgh.

Francis faced a packed auditorium. Department stores turned on speakers, and judges suspended trials to listen.

Francis explained the trial and then announced, "The poliomyelitis vaccination was sixty-eight percent effective against polio type 1, one hundred percent effective against type 2, and ninety-two percent effective against type 3. 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, unhappy at the less-than-perfect score, rose quietly to give his speech. He claimed that the vaccine should have been 100 percent effective, but the manufacturer had added an untested ingredient, which later proved to be true. Salk thanked the many people who had worked in research through the years and those who had volunteered and donated money. Although he mentioned his team at the lab in Pittsburgh, he didn't mention any team member by name.

Blaming someone else for the less-than-perfect score and neglecting to specifically mention his colleagues further angered many in the science community; some never forgave him.

Salk's old boss, to analyze the data from the trial. Salk could not make enough vaccine in his lab, so he worked with **pharmaceutical** manufacturers. The precise process of killing the virus while maintaining its structure was so difficult that only two of the five manufacturers succeeded in time to make vaccine for the start of the trial.

It was the biggest effort of its kind in history. The NFIP needed $7.5 million for the field trial—an event that would cost more than $66 million today—and they only had a few months before polio season.

Randy Kerr (right) was the nation's first Polio Pioneer.

Almost two million children participated in the trial; each one received a button that said "Polio Pioneer": some received the vaccine, some a **placebo**, and the rest would be tracked as a control group. Then came the months of waiting as Francis 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 or watched closed-circuit television as

The National Foundation for Infantile Paralysis (NFIP) changed its name to the March of Dimes in 1979.

Doing Things His Way

Franklin D. Roosevelt, the thirty-second president of the United States, was paralyzed by polio as a young man. In 1938, he founded the National Foundation for Infantile Paralysis (NFIP) to help other people with polio and **recruited** Basil O'Connor, his law partner, to run the foundation. In 1946, the NFIP decided to fund research for a vaccine.

The first step in developing a polio vaccine was to discover how many types of poliovirus existed. Scientists had discovered three, but if there were dozens of types, as there are with the common cold virus, a single vaccine would not protect against all of them.

Poliovirus was hard to work with because only humans get polio naturally; however, monkeys can be infected if the virus is injected into their brains. Traditionally, figuring out if a **strain** of poliovirus was a whole new type required giving

a monkey one known polio type—say, type 1—in order to develop antibodies in the monkey. If the monkey recovered from the disease, the scientist injected it with a small amount of the unknown strain being tested. If the monkey didn't get sick, they increased the amount little by little until the monkey got sick. If the monkey never got sick, the process was repeated for type 2 and then type 3. This took months as researchers waited for monkeys to get sick, recover, and get sick again.

Salk thought it would be faster and more accurate to infect monkeys with a light dose of an unknown virus strain. A monkey might not get sick, but the infection would produce antibodies in its blood. Then, when given a known type 1 virus, the monkey's blood would flood with antibodies if the unknown strain were type 1. If the virus grew, it was type 2, type 3, or an unknown type.

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

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

Salk ignored the distractions and went back to work as polio struck another thirty-five thousand people in 1953.

The Trial

When Salk was sure he had a safe, effective vaccine, he vaccinated himself, his wife and three sons, and workers in the lab. O'Connor and others at the NFIP pushed for a huge **field trial** of the vaccine before the next summer—this meant vaccinating hundreds of thousands of children. Salk wanted more time to perfect the vaccine, but he felt it was wrong not to try to help the thousands of children likely to get polio if he and his team delayed.

O'Connor sent information to states, schools, and parents to get volunteers to take the vaccine. He organized thousands of doctors, nurses, and health-care workers. The NFIP chose Dr. Francis,

Work at Salk's lab was a closely guarded secret, but reporters found out about the coming announcement. When *Time* magazine ran an article with Salk's picture on the cover, people began calling and visiting the lab to get more information.

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

The constant interruptions slowed work at the lab, so Salk went to O'Connor for help. They decided that Salk should explain on the radio that, although they were close, there was still a lot of work to do, and the team needed to concentrate on making the vaccine. In spite of his explanation that the work wasn't yet finished, Salk became an overnight hero—the man who would save the children.

Sabin and other researchers were furious. Although in his radio address Salk discussed the contributions of many people who had worked to bring research to this point, other researchers thought he was trying to take all the credit. Real scientists, they declared, presented their research at official conferences or in scientific journals—not on the radio!

The majority 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 instead of Salk's.

Salk was convinced that the new method was more efficient. Back in his lab, he worked overtime to try both methods and found that the new process worked, was faster, and required far fewer monkeys. He took notice of a discovery by researchers John Enders, Fred Robbins, and Tom Weller for growing poliovirus in tissue cultures, living material grown outside the body, and successfully tested for antibodies in the cultures. 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.

Polio in the World Today

Polio occurs in seven countries as of 2015. The incidents of polio have increased in the last few years, as some countries refuse to vaccinate or are at war. At one time, polio was contained in three countries. Although officially eradicated in the United States, vaccinations continue because an outbreak is still possible if the disease is brought from elsewhere—unlike smallpox, which has been eradicated worldwide.

Dead or Alive?

In 1950, a new conflict arose in polio research. Most scientists, including the outspoken Sabin, thought the only way to give people long-lasting protection from polio was to use a live-virus vaccine. To do this, scientists develop a weak virus and put it in a vaccine. When injected, the weak virus causes the body to produce antibodies, thus giving **immunity**, but—in most cases—does not cause the disease.

Salk believed that the body would get equal protection with a vaccine that contained a killed virus like the one he and Francis had produced for the flu—plus, it was safer. A killed virus could never give someone polio.

This time, the NFIP decided to fund both methods, so, with a team of fifty researchers, Salk went to work on a vaccine, but it was not an easy task. Researchers had to kill the poliovirus carefully. They used the same chemical that Salk and Francis used for the flu vaccine because they knew it worked. Salk's team experimented using different temperatures and strengths to kill the poliovirus, and then strained and mixed the solution again and again. Viruses are tiny—a million of them can line up in one inch—but just one live poliovirus could cause the deadly disease.

The First Tests

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

Salk did his first tests in 1952 with polio survivors at the Watson Home for Crippled Children because, having had the disease, the children could not get polio again. The vaccine worked; the vaccinated children showed an increase of antibodies in their blood. Next, Salk vaccinated children who had not had polio. Those children developed antibodies to protect them from the disease—and they had no ill effects. Salk prepared to present his results at the next NFIP meeting.