Selected Questions from Student Interviews
Darrell Salk, M.D.

---

1. How old were you when your father's vaccine was approved?

I was born March 30, 1947. The vaccine was approved on April 12, 1955. I was 8 years old. My two brothers, Peter and Jonathan, were 11 and 4 (one month shy of 5), respectively.

---

2. I read in a book that your father tested the vaccine on his family before it was approved. Is this true, and were there any side effects?

Yes, it is true. There were no side effects.

The first humans injected were at the Watson Home for Crippled Children in Sewickley, PA (just outside Pittsburgh) in June 1952. These were children who had already had polio and were therefore already immune to the specific type of vaccine they received (poliovirus type 1, 2 or 3). Once initial safety and antibody responses were observed in these children, the testing was extended to residents at the Polk State School and to staff and parents of residents at the Watson Home. Jonas first reported to a group of scientists the results of that summer's testing in January 1953.

Once he felt certain that there were no serious side effects and that the vaccine could indeed induce circulating antibodies, his family and the staff of his laboratory received injections in the fall of 1952. Although everyone was checked for their responses to the vaccine, the intention was more to take advantage of whatever protection the vaccine might provide than to "test" it. In the spring of 1953, the clinical studies in Pittsburgh were extended to several hundred residents in the Sewickley neighborhood and some friends, family and colleagues who traveled from farther away.

---

3. What kind of man was your father? (Character, morals)

He was an inveterate optimist. He always believed that good things would prevail, especially if one worked hard for them. He was admired and loved by patients, friends and co-workers for his gentleness and grace. He was a highly moral man and held tenaciously to ideas and concepts that he believed to be correct, even in the face of opposition. Because of this and the fact that his ideas ran counter to the "accepted" beliefs of many scientists of his day, he was viewed by some scientific colleagues as stubborn and stand-offish. He also would make intuitive leaps that some scientists felt were not adequately grounded. In spite of the fact that he would go back and carefully support his ideas with observation and experiments, some scientists never accepted his ideas. Much to his dismay, Jonas received a great deal of attention from the public and the news media that some members of the scientific "establishment" felt was unseemly. His greatest desire in those days was to be able to "get back to the laboratory" to continue his research, but it was very difficult.

---

4. Do you remember how life changed after your father's vaccine was introduced to the U.S.?

I was young enough that I do not personally remember life changing, but there is no question that it did. There was a great release from fear among parents when the success of the vaccine was announced. Almost everyone in the United States had experienced the fear of the summer polio season and had contributed in some way to the search for a vaccine. Tens of thousands of people volunteered time and effort for the National Foundation for Infantile Paralysis and millions of people sent dimes and dollars to "The March of Dimes" and the programs it supported. There was a sense of celebration and relief and of cooperative success. Summers were no longer a time of fear -- movie theaters and public swimming pools remained open rather than closing and children were no longer kept protectively at home.

---

5. Who were the members of Jonas Salk's family?

Jonas' parents were Daniel and Dora Salk. Dora came to the U.S. from Russia by herself at the age of twelve. Daniel was a first generation American, born in New Jersey, whose family was also originally from Eastern Europe.

Jonas was the oldest child and had two brothers, Herman and Lee. Herman was about four years younger than Jonas. He became a veterinarian. Lee was twelve years younger than Jonas. He became a clinical psychologist who specialized in young children and parenting and wrote several books, including "What Every Child Wants His Parents to Know."

Jonas married Donna Lindsay on June 9, 1939. She was a clinical psychiatric social worker. Donna's mother (Florence) was not alive when Jonas and Donna married. Her father's name was Elmer Lindsay and she had one younger sister, Margot. Jonas graduated from medical school on June 8, 1939, the day before his wedding. At that time he took the middle name Edward, so the wedding invitation would say "Jonas Edward Salk, M.D." rather than just "Jonas Salk", which was his given name and his preferred usage after the late 1960's.

Jonas and Donna had three sons: Peter, Darrell and Jonathan (from oldest to youngest). All three are trained as physicians. Peter, the oldest, lives in La Jolla, California, where he continues to work on projects related to AIDS that he and Jonas worked on before Jonas' death. I live in Seattle, Washington and do scientific and medical research with biotechnology companies who are developing new products. Jonathan, the youngest, is a practicing psychiatrist in Los Angeles, with a special interest in adolescent children.

---

6. When was the killed poliovirus vaccine developed by Dr. Jonas Salk?

This is a bit of a trick question. It depends on how one defines "developed."

Jonas' work with poliovirus began in 1948, as part of a National Foundation for Infantile Paralysis program to identify all types (varieties) of poliovirus. The NFIP initiated the typing program because it was necessary to make sure all types of poliovirus were known in order to develop an effective vaccine of any kind. The typing project was completed in 1951, but before the completion of that study (in 1950 or 1951) Jonas' lab began to work with the recently developed method of growing poliovirus in tissue culture (developed by Enders, Weller and Robbins at Harvard, for which they received the Nobel prize).

As usual, after initial testing in vitro (i.e. in test tubes and bottles), studies with candidate vaccines were performed in animals (monkeys). The first administration of a candidate vaccine to humans occurred in June 1952, for safety testing and to evaluate the immunologic response to vaccination. The first private report to fellow scientists of these human trials occurred in January 1953 and the first public report was published in the Journal of the American Medical Association (JAMA) in March 1953.

Throughout 1953, additional research and development was performed to determine the appropriate content of a vaccine, to test its safety and immunogenicity in a larger sample of human subjects and to refine production techniques. In late 1953, continuing into 1954, Jonas assisted vaccine manufacturers with scaling up production and safety testing for commercial development.

The first large-scale human trials with commercial vaccine began in February 1954 in schools in Pittsburgh. In April 1954, a nationwide controlled field trial was started, led by Dr. Thomas Francis at the University of Michigan. The results of the nationwide field trial (involving nearly one million children) were announced by Dr. Francis at a convocation at the University of Michigan on April 12, 1955. Vaccine, which had been prepared in advance by manufacturers and purchased by the National Foundation in the hope that it would be found to be effective, was licensed by the US government later that day for release and distribution.

So in answer to the question "When was the killed poliovirus vaccine developed by Dr. Jonas Salk?" the most correct answer is a period of time such as "Between 1950 and 1954." A better question would be more specific, such as one of the following:

- When were the first human trials with killed poliovirus vaccine started by Dr. Jonas Salk? (June 1952)
- When did Dr. Jonas Salk publish his first report of human studies using a killed poliovirus vaccine? (March 1953)
- During what year was the nationwide field trial of the killed poliovirus vaccine developed by Dr. Jonas Salk? (1954)
- When was it announced that the killed poliovirus vaccine developed by Dr. Jonas Salk was "safe, effective, and potent?" (April 12, 1955)
- When was the killed poliovirus vaccine developed by Dr. Jonas Salk introduced for widespread use? (April 12, 1955)

---

7. What do you think are the positive and negative reactions to the Salk and Sabin vaccines and why?

The “Salk vaccine” and the “Sabin vaccine” are very different. The polio vaccine developed by Jonas Salk in the early 1950’s is made from inactivated (or “killed”) poliovirus and is given by injection. Its proper name is Inactivated Poliovirus Vaccine (IPV); it is sometimes called the killed poliovirus vaccine (KPV). It stimulates the immune system to make protective antibodies, but the virus in the vaccine cannot grow or reproduce. When properly made, it cannot cause paralytic polio. The only cases of paralytic polio associated with use of the killed poliovirus vaccine occurred in 1955 because of vaccine that was not properly made by one manufacturer (Cutter Laboratories—the so-called “Cutter Incident”).

The polio vaccine developed by Albert Sabin, which was introduced into the United States in 1962, is made from weakened (“attenuated”) living poliovirus that can grow but is not supposed to cause disease. It is administered orally (by mouth) and in order to work, the virus must grow in the intestines. It is called “Oral Poliovirus Vaccine” (OPV) or live poliovirus vaccine (LPV). As the vaccine virus reproduces, however, it can change back into a form that can cause disease. For that reason, paralytic polio occasionally occurs in people who receive the vaccine or people who come in contact with them (vaccine-associated paralytic poliomyelitis, VAPP). It even occurs sometimes when there is no known contact with a vaccinated person.

In the United States today, only the killed (Salk) polio vaccine is used, because of the risk of getting polio from the oral, live poliovirus vaccine.

---

8. Is it possible to eradicate poliovirus worldwide?

The only way to eradicate poliovirus from the world the way that the smallpox virus has been eradicated will be to stop using live poliovirus vaccine. That is because the live polio vaccine constantly reintroduces living viruses into the environment.

In the summer of 2000, for example, after having been declared "polio-free," the Caribbean island of Hispaniola experienced 45 cases of polio or suspected polio in children (35 in the Dominican Republic and 10 in Haiti). At least 19 children were paralyzed and two died. The outbreak was caused by poliovirus that came from the live oral poliovirus vaccine and had been circulating in the community for two years.

Killed poliovirus vaccine can be used to prevent disease caused by either natural polioviruses or live vaccine polioviruses. Eradication is possible because humans are the only known natural host for polioviruses. Adequate use of killed poliovirus vaccine could not only eliminate all poliovirus disease (paralytic poliomyelitis), but also could eradicate (make extinct) all living polioviruses circulating among humans.