Doctor Jonas Salk and His Polio Vaccine

Taryn Law

Junior Division

Historical Paper

Paper Length: 1,641
“My job is to help people see what I see. If it's of value, fine. And, if it’s not then at least I’ve done what I can do.”

-Jonas Salk

In the 1940s and 1950s polio was at its peak of devastation and Dr. Jonas Salk introduced a way to prevent it. He produced a killed-virus polio vaccine rather than a live-virus vaccine. Dr. Jonas Salk took a stand for the development of safe and effective vaccines because he invalidated public doubt, proved unaccepted science correct, and showed that a killed-virus vaccine was more effective for a polio vaccine than a live-virus vaccine.

As a medical student Dr. Jonas Salk was invited to research the influenza virus. Dr. Salk became interested in the idea of depriving the virus of its ability to infect but also be able to give immunity from the virus. He succeeded at this attempt. In 1947, Salk was asked to work at the University of Pittsburgh Medical School. While there, he saw an opportunity with the National Foundation of Infantile Paralysis (March of Dimes) to develop a vaccine for polio. One of the many troubles of creating a killed-virus vaccine was that it would need to use large amounts of the polio virus, which was hard to attain. In 1949, John Enders, Thomas Weller, and Frederick Robbins discovered a way to grow the polio virus in laboratory tissue samples. The work of Enders and his colleagues paved the way for Dr. Salk to grow the three main types of polio and research his vaccine. Dr. Salk was convinced that the same principle he used for his World War 2 influenza killed-virus vaccine would work for a polio killed-virus vaccine. Jonas Salk grew the polio virus on monkey kidney cell cultures then deactivated the virus with formalin/formaldehyde without destroying its immunogenicity. He devoted himself to this work for the next eight years.

---

1 Salk, Jonas, U.S medical researcher. Referring to his development of the Salk vaccine for polio. Interview (1992)
The public was very doubtful of Dr. Salk and his killed-virus vaccine. As a trusted and well known scientist in the medical field, Dr. Albert Sabin spoke out against Dr. Jonas Salk and his idea for a killed-virus vaccine. The National Foundation for Infantile Paralysis (March of Dimes) approached both Sabin and Salk for a polio vaccine. The March of Dimes fully funded Salk and Sabin’s research for a polio virus. The race for a polio vaccine began between Albert Sabin and Jonas Salk. Due to Sabin’s publically expressed doubts of Salk, the public became wary of Salk and his attempts at a vaccine. During Jonas Salk’s vaccine trials, the media also spoke out against him. Walter Winchell opened a podcast with “Mothers and fathers of America they are building coffins for your children”\(^2\) referring to Jonas Salk and his vaccine. On April 12, 1955 the Salk vaccine was declared safe by Dr. Thomas Francis, Dr. Salk’s mentor. The public rejoiced, people ran into the streets full of joy, children were let out of school early, the whole country was in a state of happiness. Everyone was in a rush to get vaccinated. There was a need for pharmaceutical companies such as Cutter pharmaceutical company and Wyeth pharmaceutical company to mass produce the Salk vaccine. In late April 1955, there were many reports in California of paralytic polio in the arm or leg that was injected with the vaccine. Each of these cases were from the Cutter vaccine. Cutter pharmaceutical company had not inactivated the polio virus correctly with formalin, resulting in nearly 400,000 children being inoculated with the polio virus. In the northeastern United States, there were reports of polio vaccines causing paralysis and death in several children. The Wyeth vaccine was also not inactivating the polio virus correctly causing the inoculation children with the polio virus. These incidents caused public distress and a drop in vaccination numbers. Parents became scared of the Salk vaccine. The National Institutes of Health and Public Health Services developed safety and potency standards for all polio vaccines in the United States and a Technical Committee on Poliomyelitis

---

Vaccine was established in May 1955. The Salk vaccine was discontinued in the United States in the 1960’s when Albert Sabin had finished and tested his live-virus vaccine.

Dr. Jonas Salk proved that unaccepted virological science was correct. Most virologists, like Albert Sabin, believed that a killed-virus polio vaccine wouldn’t work. Creating a polio vaccine was a job no other medical researcher took on because if they failed would be the end of their career. Salk created his killed-virus vaccine principle during World War 2 when Dr. Salk and his mentor Dr. Thomas Francis worked on a killed-virus influenza vaccine. Salk thought the same killed-virus principle would work for a poliomyelitis vaccine. A killed-virus polio vaccine required a lot for a vaccine. Making a killed-virus vaccine required an abundance of polio virus, which was hard to attain. In 1949, John Enders, Thomas Weller, and Frederick Robbins discovered a way to grow the polio virus in laboratory tissue samples. Jonas Salk used Enders and his colleagues’ discovery to produce the polio virus on monkey kidney cell cultures. Dr. Jonas Salk used formalin/formaldehyde to kill the polio virus without destroying its immunogenicity. Jonas Salk was successful the Salk vaccine had no ability to infect and gave immunity. During an interview in 1995, Jonas Salk explained the three stages of truth that people applied to his vaccine. There are three stages of truth. First is that it can't be true, and that's what they said. You couldn't immunize against polio with a killed-virus vaccine. Second phase: they say, Well, if it's true, it's not very important. And the third stage is, “Well, we've known it all along.” Many scientists claimed to have supported Jonas Salk and his attempt of a killed-virus vaccine. Dr. Salk accomplished a medical breakthrough with his killed-virus vaccine and help pave the way for future vaccines.

Dr. Salk showed that a killed-virus vaccine was more effective than a live-virus vaccine for poliomyelitis. Dr. Salk believed that a killed-virus vaccine was safer, more effective, and easier to produce than a live-virus polio vaccine. Unlike previous polio vaccines, which killed

---

3 Salk, Jonas. "The Academy of Achievement Interview: Congressional Gold Medal
and infected several children, if Salk’s vaccine failed nobody would be injected with the polio virus because it was similar to a placebo. Sabin’s live-virus vaccine could mutate in the body after injection because it wasn’t deactivated. In 1999 the United States started using Salk’s vaccine again because it was proven to not cause polio, and all cases of polio in the U.S were caused by Sabin’s vaccine or foreigners. Salk believed his killed-virus vaccine was so safe that he injected himself, his wife, and his children, who were the first people to be inoculated. His vaccine worked for his family so he moved onto field trials.

The first human trials were conducted in Alleghany County, Pennsylvania in the spring of 1953 and involved 15,000 people – mostly children. While many people were excited for a polio vaccine, others were scared that it would be another faulty vaccine that would infect their kids rather than give them immunity. The experiment used the generation of serum antibodies against the three types of the polio virus, the study optimized the vaccine vehicle, injection schedule, and inoculation dose. These studies showed a four to sixteen fold increase in serum polio titers after injection of the vaccine and the additional benefits of the booster injections. The success of these trials led to the immediate launch of the biggest clinical trial in human history. The 1954 field trials, designed by Jonas Salk’s mentor Dr. Thomas Francis. These trials were the cause of Dr. Salk’s many fears. The panel made a last minute decision to add a preservative to the vaccine, Salk didn’t know whether or not this would affect the vaccine’s abilities to give immunity. The panel also decided to give placebos some kids and the actual vaccine in others to see the difference in the antibodies in each child. Salk agreed to the placebo because he knew they were needed for results but denied the addition of a preservative to the vaccine. 1.8 million children from the United States, Canada, and Finland were chosen for this experiment. This trial was so large that the process took over 300,000 volunteers to carry out.

The trial design was unique because two different clinical trials were conducted simultaneously based on control groups for each study region. In the control trial there was 1.08
million children involved, the 2\textsuperscript{nd} graders in a region were injected with the vaccine and observed and the 1\textsuperscript{st} and 3\textsuperscript{rd} graders were observed without any intervention. This design did not allow direct measurement of the actual effectiveness of the vaccine since any confounding placebo effect was not being considered. The placebo controlled trial was conducted at the same time in a smaller group of 750,000 children. Students from the 1\textsuperscript{st}, 2\textsuperscript{nd}, and 3\textsuperscript{rd} grades in these regions were all consented for injection in this double-blind study. Half of these consented students were given the polio vaccine and the other half received a placebo injection in an alternating fashion.

Dr. Jonas Salk took a stand for the safe and effective development of vaccines by challenging the public’s doubt, validating unaccepted virology, and proving that a killed-virus polio vaccine is superior to a live-virus polio vaccine. Dr. Salk made an incredible medical breakthrough with his killed-virus vaccine and showed the medical world the path to eradicating polio and creating other vaccines. The Salk vaccine is now used in over 126 countries and many organizations are using the Salk vaccine to eradicate polio from the globe.
Appendix

A.

TIME Magazine cover from March 1954
B.

Jonas Salk in his lab with his polio vaccine.
Annotated Bibliography

**Primary Sources**

*Charts and graphs with figures on polio cases in the United States.* 1995. *Eisenhower Presidential Library*, National Archives and Records Administration,

www.eisenhower.archives.gov/research/online_documents/salk/Salk_A.pdf. Accessed 12 Dec. 2016. Infographic. The graphs were produced by the government in 1955 to show the death rates from 1910 to 1954, the start of testing Salk's vaccine. These graphs also show the progress for the fight against polio until a vaccine was created.


ccontent.time.com/time/covers/0,16641,19540329,00.html. Accessed 10 Feb. 2017. This is a cover from TIME magazine in March of 1954 regarding the Salk vaccine and its success.

Eisenhower, Dwight D. "Press Release Statement by the President about the Polio Vaccine Situation." *Eisenhower Presidential Library*, National Archives and Records Administration, 31 May 1955,

www.eisenhower.archives.gov/research/online_documents/salk/Salk_G.pdf. Accessed 20 Nov. 2016. President Eisenhower addresses the poliomyelitis situation. He talks about the distribution and effectiveness of the vaccine. Eisenhower addresses the priorities of who will be vaccinated first. In the final words of the press release he implies that, as a nation, we need to work together to spread the vaccine and get rid of polio.


Murray, Kathleen. Interview. 5 Jan. 2017. Kathleen Murray was Dr. Salk's assistant for the last 5-6 years of his life. She provided a personality description and what is was like to work with Dr. Salk, an inference on Dr. Salk's opinions on current movements against vaccines, his motivation for researching for vaccines, and projects that Dr. Salk was apart of later in his life after his creation of the his polio vaccine.

"Press Release regarding the Cutter Laboratories Vaccine." Eisenhower Presidential Library, National Archives and Records Administration, 30 Apr. 1955, www.eisenhower.archives.gov/research/online_documents/salk/Salk_M.pdf. Accessed 12 Dec. 2016. This is a press release given by the Department of Health, Education, and Welfare concerning Jonas Salk's vaccine and one of the companies that produce it. Cutter Laboratories was one of the U.S. licensed manufacturers of Salk's vaccine. In an occurrence referred to as the Cutter Incident, 200,000 children were infected with polio because the process that makes the vaccine inactive was defective. This means that a lot of defective vaccines were set out. This press release regards the meeting of multiple science consults, Salk being one of them, discussing the issue of multiple children getting
infected with polio and also having a vaccine. The document also assures that they found the problem and can fix it.


This is an interview with Jonas Salk discussing his troubles, motives, and what he achieved with the polio vaccine. Jonas Salk discusses the public doubts and troubles he went through to prove that his vaccine was good.

**Secondary Sources**

Bos, Carole. "Jonas Salk - 'Could You Patent the Sun?'" *Awesome Stories*, 7 Oct. 2013, www.awesomestories.com/asset/view/Jonas-Salk-Could-You-Patent-the-Sun-. Accessed 29 Jan. 2017. In this short article Carole Bos writes about Dr. Salk's motives for not patenting the polio vaccine. She states her own opinion that Salk did it because it was his personal gain was secondary to helping mankind. Then she goes onto quoting Dr. Robert Cook-Deegan who says that applying to patent the polio vaccine wouldn't have worked and Salk didn't have pure intention when not patenting the vaccine.


www.nytimes.com/video/us/100000004811585/could-you-patent-the-sun.html. Accessed 29 Jan. 2017. The first half of this short documentary talks about how Dr. Salk didn't patent his polio vaccine. He could have made a lot of money but chose not to because his vaccine should be patented by the people not him. A famous quote of his " would you patent the sun?" shows how he believed important vaccines should be accessible to the public.

"The Cutter Incident: How America's First Polio Vaccine Led to a Growing Vaccine Crisis."
Journal of the Royal Society of Medicine, vol. 99, no. 3, Mar. 2006. National Center for Biotechnology Information, www.ncbi.nlm.nih.gov/pmc/articles/PMC1383764/. Accessed 12 Dec. 2016. This article gives a detailed description of the Cutter Incident. The Cutter Incident created a image that Salk's vaccine was dangerous among scientists and citizens alike. Due to the Cutter Incident, Salk's vaccine was replaced with Albert Sabin's live virus vaccine, a very risky vaccine that could cause a mutation of polio that wouldn’t happen with Salk's killed-virus vaccine.

Haelle, Tara. "Polio Vaccine Found 'Safe and Effective' 60 Years Ago: What Would Salk Think Today?" Forbes, 13 Apr. 2015. Forbes, www.forbes.com/sites/tarahaelle/2015/04/13/polio-vaccine-found-safe-and-effective-60-years-ago-what-would-salk-think-today/#69d7369c62ac. Accessed 26 Jan. 2017. This article was written as a tribute on the 60th anniversary are the Salk Vaccine. It discusses the obstacles and challenges that Dr. Jonas Salk had when he was creating his vaccine. The article talks about when Salk's vaccine first came out to the public as safe and effective and when pharmaceutical accidents happened and the public feared the vaccine.

about how Salk's vaccine was life saving and the ignorance of the anti vaccine movement. Hiltzik admires Salk for ending the polio epidemic in the U.S. He also discusses Salk's motives for not patenting the vaccine.


Juskewitch, Justin E., et al. "Lessons from the Salk Polio Vaccine: Methods for and Risks of Rapid Translation." 11 Aug. 2011. NCBI, PubMed Centeral, www.ncbi.nlm.nih.gov/pmc/articles/PMC2928990/. Accessed 20 Jan. 2017. Manuscript. This is manuscript explains the path that Salk's vaccine took and how it achieved such rapid translation in the medical field. Salk's vaccine was introduced to the public after 6 years and there were many risks to do so after such little time and testing. It talks about the Cutter Incident and how there were so little safeguards to prevent such incidents. Because of these incidents the public trust was quite shaken and vaccination rates dropped.


Kathleen Murray (Jonas Salk's assistant for last five years of his life) gives her perspective on Jonas Salk, his polio vaccine, and the Salk Institute origins. She talks about Jonas Salk's personality and his want to end human suffering, and how that influenced his mission to vaccinate and cure poliomyelitis.

---. "Jonas Salk through the Eyes of His Assistant." Interview by Laura Edison. Path Blog, 11 Apr. 2015, blog.path.org/2015/04/remembering-salk/. Accessed 29 Dec. 2016. Scientific communications associate, Laura Edison, interviewed Dr. Salk's last assistant, Kathleen Murray, in a tribute to Dr. Salk and the 60th anniversary of his vaccine being declared safe and effective. The article also includes information about the impact of Dr. Salk's vaccine today. Dr. Salk's vaccine is currently being used in over 126 countries to eradicate polio once and for all.

Sabin had with the public. Weeks also discusses the changes of America because of polio and polio vaccines.


This is a documentary about the rivalry of Salk and Sabin, Dr. Salk's hardships, and the making of medical history. Sabin was a well-known and trusted doctor in the medical field. Albert Sabin disagreed with Salk's idea for a killed-virus vaccine and the public trusted him. The race between Sabin and Salk began. Sabin was not the only one who believed Salk’s vaccine was faulty, Walter Winchell opened his broadcast with "Mothers and fathers of America they are preparing coffins for your children." Winchell believed to get famous you had to throw a brick of people who were famous. These doubts of the media and medical world cause public distrust. There is also information on the Salk vaccine field trials.

"A Science Odyssey: People and Discoveries Salk Produces Polio Vaccine 1952." _PBS_, Public Broadcasting Service, 1998, www.pbs.org/wgbh/aso/databank/entries/dm52sa.html. Accessed 17 Nov. 2016. This is a short article telling about the process that Jonas Salk went through to create his vaccine. It provides information on other possible vaccines and researchers as well, such as Albert Sabin, and his rivalry with Salk.