

Richard E. Shope  
Virology, bacteriology

### **Web version (547 words)**

In the early 20<sup>th</sup> century, laboratories around the world were focused on isolating and describing an elusive class of pathogen: the virus. Researchers and physicians understood that viruses play a central role in many diseases, but evidence even of their characteristics — let alone their mechanisms of action — was few and far between. In the 1930s, Richard E. Shope definitively identified a virus as the cause of the influenza pandemic of 1918, which killed between 50 and 100 million people in just two and a half years. For this and other subsequent findings on viruses, Shope received the 1957 Albert Lasker Clinical Medical Research Award.

Dr. Shope's initial investigations into the influenza were spent looking for a bacterium, as that was long considered the most likely cause of the disease. Because a similar disease had been decimating swine herds on Midwestern farms, Shope used the swine as his experimental model. In 1931, Shope was successful in identifying a bacterium present in the hogs — specifically, *Hemophilus influenzae suis* — but when he isolated the bacterium and used it to infect healthy animals, it did not result in the flu. Further examination of the diseased tissue led Shope to a virus that, by itself, produced only a mild form of the flu. When Shope inoculated the pigs with both the bacterium and the virus, however, the severe form of the disease manifested. The findings were significant on two levels; he had proved that a virus can be at least a contributing cause of disease, and that two very different organisms — virus and bacterium — could work together, each augmenting the pathogenic properties of the other to produce highly contagious, highly lethal disease.

Noting that a strain of the same bacterium — *Hemophilus influenzae* — was often present in cases of the human influenza, Shope compared the swine and human diseases and made an unexpected connection between the two. First, he found that people who had survived the 1918 pandemic had antibodies for the swine disease in their blood. People born after 1920, when the disease had ended, did not have those antibodies, suggesting, as Shope had suspected, a close physiological association between the human and swine versions of the disease.

In 1935, Shope completed the picture originally begun by Peyton Rous in 1911, proving that even cancer could be caused by a virus. Examining unusual growths appearing on the paws, face and head of wild cottontail rabbits, he first confirmed the cause to be a virus and then collaborated with Rous to confirm that the growths were indeed a benign form of cancer. Further investigations showed that inoculation with the benign form of the Shope papillomavirus made animals immune to more virulent forms of the disease. During World War II, Shope applied his knowledge to combating infectious agents that were being used as biological weapons. In 1942, for example, he created a vaccine effective against rinderpest. In

later work, he continued his investigations into the similarities between viruses and bacteria, and in 1953 discovered specifically antiviral properties contained in a natural antibiotic, a finding whose significance is evident in the countless pharmaceuticals now in use that take advantage of similar double-antimicrobial properties.

In addition to the Lasker Award, Shope was elected to the National Academy of Sciences in 1940.

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In the early 20<sup>th</sup> century, it was widely understood that viruses play a central role in many diseases, but evidence even of their characteristics — let alone their mechanisms of action — was scant. In the 1930s, Richard E. Shope definitively identified a virus as the cause of the influenza pandemic of 1918, which killed between 50 and 100 million people. In 1935, he confirmed a papilloma virus as a cause of cancer. For his findings on the influenza and other viruses, he was elected to the National Academy of Sciences in 1940, and received the 1957 Albert Lasker Clinical Medical Research Award.

### **Sources**

Richard Edwin Shope, a biographical memoir by Christopher Andrews, National Academies Press

Richard E. Shope, Lasker Award profile, Rockefeller University website

Richard E. Shope, Lasker Foundation award presentation:  
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