Influenza pandemics have caused death and social tragedy for hundreds of years, and the control of influenza was a priority for health and medical researchers in Australia during the twentieth century. From the 1930s to the 1960s, Frank Macfarlane Burnet and his team of NHMRC-funded researchers at The Walter and Eliza Hall Institute (WEHI) made major contributions to our understanding of the influenza virus and the development of vaccines and antiviral treatments. This work involved the Commonwealth Serum Laboratories (now CSL Limited), the John Curtin School of Medical Research (JCSMR) at The Australian National University (ANU), and Monash University.

### Origin
Influenza is a highly contagious respiratory illness that impacts all countries in the world. The World Health Organisation and the Australian government track its incidence and worldwide, there are 1 billion cases of influenza, 3-5 million severe cases, and 290,000-650,000 deaths from influenza-related respiratory illness. The influenza pandemic of 1918-19 caused millions of deaths worldwide. In Australia, two million Australians were infected and over 15,000 died, a significant proportion of whom were young adults. Indigenous Australians were severely affected, with a mortality rate approaching 50 percent in some communities. Hospitals were overwhelmed, medical and public health workers were incapacitated and many temporary hospitals had to be staffed by lay volunteers. Schools, theatres, dance halls, churches, pubs and other places of public congregation were closed. Streets were strewn with diseased and people were compelled to wear masks in public. Movement by public transport was restricted and state borders were closed. As a consequence of the 1918-19 pandemic, research into influenza became a long-term focus for medical researchers in Australia.

### Grants and Investment
**WEHI and CSL**
In 1915, an institute for research in pathology and hygiene was established, supported by the Walter and Eliza Hall Trust. The following year, the Australian Government established the Commonwealth Serum Laboratories (CSL), in response to the loss of access experienced by Australia during the war to international supplies of vaccines and other bacteriological products. During the first 18 months of its existence, CSL was housed in WEHI’s laboratories, establishing a close relationship between the two organisations that continues today.

**NHMRC**
NHMRC grants for health and medical research commenced in 1937, and for most of the next three decades a team of virologists led by Frank Macfarlane Burnet were prominent recipients. This team included Dora Lush (1934-1939), Gordon Ada and Patricia Lind (1948-1965) and Alfred Gottschalk (1955-1959). NHMRC also funded Peter Colman’s research on the crystalline structure of the influenza virus, and development of an antiviral drug.

### Research and Collaborations
**Influenza vaccine production from WEHI**
In 1951, a government grant to WEHI for research on influenza vaccine production was awarded. Burnet’s team at WEHI (1948-68) then moved to JCSMR, ANU. This work led to the development of a vaccine that could be produced in eggs rather than chickens, which was then used to produce the vaccine for widespread use.

**Zanamavir (and the closely related pharmaceutical oseltamivir (Tamiflu®)) can reduce the incidence of influenza Type A and B. By 1945, large scale production of influenza vaccine had been transferred completely to CSL.**

In 1996, Colman, Laver and von Itzstein shared the Australia Prize for their contributions to developing zanamavir.

### Trials and Results
**Influenza pandemics and their control:**
Influenza pandemics have caused death and social tragedy for hundreds of years, and the control of influenza was a priority for health and medical researchers in Australia during the twentieth century. The current understanding of the influenza virus and the development of vaccines and antiviral treatments have been a major contribution to the health of the Australian community. This work involved the Commonwealth Serum Laboratories (now CSL Limited), the John Curtin School of Medical Research (JCSMR) at The Australian National University (ANU), and Monash University.

**Influenza**
In a typical Australian winter, around 3,000 deaths are caused either directly by influenza or by severe complications such as pneumonia. Influenza is a viral infection caused by a large family of viruses known as the Orthomyxoviridae. The virus is highly contagious and can be transmitted through respiratory secretions, including coughing, sneezing, and speaking.

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### Outcomes and Impact
In traditional Australian winter, around 3,000 deaths are caused either directly by influenza or by severe complications such as pneumonia. Influenza vaccination is the primary method for preventing influenza and reduces the risk of influenza illness by 40-60%.

In 2015, the global seasonal influenza vaccine production was about 1.47 billion doses. Burnet’s CAM technique, improved but fundamentally the same, was used to produce about 90% of the supply, enabling easier, cheaper and higher volume production of influenza vaccines globally.

Sequin (a part of the Australian owned CSL Limited and the second largest influenza vaccine company in the world) manufactures seasonal influenza vaccine in Melbourne and in the process uses more than one million fertilised eggs every week. In 2020, 16.5 million influenza vaccinations were available for Australians, with 9 million manufactured by Seqirus.

Zanamivir (and the closely related pharmaceutical oseltamivir (Tamiflu®)) can reduce the incidence of major, life-threatening secondary complications of influenza illness, including bacterial pneumonia.

In 1996, Colman, Laver and von Itzstein shared the Australia Prize for their contributions to developing zanamavir.

### NHMRC case studies may be found at: https://www.nhmrc.gov.au/about-us/resources/impact-case-studies