TBE NEWS

HISTORY OF TBE AND TBE VACCINE DEVELOPMENT

Background

The best measure to protect against TBE is vaccination. The first TBE vaccine was developed in the Soviet Union in the 1930s, but today, international recommendations usually refer to the Austrian experiences, where a nationwide vaccination program against TBE has been ongoing since 1981. This Newsletter discusses a review about the first isolation of TBE virus, the description of the disease, the identification of ticks as a vector for the virus, and the development and application of TBE vaccine.

Results

In the 1930s, an outbreak of a severe paralytic disease in the Soviet Far East led the virologist Lev Zilber to organize an expedition into that region and to describe the disease which soon became known as the Russian spring-summer encephalitis. Zilber also isolated the causative virus and identified *Ixodes* ticks as the vector. Zilber and his female colleagues were accused of being Japanese spies and were imprisoned in Stalin's Gulag. In 1938/40, Pavlovsky developed his nidality theory and he became the precursor of landscape epidemiology and the One Health agenda.

The attempts to develop preventive measures, especially for the military, began soon after the discovery of the virus. The early development of a TBE vaccine was markedly driven by female scientists at Moskow's All-Union Institute of Experimental Medicine. The first vaccine. based on the Sofyin strain (formalin inactivated mouse brain suspension) was self-tested by the female scientists and larger trials were conducted in 1939 on the population in the affected area.

In the late 1930s and 1940s to 1950s, TBE virology became a field of civil cooperation between Soviet and Western scholars, e.g., it was already in 1941 that Soviet scientists sent a TBE virus strain to the Rocky Mountain Laboratory of the US Public Health Service, followed by visits of Russian scientists in the USA and reciprocal visits. One reason for this international interest was the apparent emergence of TBE in Central and Eastern Europe after the 2nd World War. In 1949, Czechoslovakian scientists isolated the first TBE virus strain in Central Europe, followed by further isolations of virus strains in other European countries. TBE became a research matter with intensive scientific exchange across the Iron Curtain.

In 1959–1960, the production of a new TBE vaccine based on cell culture was started at the Institute of Poliomyelitis and Viral Encephalitis in Moscow, and this project was open to and profiting from international cooperation (including the US, UK, and Czechoslovakia).

In Austria, it was in 1931 that the physician Hans Schneider reported about the "acute serous meningitis", which is considered to be the first clinical description of TBE, but it was a Dutch scientist Jacobus D. Verlinde who isolated the virus from the brain of five fatal cases in southeastern Austria in 1954. In 1960, the Austrian scientist Hans Moritsch started a collaboration with the US military in the field of TBE research, and this project was later taken over by Christian Kunz. Kunz had a strong cooperation with the Microbiological Research Establishment (MRE) in Porton Down, UK, and here, the first vaccine to protect against louping-ill virus was developed. This was followed by a vaccine development to protect against TBE virus as a "logical sequel" based on the Austrian strain Neudörfl provided by Kunz in 1971.

It has to be stated that the British-Austrian TBE vaccine development collaboration was more classified as part of a defense evaluation and not of a rapidly growing MRE civil program. Moreover, the TBE vaccine development was not an invention by Christian Kunz. It was more a "MRE vaccine" and the input by Kunz was rather limited. Thus, it was in the second half of the 1970s that the vaccine began changing its identity from "British" to "Austrian". From 1975 onwards, the vaccine production was divided between Porton Down and the Austrian company Immuno AG. During a vaccination program in Austria, it was recognized that the vaccine caused a high reactogenicity due to residual cell material in the vaccine, and it was the MRE scientists who proposed modifications of the purification process by introduction of zonal ultracentrifugation step.

In 1981, Austria started a nationwide vaccination campaign against TBE using this modified vaccine, and the vaccine officially became an Austrian invention. The vaccination program was extremely successful, and by 1994 more than 70% of the Austrian population received the shot.

Discussion

This review demonstrates that the history of science and medicine, in this special case, the history of TBE and TBE vaccination, can be much more complex than narratives suggest. The development of TBE vaccine was a transnational project involving the Soviet Union, Czechoslovakia, Austria, the United States, and the United Kingdom and was influenced by military concerns and Cold War geopolitics. The development of the "Austrian" vaccine, which is often credited to Christian Kunz alone, was in fact a British-Austrian project that was directly influenced by the Cold War agendas and military concerns. Although the vaccine was later "Austrianised", it was a product of a transnational scientific endeavor.

Literature

Mazanik A.
Arbovirology and Cold War collaborations: A transnational history of the tick-borne encephalitis vaccine, 1930-1980
J Hist Med Allied Sci. 2023;jrad054. doi:10.1093/jhmas/jrad054

In this context, another recently published article is worth to be recommended:

Dobler G, Gniel D.
A history of tick-borne encephalitis and its virus
In: Vasilakis N, Kramer LD. *History of arbovirology: Memories from the field*. Springer Cham;2023:453-467. doi:10.1007/978-3-031-22003-6_21

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