Antigenic Ha Shifts Linked to 11-year Solar Cycle Explain Timing of Historic (1889-2021) Suite of Pandemics Originating in South Central China

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Objective and Rationale

Identify which climate "drivers" and a mechanism explaining how they may have incited the onset of 11 major pandemics over the past 140 years

>> use text mining to develop an ecological, qualitative database of first onset, peak, and end years of pandemics over past 140 years -- for correlation to climate variables.

>> apply climatic indexes to monitor the risk of a future pandemic
**Early Findings**

1. Major pandemics start at bottom of solar cycle, most end at top of solar cycle
2. Purported or "pseudopandemics" start at or near top of solar cycle
3. Pandemic initiated with antigenic shift or variation in Ha, hemagglutinin protein
Current and Future Use

Apply findings to develop a framework and a set of climate indicators to monitor the risk of a future pandemic

>> two authors … "It is impossible to predict the next pandemic"

>> first step -- evaluate the possibility of prediction
In 1951, Johan Hultin (pathologist) traveled to Brevig Mission (Seward Peninsula, Alaska), where in 1918, the Spanish flu killed 72 of the 80 people, 90 percent the village, from Nov. 15-20, 1918. Retrieval of live virus did not work, so he went back in 1997 – this time removed the preserved lungs of a woman and sequenced (live) virus in the lab -- what they found NIH virologists called “the largest breakthrough in years”. The virus had a strong avian signature, and was not of swine origin as previously believed. Parallel study on Spitzbergen, Norway….Nature mag. exhumation alaska 1918 flu victims, Science March 2004, p. 1866
US military has a special interest in keeping their personnel safe, especially through a major pandemic. An influenza A vaccine was first developed in 1938, by 1943, vaccine was available effective against both influenza A and B; this was mass produced, and stored in case of emergency. But by the time of a pandemic outbreak 3 years later, the virus had mutated and the vaccine proved almost totally ineffective. This is often cited as one of the important lessons of history, and now a basic principle of modern virology.

Credits: US Army Center of Military History