

The 'Hittite plague', an epidemic of tularemia and the first record of biological warfare

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Abstract

A long-lasting epidemic that plagued the Eastern Mediterranean in the 14<sup>th</sup> century BC was traced back to a focus in Canaan along the Arwad-Euphrates trading route. The symptoms, mode of infection, and geographical area, identified the agent as *Francisella tularensis*, which is also credited for outbreaks in Canaan around 1715 BC and 1075 BC. At first, the 14<sup>th</sup> century epidemic contaminated an area stretching from Cyprus to Iraq, and from Israel to Syria, sparing Egypt and Anatolia due to quarantine and political boundaries, respectively. Subsequently, wars spread the disease to central Anatolia, from where it was deliberately brought to Western Anatolia, in what constitutes the first known record of biological warfare. Finally, Aegean soldiers fighting in western Anatolia returned home to their islands, further spreading the epidemic.

Keywords: biological warfare, paleoepidemiology, quarantine, tularemia

Onset of the epidemic

A deadly epidemic, also dubbed the Hittite plague, affected most of the Middle East toward the end of the 14<sup>th</sup> century BC. The present study determined that its onset was described in the Egyptian royal archives, enabling to date it to the last reigning years of Akhenaten, i.e., just before 1335 BC, and locate the focus to an area northeast of Byblos (present-day Lebanon).

Letter EA 96 states that “there is a pestilence in Simyra” [1]. Anyone from Simyra was barred from entering nearby Byblos (see Figure 1), and donkeys were not to be used in caravans because of the pestilence [1]. The measure did not work, as evidenced by letter EA 362 stating the pestilence did reach Byblos, and by letter EA 137 stating the Byblos ruler got chronically ill. The plague spread further south as attested by the ruler of Amurru in present-day southern Lebanon, who referred to his relationship with Byblos, and mentioned he was now sick, and was going to die (EA 95) [1]. Still further south, along the coastal trade route from Byblos, coeval letter EA 224 reports Megiddo “is consumed by pestilence” [1].

The east-west trade road going through Simyra linked the Mediterranean coast to the Euphrates. Reports from 1335 BC show that east of Simyra, in Babylon, an aristocratic woman died from plague (EA 7), and the local ruler was ill (EA11), consistently with spread along the trade route. West of Simyra, coeval letter EA 35 from Cyprus stated “the hand of Nergal is in my country” [1], killing many, in particular individuals linked to copper mining. The attribution of the plague to the Mesopotamian god of pestilence Nergal points to an origin from the east, i.e., via Canaanite harbors and indicates the etiological agent also traveled by ship.

Records from Egypt, a line on a column and the copying of a text, hardly reflect an epidemic, implying the disease did not enter Egypt, thanks perhaps to preventative measures. The *Restoration Stele* of Tutankhamen, dated to 1335-1330 BC, refers to Egypt ravaged and hit by the gods [2]. However, the text could also metaphorically indicate the country was in a state of chaos, a state attested by the ruling dynasty losing its power to the military [3]. Additionally, the *London Medical Papyrus*, was copied

around 1335-1325 BC off an older medical text [4]. The authorities perhaps thought useful to disseminate copies of the old manual, although this text is not specialized in any disease, which raises the question as to whether it would have addressed an epidemic entering Egypt.

### Wars spread the epidemic

Neshites, also known as Hittites, were the political rivals of the Egyptians, attacked Egyptian border positions at Amka along the river Litani just east of Byblos and Simyra (Figure 1) in 1325 BC. The booty and prisoners of war left a contaminated trail as attested by letter *RS 4.475* from Ugarit ruled by Niqmaddu II (1349-1315 BC), one of the mini-states within the Neshite empire. Neshite merchants died at Ugarit from “the hand of a god” [2]. The plague then appeared in Neshite homeland, and to royal inscription *KUB 14.8* states that kings Suppiluliuma I (1358-1323 BC) and Arnuwanda II (1323-1322 BC) died from the plague, which lasted for at least 20 years, i.e. into the reign of Mursili II (1322-1295 BC) [2].

Western Anatolian Arzawa attacked the Neshites in 1320 BC, but was routed by a Neshite counterattack, which even placed Arzawan capital under siege. During these military operations, a divine thunderbolt, seen from behind by the Neshites and from the front by the Arzawans, hit Arzawan leader Uhhazitis in the knee, disabling him [2].

Thunderbolts from gods with face and back hitting knees are unknown in nature, and the event recorded in the Neshite annals is fully explainable in terms of the epidemic. Just as gods were “credited” with plagues, the divine thunderbolt could be one such plague characterized by burning as exemplified by severe fever. Moreover, the

thunderbolt's "front and back" is consistent with the plague first affecting the Neshites and subsequently the Arzawans, hence providing the chronology of the spread of the epidemic. Finally, thunderbolts may hit towns and people, but the likelihood that the person hit was the leader is infinitesimal, and that only knees were affected is even smaller. The thunderbolt must therefore be a metaphorical. A ruler infected with the plague, and symptoms thereof being observed in the knees, or in a region euphemistically and/or puritanically described as the knees, fit the metaphor.

The alternative explanation of a stroke hitting the Arzawan leader is inadequate. A stroke could be described as a thunderbolt, and subsequent paralysis could be described as the knees being affected, stroke leaves out several other factors. However, strokes are very rare events, and occur in our society marked by overconsumption and smoking, which promote strokes, at an annual rate of 0.1%, raising exponentially to 2-3% for individuals aged 80 or older [5]. As those two factors were absent in Bronze Age societies, it stands to reason that the low incidence for stroke was even lower, which speaks against the Arzawan leader being affected by a stroke. Moreover, stroke fails to explain the front and back of the thunderbolt. Additionally, the thunderbolt took place at a time an epidemic was ravaging the country, favoring the odds that the thunderbolt is related to the infection rather than a separate illness. In fact, texts quoted by Herodotus mention the plague placing it along the western Anatolian coast at this point in time. Soldiers from the island of Crete who had fought in western Anatolia had come back with a deadly disease (*Histories*, 7.171) [6], similarly to the later 1918-1919 H1N1 influenza pandemic [7]. The epidemic was said to have taken place circa a century after the Minoan

state had collapsed [6], i.e. right after 1350-1325 BC, which is compatible with the 1320-1318 BC Neshite-Arzawan war.

Tularemia?

The reconstruction of the dynamics of the epidemic helps identifying the etiological agent. A disease lasting 35-40 years, infecting humans and animals, causing fever, disabilities, and death, spreading via rodents aboard ships as well as donkeys, points to *Francisella tularensis*, the etiological agent of tularemia,

This disease can linger for a long time [8], and its longevity is incompatible with shorter-lived epidemics such as from bubonic plague, which for instance hit Europe around 1347-1349, and in 1629-1634 [9]. Furthermore, the description in Neshite records [2], e.g., knees, debilitation, and sensation of internal burning, is also coherent with tularemia [10].

Moreover, tularemia also fits the onset of the infection, as it infects caravans stopping for rest, turning them into carriers for the etiological agent [11]. The aforementioned trading route between the Mediterranean Sea and the Euphrates would have had such contact points allowing for the spread the pathogen. It is also noteworthy that at least two epidemics best explained by tularemia did arise in the Canaan area in the 2<sup>nd</sup> millennium BC, indicating this geographical area was a reservoir for the etiological agent. One took place in the early 11<sup>th</sup> century BC affecting present-day Israel and Palestine [12]. The other epidemic took place in the late 18<sup>th</sup> century BC, and contaminated harbors and ships, introducing the plague to the Egyptian harbor of Avaris [13], paralleling the 14<sup>th</sup> century BC epidemic as the route through Symira reaches the

coast facing the city island of Arwad, across which is the island of Cyprus. Similarly to the 18<sup>th</sup> century BC epidemic, stowaway rodents would have ferried tularemia from Canaanite harbors [13].

Finally, unlike the case with most diseases, natural immunity to tularemia is only sustained by continuous contact with animals harboring attenuated strains of the bacterium [10]. This condition is reflected in the texts reporting deaths in urban areas and mines, rather than the countryside, where the population would have been more immune. This condition is also reflected in a passage transmitted by Herodotus *Histories*. Pagan gods represented abnormal phenomena, and the god Pan protected shepherds while bringing fear [14], an odd combination making however perfect sense when considering tularemia: shepherds if continuously exposed to attenuated strains of the disease are immune to the otherwise deadly disease. Moreover, Pan was first observed in the Aegean roughly 800 years before Herodotus himself (2.145) [6]. The historian being born around 484 BC, Pan is a circa 1300 BC phenomenon, in full compatibility with the 14<sup>th</sup> century BC epidemic along Aegean Anatolia and the nearby islands.

Biological warfare?

The Neshite-Arzawan conflict raises the question of the pathogen being intentionally used as a weapon. In spite of the plague and changes of rulers, Neshites blocked the Arzawan attack, then routed the opponents, and did so in less than two years. Did Neshites have a secret weapon? The Neshite king wished the plague on the Arzawans [2]. Did he actively contribute to make his wish come true?

Well, during the Bronze Age blitzkrieg, Arzawans and allies were infected. Additionally, Neshites were directly blamed for the epidemic. In fact, Neshite rituals describe how a ram and a woman attending the animal were sent on the road, spreading the disease along the way [15]. The practice was confirmed by Arzawans who reacted to the plague caused by enemy by sending their own ram on the road in the direction of the enemy troops, and asking the gods to direct their attention to the Neshite land [2]. Ovines are known carriers of tularemia [10].

As a result, it is safe to state that the warring parties engaged in mutual use of contaminated animals with the purpose of infecting the opponent. Such use is not attested in prior literature, making the 1320-1318 BC Anatolian war the first known record of biological warfare. This neither means this warfare was invented in Anatolia nor it means such practice did not exist prior to this war, but rather means that if the practice pre-existed this war, it was not documented, or the relative documents were lost in time.

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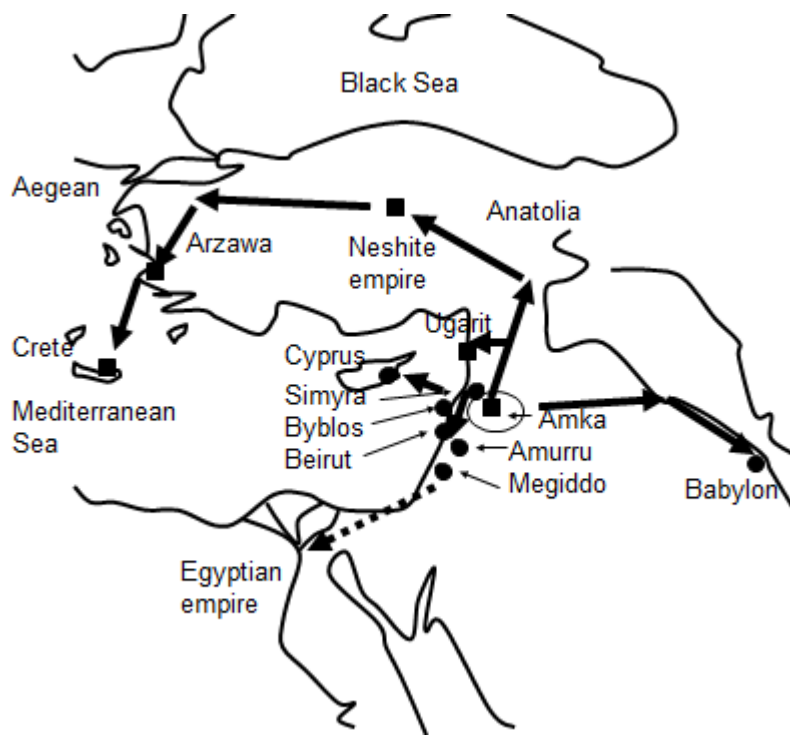


FIGURE 1

14th century BC epidemic: Amarna letters/ 1335 BC sites (●), 1325-1305 BC sites (■).

The circle area represents the most probable area of origin for the disease. The spread of the epidemic is indicated by arrows.

