



The biblical plague of the Philistines now has a name, tularemia

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Summary An epidemic thought to have been the first instance of bubonic plague in the Mediterranean reveals to have been an episode of tularemia. The deadly epidemic took place in the aftermath of the removal of a wooden box from an isolated Hebrew sanctuary. Death, tumors, and rodents thereafter plagued Philistine country. Unlike earlier explanations proposed, tularemia caused by *Francisella tularensis* exhaustively explains the outbreak. Tularemia fits all the requirements indicated in the biblical text: it is carried by animals, is transmitted to humans, results in the development of ulceroglandular formations, often misdiagnosed for bubonic plague, and is fatal. Moreover, there is the evidence from the box and rodents: mice, which are known carrier for *F. tularensis* and can communicate it to humans, were credited by the very Philistines to be linked to the outbreak, and are small enough to nest in the box. Mice also explain the otherwise odd statement in the biblical text of a small Philistine idol repeatedly falling on the floor at night in the building where the Philistines had stored the box as mice exiting the box would easily have tipped over the statuette. Tularemia scores yet another point: an episode of the disease is known to have originated in Canaan and spread to Egypt around 1715 BC, indicating recurrence for the disease, and suggesting Canaan was a reservoir for *F. tularensis* in the 2nd millennium BC.

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Introduction

The so-called Philistine plague has been proposed to have been the first record for bubonic plague in the Mediterranean area [1,2]. However, the case for *Yersinia pestis* is not conclusive, has been seriously questioned [3], and dysentery has also been proposed as an alternative explanation for this epidemic [4].

According to the historical record, a wooden box was moved from an isolated Hebrew sanctuary to a

battle scene. The Philistines gained the upper hand, seized the box as booty, and brought it to their temple within the town of Ashdod. Three events followed: a deadly plague characterized by tumors developed in each town after the arrival of the box, a Philistine idol repeatedly fell on the floor at night after the box was placed in a local temple, and rodents started being noticed across the country. After 7 months, the Philistines concluded they may have brought this disaster on themselves, and could atone by returning the box to the original owners, alongside providing settlement by offering five replicas in gold of tumors and mice, one set of replicas for each of their towns. The Philistines' action

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spread the pestilence to the first Hebrew settlement where the box arrived, and the plague only subsided after the box was quarantined in a farm (1Sa.4.3-7.1) [5].

Neither bubonic nor dysentery

The data reported by the historical record are not satisfactorily explained by either bubonic plague or dysentery, the candidates proposed in the literature so far.

Bubonic plague is transmitted by *Yersinia pestis* in fleas living on rats [6]. The historical source does mention buboes and rodents, albeit not necessarily those linked to bubonic plague. Moreover, one is still left to explain bubonic plague in an area where no previous case is known, thus requiring strong evidence for the first manifestation of the disease, and the repeated failures for the disease to reoccur as in the subsequent centuries there are no records for bubonic plague in this area. One is also left to explain the mechanism of spreading, linked to the transfer of the box, and why the epidemic was confined to such a small territory, which would be atypical for bubonic plague [6]. Additionally, one is left to explain the fall of the Philistine idol.

The dysentery alternative fares no better. The sole evidence rests on the 17th century King James Version translation into English of the biblical text. This translation states that due to the plague, the Philistines “had emerods in their secret parts” (1Sa.5.9) [7]. However, other translations respecting the original text in Hebrew do not report any localization for the tumors. For instance, Chouraqui’s translation, which is considered to be the most literal one ever produced, has Philistines ulcerated by tumors, “ils sont ulcérés de tumescences” (1Sa.5.9) [8].

Even accepting for argument’s sake the possibility that tumors were only found in the perianal area, and were due to dysentery, this explanation ends up in a cul-de-sac. Dysentery is caused by either *Shigella* [9], or amoebas [10], is characterized by diarrhea, and is linked to contaminated water. The text mentions neither contaminated water nor diarrhea [5], and focuses on lethality and tumors. Dysentery also fails to explain the mechanism of spreading of the epidemic, as well as the odd detail of the idol falling at night in the temple.

An etiological agent for the Philistine plague

The biblical data appear to center around the box as a vehicle for the disease, as well as the rodents

that appear shortly thereafter, and are depicted in the “settlement” paid in gold. The Hebrew word *akhbar* for the rodents fails to distinguish between mice and rats. Rats would have carried *Y. pestis*, but bubonic plague fails to adequately explain the epidemic. Mice are a better option: they can carry diseases, and fit the other data relative to the historical text, i.e., box, idol, and settlement payment.

The gold-plated wooden box measured $2.5 \times 1.5 \times 1.5$ cubits (Ex. 25.10-22; Ex. 37.5-10) [5], i.e., $1.1 \times 0.7 \times 0.7$ m, giving a volume of roughly 500 l, offering a nest to mice but not rats. The former animals average 20 g [11] and are small enough to enter the box through a small aperture, possibly hidden by the gold covering. The latter animals average 300 g [12], requiring a wider aperture and more internal space. Mice nesting in the box would have explored their new habitat upon each the transfer of the box, thus offering an explanation for the box transmitting the disease.

Mice also explain the otherwise odd detail of a small Philistine idol falling on the floor. Once the box was hosted in the Philistine temple, the animals exiting the box from the same aperture, would have tipped over the statuette, eventually breaking the extremities after repeated falls (1Sa.5.2-5) [5].

The five replicas in gold of rodents and tumors to settle the dispute with the Hebrews (1Sa.6.3-5) [5] also favor mice over rats. Given the specific gravity of gold, just over 19 kg/l, a gold mouse would be shy of 400 g, while a rat would be shy of 6 kg. Considering 10–20 g tumors, the Philistines were paying roughly 3–4 kg of gold in total. Rat-like tumors would have resulted in 31–32 kg of gold, where the tumors would have only contributed marginally (additional 3–6%) to the gold already provided by the rats, raising the question of their raison d’être.

Linking mice to the box and to the disease singles out tularemia as the disease portrayed by the biblical text: mice are known to carry *Francisella tularensis*, the etiological agent for tularemia. Moreover, the text calls for a disease which originated from animals, can be communicated, can form tumors, and is deadly. **Tularemia is a zoonotic disease** that can be transferred to humans, manifests ulceroglandular formations, which tend to be misdiagnosed for signs of bubonic plague, and carries a **15% fatality rate** when untreated, thus fitting all the criteria in the text [13].

Tularemia also the extratextual, criterion. Around 1715 BC the incidence of tularemia known as “Asiatic disease” originated in Canaan, and spread to Egypt via contaminated ships [14].

Tularemia would thus have occurred more than once in Canaan, and the recurrence would suggest that this geographical area was a reservoir for *F. tularensis* in the 2nd millennium BC.

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