History of medicine and ethics

# Investigating the Theoretical Possibility of Dengue Fever in Ancient Egypt

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Keywords

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Summary

*Dengue fever, a mosquito-borne viral disease primarily transmitted by Aedes aegypti, has become a growing global health concern, with dramatic increases in incidence in recent years. Although no direct evidence of dengue exists from ancient Egypt, this study investigates the theoretical possibility of its presence in that historical context. The approach integrates palaeoclimatic data, modern entomological and vector ecology studies, molecular clock analyses, and the interpretation of ancient Egyptian medical papyri. Special attention is given to the term temyt, described in association with dermatological and neurological symptoms in children and linked to the demon nesyt, as reinterpreted by scholars such as Bruno Halioua and Pascal Hannequin. These sources are critically re-evaluated alongside modern clinical symptomatology of dengue. Findings suggest that environmental and climatic conditions in ancient Egypt – particularly in regions like the Fayum– could have supported Aedes populations, and that certain disease descriptions may reflect empirical observations of vector-borne illnesses. While the evidence remains circumstantial and speculative, it opens new interpretative avenues regarding ancient Egyptian understandings of febrile, eruptive childhood diseases. The study concludes that dengue or dengue-like syndromes cannot be ruled out and that future interdisciplinary research, including palaeogenetic and archaeoviral approaches, may help clarify the presence of arboviral diseases in antiquity.*

## Introduction

The history of the scientific name of the yellow fever mosquito, the vector of the yellow fever virus, dates back to the late 18th century. In his 1757 work *Iter Palæstinum***,** Frederic Hasselquist described a mosquito, which he named *Culex aegypti***,** which was responsible for a very serious disease, which was very common in Egypt [1]. Linnaeus edited the writings of Hasselquist and included this mosquito in his nomenclature [2]. When the vector of the unknown yellow fever agent was identified in Cuba in the late 19th century, it was named *Stegomyia fasciata* [3]. The classifications multiplied, as different mosquitoes were identified and a heated debate about the nomenclature began until *Stegomyia* was relegated to the subgeneric rank of *Aedes* [4]. The term Aedes derives from the Ancient Greek adjective ἀηδής (aēdḗs, "unpleasant, odious"), ἀ- (a-, "un-") + ἡδύς (hēdús, "sweet, pleasant") [5]. Closely connected with this vector **is** dengue fever (DENV), which is a rapidly spreading arboviral disease, with recent years witnessing unprecedented outbreaks. In 2024, over 12.4 million cases were reported globally, doubling the 6.5 million cases from 2023 [6]. This surge is attributed to factors such as climate change, urbanisation, and increased human mobility [7]. The World Health Organization (WHO) has launched a global strategic plan to combat the rise of dengue and other Aedes-borne diseases, emphasising the need for coordinated surveillance and vector control efforts [8]. With particular reference to Egypt, dengue fever has re-emerged as a public health concern. After the eradication of *Aedes aegypti* in 1963 [9], the vector has been detected again in various regions, including the Nile Valley and Red Sea coast [9]. In 2023, Germany reported 36 dengue cases among travellers returning from Egypt, particularly from the Red Sea resort areas [10]. Furthermore, in May 2024, three Italian travellers were diagnosed with dengue after visiting Sharm El Sheikh, marking the first reported cases from this popular tourist destination [11]. Given the current epidemiological landscape, this study investigates the theoretical possibility of dengue fever's presence in ancient Egypt. By examining historical medical descriptions, environmental conditions, and vector ecology, we aim to assess whether ancient Egyptians could have encountered a disease analogous to modern dengue.

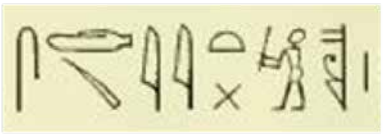
## Problematising Halioua's retrospective diagnosis of measles in Ancient Egypt

Ancient Egyptian medical papyri provide insights into the civilisation's understanding of diseases. Bruno Halioua, in his work *La médecine au temps des pharaons*, discusses the interpretative challenges of aligning ancient disease descriptions with modern diagnostics [12]. For instance, a pathogenic substance described in the Hearst papyrus (n. 168, 10-12), known as *temyt, is said to be treated by means of therapies aimed at expelling it, such as charcoal, liquid residue, wheat starch, sea salt, castor bean, dates, pyrethrum seeds, honey [12].*
The following original passage is reported from Grapow's edition of the papyrus [13], as detailed in the following image (Fig. 1).

**Fig. 1.** The tmjt-*Krankheit*, from H. Grapow, 1958


Halioua considers this *temyt* to be "a childhood disease by definition: a violent skin eruption that the Egyptians attributed to the action of a mysterious substance (*temyt*) that had to be fought", which is based on Pascal Hannequin's view that "the *temyt* substance manifests itself through cutaneous signs and affects children (it is not found in passages concerning adults)" - (authors' translation of both passages) [14]. Hannequin's considerations are based on the London Papyrus 6 (3, 1-5) where a disease affecting Horus' skin is hinted at [14], although – it should be remarked – the description appears to be somewhat fragmentary and vague to make a clear-cut retrospective diagnosis. Halioua, then, also explores the *temyt pathogenic substance/disease in the* Berlin Papyrus (n. 3027, 1, 4-9) [12].
The following passage (Fig. 2) is from the Erman 1901 edition [15].

**Fig. 3.** The word *sḏy.t qs* in hieroglyphic script.

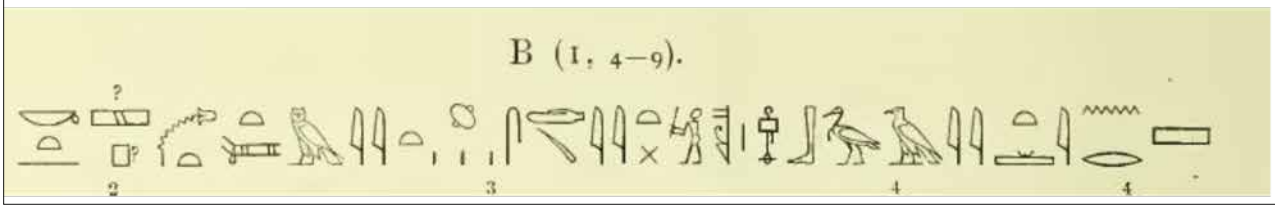


Worthy of note, in this passage, is the reference to temyt, followed by the attribute *sḏy.t qs* (Fig. 3), which literally means "she who belongs to the bone-breaking", hence "the bone-breaker" – *Knochenbrecherin* in the German translation by Adolf Erman (1854-1937) [15].
Subsequently, Halioua draws on the mentioned London Papyrus (n. 6, 3, 1-15) and Hannequin's work to connect *temyt* with the disease-causing demon *nesyt* and follows the latter scholar's 2001 formulation:

> *Certains auteurs ont identifié le démon-nesyt à des troubles neurologiques voire même à l'épilepsie. Nous sommes donc devant une maladie infantile présentant des signes dermatologiques et parfois neurologiques, semblant relativement grave (noter qu'aucun des textes ne pronostiquent une éventuelle guérison). Ces textes pourraient donc se rapporter à la rougeole, responsable encore maintenant de nombreux décès d'enfants dans les pays en voie de développement* [14].
>
> ["Some authors have identified demon-*nesyt* with neurological disorders and even epilepsy. We are therefore dealing with an infantile disease with dermatological and sometimes neurological signs, which appears to be relatively serious (note that none of the texts prognosticate a possible cure). These texts could therefore relate to measles, which is still responsible for many child deaths in developing countries" – authors' translation]

Hence, according to Hannequin and Halioua, ultimately *temyt* could be a reference to measles [12, 14]. The basis for this interpretation is to be ascribed to: a. the paediatric patient category described; b. the cutaneous manifestations Halioua describes without a direct reference to a specific passage; c. the *temyt-nesyt*-neurological connection.
While the two scholars' morbillous interpretation is certainly a plausible hypothesis worth considering, it should be underlined that measles is widely believed to have emerged as a distinct human disease during the early Middle Ages, likely evolving from the rinderpest

**Fig. 2.** Hieroglyphic passage from Erman, 1901.



virus in animal populations before adapting to humans. Molecular clock analyses estimate this zoonotic jump occurred around the 6th century AD, coinciding with the rise of large urban centres that could sustain the continuous transmission required for measles' survival [16]. The first clear clinical description is attributed to the Persian physician al-Razi (Rhazes, ca. AD 864/865–AD 925/935) in the 9th century, who differentiated measles from smallpox in his treatise *Kitab al-Jadari wa al-Hasbah* (*i.e., The Book of Smallpox and Measles*), highlighting the disease's fever, rash, and respiratory symptoms. This supports the view that measles, as we know it today, was first recognised and described in the Islamic Golden Age [16]. However, some scholars argue for its presence in antiquity [17]. Classical accounts occasionally mention childhood diseases characterised by fever and eruptive symptoms. Historian Kyle Harper notes that while retrospective diagnosis is inherently speculative, certain descriptions in Greco-Roman medical and historical texts suggest the circulation of illnesses compatible with measles. He acknowledges the ambiguity of such sources but argues that the demographic and urban conditions of the Roman Empire may have allowed for sustained transmission of measles-like pathogens before the Middle Ages [17]. Thus, while the prevailing consensus favors a Mediaeval emergence, the hypothesis of earlier outbreaks remains plausible.

Returning to Halioua's analysis, the reference to measles in a paediatric context may appear to support identifying *temyt* as that infectious disease. Nonetheless, although he mentions the bone-breaking property of *temyt*, Halioua does not elaborate further on it [12], nor does Hannequin [14].

Despite the symbolic language, this symptom could suggest an alternative interpretation: dengue. Classical dengue fever typically presents with sudden high fever, rash, severe headache, retro-orbital pain, muscle and joint pain (which earned it the nickname "breakbone fever"), and general malaise [18]. In children, dengue may also cause irritability, skin manifestations, and in severe cases, neurological symptoms like seizures or altered consciousness, which are commonly associated with dengue shock syndrome or dengue encephalitis [19]. Moreover, the reference to bone-related pain or disease in ancient texts – while metaphorical– may correspond to the deep musculoskeletal pain and systemic inflammation typical of dengue. The ancient therapeutic use of castor oil and pyrethrum seeds, both known for their insecticidal or anti-inflammatory properties, suggests a symptomatic treatment of the illness, even if its aetiology remained unexplained.

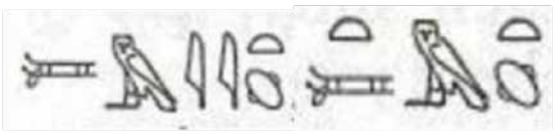
As far as neurological manifestations of dengue in children, many have been reported such as encephalopathy, encephalitis, seizures, motor complications, sleep disorders, etc. [20], hence neurological complications or sequelae would not be exclusively observable in measles although one can concede to Hannequin and Halioua that measles has a higher rate of severe neurological complications such as measles encephalitis (1 in 1,000 cases) and SSPE (1 in 10,000–25,000), which is often fatal [21].

Moreover, can one be sure that such vague cutaneous manifestations are really those of measles? Moreover, bone-cracking fever is not typical of measles and is, on the contrary, one of the main symptoms of the disease caused by *temyt*.

## *Temyt* in the ancient Egyptian language

A compelling case study emerges from the interpretation of the above-mentioned term *temyt* (also spelt as *tmy.t*, *tmjt* or *temit*, Fig. 4, found in ancient Egyptian magical-medical texts and discussed by the late Egyptologist Rainer Hannig (1952-2022).

**Fig. 4.** Alternative forms of *temyt* in hieroglyphic script.



Listed tentatively among dermatological diseases, *temyt* is marked with an asterisk in Hannig's lexicon, indicating translation uncertainty [22]. Its characterisation as a demon-induced ailment (*von Dämonen bewirkt*) and the use of incantations aimed at banishing it from urban spaces back to swampy, rural regions suggests an environmental association that is particularly intriguing and goes in the direction of the previously described interpretation by Hannequin [12]. The described progression – from the swamp to the human population – evokes a pattern consistent with vector-borne disease transmission. Moreover, Erman's dating of the relevant spell to between the Hyksos period and the 19th and 20th Dynasties situates it within a timeframe consistent with the New Kingdom, when intensified agricultural activity and the colonisation of regions like the Fayum Oasis may have fostered ecological conditions conducive to mosquito proliferation. The association of the Fayum with stagnant waters and the emergence of malaria further strengthens the argument that *temyt* may reflect cultural memory or mythologisation of diseases spread via mosquitoes – possibly even dengue-like syndromes. The magical remedy's focus on repelling the disease to its environmental origin aligns conceptually with the vector control strategies of modern public health.

## Discussion

### Climatic and Ecological Conditions in Ancient Egypt

Ancient Egypt's climate was predominantly arid; however, the annual Nile floods created standing water bodies

ideal for mosquito breeding. During certain historical periods, particularly the Middle and New Kingdoms, palaeoclimatic studies indicate slightly more humid conditions in the Nile Valley due to increased monsoon influence [9]. These conditions could have supported the proliferation of mosquito species, including *Aedes aegypti*. Modern modelling studies predict that suitable habitats for *Aedes aegypti* are concentrated in the Nile Valley, Nile Delta, Fayoum Basin, Red Sea coast, and South Sinai. Projections under future climate change scenarios suggest an expansion of suitable habitats, particularly in the Nile Delta region, with a 61%-68% increase in suitable habitat area by 2050 [24]. These findings imply that similar ecological conditions could have existed in ancient times, facilitating the presence of dengue vectors.

## Vector Ecology: Ancient and Modern Perspectives

Mosquitoes are frequently referenced in Egyptian texts and visual culture, and ancient remedies for insect repulsion are well-documented. While species-level identification is not possible from ancient remains, *Anopheles pharoensis* – a malaria vector – was long present in the region. The re-emergence of *Aedes aegypti* in modern Egypt due to climate change and urbanisation suggests that similar conditions could have supported the vector in ancient times [24]. Recent studies have confirmed the reappearance of *Aedes aegypti* in Egypt, particularly in Upper Egypt's governorates. In one study, 2,800 adult mosquitoes were captured near a dengue outbreak site, which provides evidence of the vector's re-establishment [24]. These findings underscore the importance of vector surveillance and control in mitigating dengue transmission.

## Mosquitoes in ancient Egypt: Herodotus' account

Herodotus provides one of the earliest ethnographic observations of mosquito avoidance practices in Egypt. In *Histories* 2.95.1-3, he notes that Egyptians living in marshy areas employed various strategies to protect themselves from mosquitoes. Those residing in lower Egypt slept under fine fishing nets, not primarily to guard against bites, but to block the incessant noise of the insects:

> *Against the mosquitos that abound* [τοὺς κώνωπας ἀφθόνους ἐόντας]*, the following have been devised by them: those who dwell higher up than the marshy country are well served by the towers where they ascend to sleep, for the winds prevent the mosquitos from flying aloft; those living about the marshes have a different recourse, instead of the towers. Every one of them has a net* [ἀμφίβληστρον]*, with which he catches fish by day, and at night he sets it around the bed where he rests, then creeps under it and sleeps. If he sleeps wrapped in a garment or cloth, the mosquitos bite through it; but through the net they absolutely do not even venture* [25].

This passage reflects a culturally embedded response to a well-known environmental nuisance and may represent one of the earliest known uses of netting against insect vectors. Though Herodotus does not link mosquitoes to disease, his account offers valuable context for understanding ancient Egyptian awareness of, and adaptation to, mosquito presence along the Nile [26].

## The antiquity of Dengue in light of molecular clocks

The evolutionary history of the dengue virus (DENV) reflects a long and intricate coevolution between the virus itself, its primary mosquito vector (*Aedes aegypti*), and primate hosts. It is widely believed that dengue originated as a sylvatic virus circulating among non-human primates in the forests of Southeast Asia or Africa, maintained through a transmission cycle involving forest-dwelling mosquitoes. Dengue belongs to the *Flavivirus* genus within the *Flaviviridae* family and exists in four closely related serotypes: DENV-1, DENV-2, DENV-3, and DENV-4. Molecular clock studies suggest that the strains adapted to humans diverged from their sylvatic ancestors around 1,000 years ago [27, 28]. However, deeper divergence events – those separating sylvatic from endemic strains – may stretch back several thousand years, though these estimates become less precise with time. The virus likely made the leap to sustained human transmission when growing population centers and permanent settlements created the conditions for continuous cycles of mosquito-to-human transmission. *Aedes aegypti*, in particular, played a key role by adapting to human environments and breeding in water storage containers, thus becoming an efficient urban vector for the virus [27, 28]. Importantly, the estimate of approximately 1,000 years for the divergence of human-adapted dengue strains is based on genetic analyses of modern viral genomes, as ancient RNA virus sequences like those of DENV are exceptionally rare or virtually nonexistent due to their instability over time.

The convergence of symbolic medical descriptions, favorable microclimates, and potential vector habitats suggests the theoretical possibility of dengue fever in ancient Egypt. While the prevailing aridity might argue against it, the presence of Nile-related irrigation and water storage could have created microhabitats ideal for mosquito breeding, especially during the inundation season. Ancient descriptions of febrile illnesses accompanied by skin eruptions, the ritualistic use of fumigants, and the presence of remedies associated with dermatological or neurological symptoms may reflect an empirical recognition of vector-borne diseases, even if they lacked a precise etiology in modern terms. Moreover, the pairing of ailments with demonic forces such as *nesyt* and harmful substances like *temyt* suggests that diseases with both dermatological and neurological manifestations – such as severe or hemorrhagic forms of dengue – could have been conceptually assimilated into religious or magical paradigms. The symptomatology described – fever, rash, convulsions, irritability in children – parallels the profile, albeit

imprecisely, of dengue infections in modern pediatric cases. Furthermore, the therapeutic use of plant-derived compounds, such as pyrethrum seeds and castor oil (noted for anti-inflammatory and insecticidal properties), aligns intriguingly with modern approaches to symptom management and vector control. Whether through empirical observation or ritual practice, the ancient Egyptians appeared to respond to syndromes consistent with vector-borne illnesses.

## Conclusion

While there is no direct evidence of dengue fever in ancient Egypt, its theoretical presence cannot be entirely dismissed. A multidisciplinary review reveals a set of circumstantial elements—favorable microclimates, the existence of potential mosquito vectors, suggestive disease descriptions in medical papyri, and environmental conditions compatible with dengue virus transmission. The recent epidemiological re-emergence of *Aedes aegypti* in modern Egypt reinforces the plausibility that the region, even in ancient times, may have supported mosquito populations capable of spreading dengue or dengue-like diseases. Bruno Halioua's interpretation of terms like *temyt* and *nesyt* in relation to childhood illness with neurological and dermatological symptoms opens the door to new speculative readings of ancient pathologies. While measles is the most common comparison for such symptoms, severe forms of dengue also present with overlapping clinical features, particularly in young children. Thus, a hypothetical case for dengue in ancient Egypt remains speculative but worthy of scholarly consideration. As modern Egypt confronts a re-emerging dengue threat in a warming climate, understanding its potential historical presence adds depth to both our epidemiological models and our appreciation of ancient medical knowledge. Future interdisciplinary research, including palaeogenetic studies of preserved tissues or further entomological analysis of ancient remains, could offer more definitive answers – as was the case for other ancient infectious diseases, such as leprosy, tuberculosis and tetanus, elucidated through palaeopathological approaches [29-32].

## Data availability statement

Not applicable.

## Informed consent statement

Not applicable.

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## Conflicts of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Authors' contributions

FMG, EV, MEH: conceived the study. FMG, EV, MEH, MM: designed the study. FMG, EV, MEH: drafted the manuscript. FMG, EV, MEH: original draft preparation. All authors performed a search of the literature, critically revised the manuscript and dealt with conceptualization, methodology, investigation, data curation, review and editing. All authors have read and approved the latest version of the paper for publication.

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