# The Critics of Galen: Analysing Criticisms of Galen's Accounts of the Antonine Plague

## By Sam Northgraves

The influence of Galen on medicine survives well into the 19<sup>th</sup> century and beyond (Jackson, 2011:21, Mattern, 2011:478). Known as the "Prince of Physicians", his connection to the Antonine Plague in his time and our reliance on him as a source has led to the Plague often being referred to as the Galenic or Galen's Plague (Jackson, 2011:21). While Galen was not without his flaws, such as his disparaging of rival physicians in pursuit of his own legacy, his observational skills, experience, methodical practices, anatomical discoveries and contributions to medicine cannot be overlooked (Nutton, 2020:124, Mattern, 2011:478). It is these factors and his presence in Rome during the outbreak which have led to him becoming a central source for the Antonine Plague.

This article will explore the modern criticisms of Galen's accounts of the Antonine plague, chiefly in his *Method of Medicine* (5.12) in which he discusses his attempts to treat the plague and the symptoms of the disease. This is described by some modern historians as providing inaccurate, disappointing and partial descriptions of the plague. This analysis will explore what Galen covers of the disease, the biases of retrospective diagnosis and how this has influenced the reception of Galen's medical accounts, his motives and his importance as a medical source in light of other surviving evidence. Additionally, this analysis proposes more constructive criticisms of Galen. Under the aim of examining Galen's reception as a prominent medical source in the study of the ancient diseases, this article intends to advocate for the practical use of primary accounts in consideration of their context and to review scholarly criticisms of the primary evidence.

### The biases of smallpox

Many historians have made the informed assumption that the Antonine plague was smallpox (Haesar, 1882:32, Hirsch, 1883:126, Jackson, 1988:157, Duncan-Jones, 1996:116, Nutton, 2024:224). While other possible diseases have been considered, from typhus to the bubonic plague to measles and rubella, this conclusion of smallpox has led to many issues in objectively discussing

Galen's evidence (Gourevitch, 2013:66, Littman et al, 1973:245). Zinsser (1960:101) makes the further suggestion that this was not one singular infection but an attack from multiple diseases, though he too agrees that the major contributor was likely related to smallpox. A strong emphasis has been placed on Galen's failure to deliver a full account of the symptoms of the plague, deemed unsatisfactory to a modern medical and historical audience (McNeill, 1977:132). This seems partially spurred by the nonconformity to the symptoms of smallpox. This is equally relevant when referring to his suspected inaccuracies. The dismissal of these symptoms is an example of the problematic practice of thinking backwards, starting at a conclusion and dismissing any evidence which does not conform to this belief. While there is value in criticising sources, criticising the limits of an experienced physician's accounts only to rely on them so heavily in making a modern diagnosis leads to the conclusion of smallpox appearing rather dubious or hasty at a minimum.

A frequently cited advocate for the diagnosis of smallpox is Littman (et al, 1973). While Littman (et al, 1973:245) agrees that Galen's symptomatology is "sketchy", there is enough to "make a firm diagnosis". Littman's (et al, 1973:250-251) discussion of Galen's symptoms frequently connects back to the smallpox diagnosis, leading to the dismissal of symptoms that fall outside of this range and limiting the analysis of the disease. However, Littman (et al, 1973:251) does discuss possibilities beyond smallpox and why these do not align with Galen's recorded symptoms, such as typhus. Yet, Littman (et al, 1973:251) then reaffirms the smallpox diagnosis, as "no plague disease other than smallpox is known to produce an exanthem such as Galen describes". Though, in a footnote, Littman admits that Galen does not reference the characteristic scarring left behind by smallpox. Littman (et al, 1973:251-252) attributes this to Galen's partial descriptions, and motives in treatment over diagnosis. Like other advocates of this diagnosis, Littman takes the absence of symptoms such as scarring as an omission by Galen, such is their conviction over the smallpox diagnosis. Littman further argues such symptoms appear after the disease concludes its course, though an absence of symptoms does not necessarily correlate to omission on Galen's part. Flemming (2019:233), however, criticises these explanations as "vague and unsatisfactory". Being such a characteristic symptom of smallpox, it is concerning that no mention has been made by Galen or any other sources of this lasting impact of the disease. A more convincing possibility Flemming (2019:233) presents is

the variability of the smallpox virus and how differences in the population and environment of Rome may have led to less scarring. While Gourevitch (2005:65) seconds the smallpox diagnosis, she does counter Littman's (et al 1973:251) insistence that this was an omission evidencing the modern omissions of the scarring in Rooyen (et al, 1948:286). Gourevitch (2005:65) argues that in other accounts of smallpox such descriptions were not omitted, such as in Balzac's *Le Curé de village*. Equally, there are ancient accounts which have been speculated to be of pockmarks and similar scarring beyond the Antonine Plague, thus not explaining why Galen wouldn't record such symptoms (for example Pliny *NH* 26.1–11). Rhazes (*KJH* 11), who is discussed later, crucially mentions treatments to remove the lasting marks of jadari, believed to be smallpox. However, a flaw in this comparison is that Rhazes was practising significantly later, around 900 AD. There are no surviving contemporary accounts mentioning the lasting scarring of smallpox from the Antonine plague, weakening the diagnosis and thus this reproof of Galen.

It is these flaws in the modern smallpox diagnosis which lead the criticisms of inaccuracies and omissions in Galen's account to be scrutinised. Furthermore, it reflects the biases which come with placing modern medical expectations onto ancient accounts. Flemming (2019:232) equally criticises Littman's conclusion, presenting Littman's omissions of Galen's recorded symptoms of memory loss and the confusion which Littman fails to explain in relation to the proposed diagnosis. Flemming (2019:232) equally acknowledges that smallpox is exclusively human, which does not align with the accounts of animal deaths (Herodian 1.12.1-2, Aristid. Or.48.38). Flemming's criticisms of Galen's accounts are certainly fairer than Jackson's, which is discussed later. While Flemming (2019:226) does explore the modern diagnosis of smallpox, her sceptical analysis and critiques of the diagnosis clearly imply her scepticism as to the belief. Flemming's (2019:226) critiques seem to not be with Galen only, unlike Jackson's, but with the use of Galen's account by historians. Galen's symptoms are certainly specific, in both their descriptions and their duration (MM 5.12). Yet, his focus on individuals rather than the general populace has certainly limited our understanding of the disease. These issues are not wholly with Galen and his accounts, but with the limits in using his accounts as the basis for a robust diagnosis. Galen's symptoms are indeed scattered throughout his works and Flemming's further criticisms of Galen himself are reasonable. A prominent limit in the use of Galen's accounts in the present day is his lack of "sustained analysis" (Flemming, 2019:225-226). For example, while his comments on the healing properties of "astringent milk" (*MM* 5.12) are extremely interesting, they have no modern value within medicine due to a lack of analysis as to precisely how this milk cured the individual. This is likely not due to omission, instead to the fact that Galen did not know in a precise, medical sense why the milk worked. It is placing modern expectations and values onto these ancient sources which culminate in unfair objections and the dismissal of limited and valuable evidence.

Yet, to develop this hypothesis, Thucydides' accounts of the Athenian Plague have equally been considered to be smallpox, along with many other diseases (Morgan, 1994:197, Littman, 2009:460). While Thucydides' (2.47-55) accounts show striking similarities to Galen's, such as a rash, coughing up of blood and vomiting (Thuc.2.49, MM 5.12), there are some crucial differences such as an insatiable thirst noted by Thucydides. While their accounts of their respective plagues are frequently compared, Littman and other supporters of the Antonine smallpox hypothesis fail to explain the absence of the loss of sight which was prominently noted by Thucydides but not Galen (Thuc.2.49, Flemming, 2019:229). Carrying the risk of loss of sight, this could advocate for a stronger possibility of smallpox for the Athenian plague than that of the Antonine (Crosby et al, 1993:1009). Though the absence of scarring and the addition of animal deaths makes the possibility that the Athenian plague was smallpox significantly less likely, this therefore brings into question, should the Athenian and Antonine plague have both been smallpox, why Galen did not encounter or mention a loss of sight in his patients (Duncan-Jones, 1996:109, Thuc.2.50).

Beyond such diagnoses, many historians seem to agree on the limits of Galen's accounts. However, Flemming's stance respects the nuances of the evidence, commenting on its limits within modern medical diagnoses. The argument of other historians such as Littman, that Galen's accounts are inaccurate or partial, appears to be heavily influenced by the widespread, accepted belief that he was recording the symptoms of smallpox. Excluding this smallpox bias, it would be challenging to criticise Galen as inaccurate or omitting elements due to our limited comparable accounts. It appears that only under this smallpox assumption can Galen be criticised in such a way.

### What does Galen provide?

Even beyond a medical context, Galen is critical for understanding the social and cultural elements of Roman life during his period (Jackson, 2011:28). Most significantly, he presents a valuable insight into Roman imperial physicians, both in their practices and education. But Galen's importance is paramount in considering the lack of comparable sources for the Antonine plague and its symptoms. A more productive stance than the criticisms of what Galen possibly omits or his alleged inaccuracies is what Galen does provide in his accounts. Jackson's (1988:174) criticism quotes Gilliam's (1961:227) comment, in which Gilliam praises Galen for his influence but maintains that his references to the plague "are scattered and brief". Jackson (1988:174) adds his own interpretation of Galen's account as "disappointingly uninformative". This interpretation, while understandable from a medical standpoint, fails to recognise that the symptoms provided by Galen are apparently enough for some historians to reconstruct a medical diagnosis. At minimum, Galen's accounts do provide some understanding of the disease.

Galen's symptoms have allowed historians to conclude possible diseases as unlikely, such as typhus and the bubonic plague (Flemming, 2019:232). The absence of symptoms, though believed to be due to omissions or inaccurate by some, could equally be used in an attempted diagnosis. If taken as the full truth, Galen's accounts could be essential to a diagnosis if all present and excluded symptoms corresponded to a disease. It is the lack of such a perfect match which appears to have led to some criticisms. Mattern (2008:150) praises Galen's approach to his patients, both his skills as a physician and his documenting of symptoms. Galen's symptoms, though brief within his volume of works, are relatively detailed when not contrasted to modern medicine. In his *Method of Medicine* (5.12) Galen discusses in succession his attempt to treat the afflicted and the methods he took in examining the patient, but crucially the symptoms of coughing, a sore trachea, catarrh, the coughing up of hot but not very fresh blood, internal ulcerations, the expelling of a piece of the lining of the trachea, subsequent damage to the patient's voice, changing of appetite, vomiting in some, a stomach disturbance in all, exanthemata, the combination of exanthemata and bodily purging occurring in those who would survive, fever, dry sores, scabbing resembling ash which fall away to reveal healthy

skin which scars over within days in those with ulcerations, those without ulcerations had itchy, rough scabbing which fell like scales instead, similar to "lepra", presumably leprosy, and the duration of some symptoms. Gourevitch (2013:58) adds that in his *De atra bile* (4.1-12), Galen discusses the state of the patient's excrement. While he specifies that the excrement was black, he further details the timings, indications of impending mortality and the varied occurrences of pain or smell. This could be evidence of gastrointestinal bleeding or internal haemorrhaging (Gourevitch, 2013:58).

Beyond the plague, Galen was sensitive to his patient's body temperatures (for example Feb. Diff.1.3, 2.7, MM 10.3) pulse (for example Feb. Diff.2.7, MM 10.3, see his works on the pulse Diff.Puls., Dig.Puls., Caus.Puls., Praes.Puls.), humoral imbalances (for example Temp.2.6), expressions, skin pallor and focused on his patients' own wording of their ailments (for example MM 5.12), with his description of the Antonine plague remaining just as systematic in its coverage of the symptoms (Mattern, 2011:479, Flemming, 2019:227). While criticised for incorrect beliefs in humours, this should rather be a criticism of the time and context of his work than of his conclusions (Jackson, 1988:174). Even with Galen's "systematic coverage" of the Antonine plague symptoms, Littman (et al, 1973:249-252) finds a criticism in Galen's failure to mention whether these were raised or flat exanthemata, even after describing Galen's description of the exanthem as excellent (Flemming, 2019:227). However, this is again only in relation to the pursuit of a modern diagnosis. Approaching these symptoms from a non-medical perspective, without the expectations of conclusive symptoms and its biases, Galen's accounts are incredibly valuable.

### What was Galen trying to accomplish?

Galen's primary interest, according to Littman (et al, 1973:245,251), was the treatment, diagnosis and effects of the plague. Jackson (1988:174) criticises Galen's focus on the humoral symptoms, alleging the other symptoms of fever and pustules took "secondary importance". If the humoral symptoms were clearly his primary focus, it is unreasonable to criticise Galen's secondary focus on the symptoms for not taking primary importance. Galen's focus was evidently not the detailing of symptoms for future generations, unlike Thucydides', hence we should not hold his

work to this standard (Littman et al, 1973:244, Gilliam, 1961:227). Holding this expectation that a modern audience will find a detailed list of symptoms that were preserved under the attempt to inform a modern audience of the disease is unreasonable if this was not Galen's intentions. A more useful criticism to make of Galen's work is whether he accomplished what he intended to in his writings. Galen's approach to diagnosis was rigorous and evidently effective even without the use of a modern, medical setting (Mattern, 2011:479). But for example, one could argue that Galen's accounts, such as his lack of explanation concerning the exact qualities of the curative milk (*MM* 5.12), has hindered future readers in attempting to understand his cure and replicate its benefits. But if this was not Galen's intention it is unfair to criticise his accounts solely on this basis. His alleged omissions could be for a multitude of reasons. In the case of the milk, it may be a lack of insight into its exact medicinal properties. But equally, it may be down to his audience.

Galen was not writing for the average population, of his time or of a modern context (Littman et al, 1973:244, Gilliam, 1961:227). Galen's readership was his contemporaries, his friends and colleagues who knew him personally, equally elite, literate and educated members of Roman society (Nutton, 2020:98,124). These were evidently individuals who held Galen in high regard, but crucially these were individuals who also lived through the plague (Nutton, 2020:124). The absence in Galen's writings of a complete description of the disease likely stems from the fact that his readership was well informed on the plague, both its symptoms and societal effects, having lived through it alongside Galen. Equally, their degree of medical understanding, even if only through knowing of Galen and his achievements, could lead to many elements being omitted. It is equally possible that this lack of a complete description was not due to omissions but Galen himself. Galen may not have understood the full impact of the disease, nor have encountered every symptom of it. While this would be very unusual considering his standing, his extensive writings and his prolificity as an imperial physician, the insinuation that his descriptions are partial suggests he deliberately omitted elements. Due to the scarcity of comparable accounts, it is not conclusive that he did. Yet, it is highly probable that these omissions were down to his knowledge of his readership.

Galen's motive in writing his accounts may have been tied to his interest in epidemics, as well as demonstrating his capabilities as an imperial physician (Jackson, 1988:173). His Method of Medicine was not intended as a collection of detailed nosological records but as a collection of accounts on the methods of treating injuries and diseases, as explained in the title of the work: methodus medendi. It is evident, as will be discussed later, that Galen is flawed in his presentations of himself within his works. Galen's tendency to boast over his accomplishments strengthens his unreliability as an unbiased narrator of his accomplishments and so his accounts. Galen's almost fantastical diagnoses of tumours and miscarriages on pulse alone may be a demonstration of his skill as a physician but, considering his bias as the narrator, it is possible these accounts were exaggerated to serve his personal goal of inflating his accomplishments (Mattern, 2008:151, Flemming, 2019:220). In Galen's accounts of his life, he makes mention of divine visits (Nutton: 2024: 217). As a public figure within Rome, his accounts are biased considering his motive of aiding his self-image, such as his claims of Alexandria as unsatisfactory for his education even with its reputation within education, though he remained for many years (Matter, 2011:478, Nutton, 2024:217). Galen was evidently a competent physician, treating the likes of Marcus Aurelius, his son and household (Mattern, 2011:478). While Galen did treat patients of all ages, sexes and social classes, the majority of his writings were on patients of similar social standings to himself and his audience (Mattern 2011:479). Another crucial nuance is the possible influence of Galen's superiors, such as his return to Rome on the instruction of the emperor (Gourevitch, 2005:60).

Galen's intentions in his works are not specifically expressed, but it is evident he is not detailing a completely unbiased account of his endeavours. While this is a valid criticism of his reliability, this must also be accounted for in the context of his motives. Galen's motive was not to document the entirety of the symptoms for future generations, but likely instead to present his own reports of the plague to those equally familiar with its effects. It is therefore unreasonable to criticise Galen's accounts as not satisfying a modern medical audience. Galen's audience were his peers, who were aware of Galen's work and the lived experience of this plague. While it is reasonable to be disappointed in Galen's seemingly limited descriptions, it is unfair to criticise the limits of his accounts if this is not what he set out to achieve.

### Additional sources for the Antonine plague

The dismissal of Galen's accounts and the criticisms of his alleged inaccuracies is hindered by the lack of comparable contemporary sources. There is the frequent argument that Galen's descriptions of the disease are not detailed, however this criticism must be put into the context of the other available sources. Jackson (1988:174) criticises Galen's accounts as "sparing and disappointingly uninformative", "scattered and brief" and lacking precision in relation to the attempts at modern diagnosis, taking the unfairly personal but debatable stance that Galen has concentrated on the wrong symptoms. However, Flemming (2019:221) argues that all the surviving texts discussing the Antonine plague are "patchy and programmatic", the majority dating to centuries after the plague.

Beyond the medical context there are additional textual sources which discuss the impact of the plague, both later such as Ammianus Marcellinus (23.6.24) and contemporary such as Lucian (Alexander 36, Gilliam, 1961:231-232). But many of these sources are limited to a few lines and do not go into extensive detail, each supplemented by the author's own bias and motives. Eutropius' (Breviarium 8.12) account is in relation to the impact on the army, while Dio (Epit.71.2.4, 73.14.3-4, 73.15.1) mentions the extent of the plague and his estimated mortality rates. However, the work's genre as historical and its motives and biases are evident in Dio's discussion of the plague primarily in relation to emperors and political conspiracies, and the conspiracies of deliberate poisonings during the outbreak. Herodian (1.12.1-2) details the severity of the plague and the response of doctors, who recommended individuals use perfumes, incenses and herbs to prevent the inhalation of polluted air, though this is equally brief. Orosius' (7.15.5, 7.27.7) account is more extensive, though certainly exaggerated, detailing complete devastation across Italy and the armies of the frontiers with "nothing remained but ruins and forests". This exaggeration may come from Orosius' bias as a Christian, exaggerating this "pagan catastrophe" (Jackson, 1988:174, Gilliam, 1961:233). It is the limits of these alternative sources which lead to a debatable reliability, but crucially none of these references the symptoms of the plague.

Aristides (*Or.*48.38-45) details his personal experience with the Antonine plague, including his symptoms of an extreme burning sensation and a long recovery period. Crucially, Aristides does

discuss the lasting symptoms of the plague, something absent from Galen's accounts, of a sore pharynx and pain swallowing (*Or.*51.9). It is possible to interpret additional symptoms from his accounts, including delirium, dreams and restlessness (Gourevitch, 2013:64). Though initially presenting himself as selfless in his primary focus on the welfare of others, his focus shifts to a narrative with a clear personal motive. He details how, while afflicted with the disease, his mind remained firm compared to others (*Or.*48.39). Quoting the *Iliad*, comparing himself to the Homeric hero Eurypylus, Aristides' accounts are subject to his own bias and ego (*Or.*48.39). Furthermore, Aristides' (*Or.*48.40-42) accounts are questionably dramatized, such as his divine visit by Athena. While his documenting of his own symptoms is nonetheless beneficial to the modern historian, his dramatization introduces and air of unreliability to his account, though his lived experience is nonetheless valuable beyond a medical sense.

By comparing Galen's accounts of the plague to fellow physicians, it may be determined whether Galen was truly lacking in his documentation. A credible comparison could be Abū Bakr Muḥammad ibn Zakarīyā al-Rāzī, latinised to Rhazes (Flemming, 2019:236). Rhazes, in the latter part of 900 AD, discusses his treatment of the diseases jadari and hasbah, believed to be smallpox and measles (Flemming, 2019:236-237). Though writing significantly later, Rhazes' (KJH) discussion is more detailed. However, this could be a result of motives and audience, as discussed before in relation to Galen. The diagnosis of smallpox is stronger within Rhazes accounts, with the additional evidence of pockmarks which was crucially missing for Thucydides and Galen (Rhazes, KJH 11). Rhazes defends Galen from those criticising him for not mentioning the affliction of jadari, his praise of Galen appearing foremost in his work (KJH 1.1-2). The criticism that Galen's accounts pale in comparison to Rhazes' lengthy description is flawed. These were two different physicians from widely different contexts. While Rhazes praises Galen for his work, this does not inevitably correlate Rhazes' jadari to Galen's undetermined plague. Should the Antonine plague be confirmed as smallpox, the works of Rhazes could certainly be used in addition to Galen to build a greater understanding of smallpox in the ancient world. Crucially there was a notable pause in documentary evidence during the epidemic, hence Galen's significance, seen in diplomata, (fig. 6, fig. 7 in Duncan-Jones, 1996:124-125) inscriptions, (fig.8, fig.9, fig.10, fig.11 in Duncan-Jones, 1996:126-127) and

coin minting (fig.16, fig.17, fig.18 in Duncan-Jones, 1996:132-133). The documentation which remained included inscriptions, oracles, Egyptian taxation documents detailing population drops, and Egyptian administrative reports referring directly to the plague and its impact (Gilliam, 1961:234-235, 240, Duncan-Jones, 1996:119).

These documents and texts are valuable as a collective for the understanding of the plague and its impacts on Roman life. However, on an individual basis, these documentations hold limited evidence. The knowledge of these additional sources' flaws and biases allows for criticism of Galen's critics. These alternative texts provide little as regards the symptoms of the Antonine plague, leaving the primary, contemporary source of the plague's symptomology being Galen. Without his accounts, the modern understanding of the plague's symptomology would be severely lacking. Flemming (2019:225-226) explains that all literary engagements with illnesses, such as the Antonine plague, are subject to the narrator's own terms. These accounts are shaped by their private interests and biases. The critiques of Galen's accounts can be ascribed to many of these additional sources and frequently weaken under the understanding of the limits of the alternative evidence. Equally, the understanding that these complaints can be applied to these alternative sources suggest a ubiquitous issue in documentation in antiquity than simply Galen alone.

#### The flaws in Galen

A more robust criticism of Galen is not his alleged inaccuracies or partial descriptions, but his evident biases as discussed prior. An apparent bias is a constant within medical accounts of antiquity, in which a greater focus is put on the treatment of individuals than the documentation of the population (Flemming, 2019:230). This is the case within Galen's accounts of the Antonine plague. This leaves historians reliant on singular cases, often of elite men, to understand the symptoms of the disease which may well present with minute differences in different individuals. Galen does not mention falling ill (Flemming, 2019:231). Unlike Aristides, Galen presents himself as having the authority of other classical physicians through his alleged immunity and endurance in comparison to his patients. Furthermore, for such a seemingly deadly disease, Galen mentions no deaths under

his care (Gourevitch, 2013:59). This could be down to a bias in what he records, perhaps in relation to his motives or audience. Galen is equally selective in his accounts beyond the Antonine plague, primarily documenting patients of similar social standings, distinguished patients and intriguing cases (Nutton, 2024:228). In many cases, these seem to be used to demonstrate Galen's abilities as a physician, seemingly "bent on singing his own praises", linking his achievements to the great names of the past (Gourevitch, 2013:60, Nutton, 2024:227). His mentioning of divine interactions sows equal doubt as to his reliability, either through dramatization or delusion (Nutton:2024:217). However, as demonstrated previously, the other sources of the plague are equally as flawed.

Gilliam (1961:249) explains how accounts of pestilence encourage their writers to display their talents, crafting "highly coloured and extravagant" dramatized accounts. This is not a uniquely ancient problem, but merely a human flaw. A criticism of his reliability, founded in Galen's own biases, is much more constructive than simply questioning his symptoms. This allows for critical engagement with his accounts and use of him as a source for the Antonine plague, while remaining wary of the flaws in his works.

#### Conclusion

The criticisms of Galen's accounts seem heavily rooted in the smallpox assumption and modern historians' failures to diagnose the Antonine plague accurately. To critique these descriptions as inaccurate or partial is not productive when accounting for the limited alternatives. The nuances of Galen's motives and intended audience must be considered in utilising his accounts and the understanding of the limited additional evidence further grounds Galen's value as a source. Galen was evidently a skilled physician, but nonetheless he was not immune to the human flaws of bias, boasting and unreliability. Understanding and examining these nuances, rather than dismissing them, provides a more constructive scholarly practice. All accounts of the Antonine plague must be treated with scrutiny, but to allege Galen to be "disappointingly uninformative" is limiting (Jackson, 1988:174). If we broach his accounts with no preconceptions, and with the understanding of these nuances, Galen's medical accounts are invaluable.

## **Primary Bibliography**

- Abú Becr Mohammed ibn Zacaríyá ar-Rází, *A treatise on the small-pox and measles*, 1848, Greenhill, W. A., England, Sydenham Society.
- Ammianus Marcellinus, Ammianus Marcellinus, 1935, Rolfe. J. C., London, Cambridge.
- Aristides, Aelius, *Orations*, 1968, Behr, C. A., 1968, Aelius Aristides and the sacred tales, A.M. Hakkert, Amsterdam.
- Dio, Cassius, Roman History, 1955, Cary, E., Vol. 9, William Heinemann LTD, London.
- Eutropius, Breviarium, 1886, Watson, J. S., London, George Bell and Sons.
- Galen, *De Atra Bile*, 1937, de Boer, W., Galeni de propriorum animi cuiuslibet affectuum dignotione et curatione / de animi cuiuslibet peccatorum dignotione et curatione / de atra bile, Leipzig, Teubner.
- Galen, *De febrium differentiis*, 2004, Wernhard, M., uber die arten der fieber in der arabischen version des ounain ibn Ishaq, Ludwig-Maximilians-Universität, München.
- Galen, *De pulsuum differentiis*, 2024, Johnston, I., Papavramidou, N., Galen on the Pulses, Walter de Gruyter GmbH, Berlin/Boston.
- Galen, *De dignoscendis pulsibus*, 2024, Johnston, I., Papavramidou, N., Galen on the Pulses, Walter de Gruyter GmbH, Berlin/Boston.
- Galen, *De causis pulsuum*, 2024, Johnston, I., Papavramidou, N., Galen on the Pulses, Walter de Gruyter GmbH, Berlin/Boston.
- Galen, *De praesagitione ex pulsibus*, 2024, Johnston, I., Papavramidou, N., Galen on the Pulses, Walter de Gruyter GmbH, Berlin/Boston.
- Galen, *Method of medicine*, 2011, Johnston, I., Horsley, G. H. R., Cambridge, Harvard University Press.
- Galen, On temperaments, 2020, Johnston, I., Cambridge, Harvard University Press.

- Herodian, *History of the empire Herodian*, 1969, Whittaker, C. R., Cambridge, MA, Harvard University Press.
- Orosius, Seven books of history against the pagans: the apology of Paulus Orosius, 1936, Raymond, I. W., Columbia University Press.
- Pliny the Elder, *The Natural History*, 1855, John Bostock, London. Taylor and Francis, Red Lion Court, Fleet Street. 1855.
- Thucydides, *History of the Peloponnesian War*, 1843, Hobbes, T., Molesworth, W., The English works of Thomas Hobbes of Malmesbury, London, J. Bohn.

# Secondary bibliography

- Crosby, A. W., Kiple, K. F., 1993, 'Smallpox', *The Cambridge World History of Human Disease*, Cambridge, Cambridge University Press, pp. 1008–1013.
- Duncan-Jones, R. P., 1996, 'The impact of the Antonine plague', *Journal of Roman Archaeology*, 9, pp. 108–136.
- Flemming. R., 2018, 'Galen and the Plague', Galen's Treatise Περὶ Ἀλυπίας (De indolentia) in Context, Brill, pp. 219-244.
- Gilliam, J. F., 1961, 'The Plague under Marcus Aurelius', *American journal of philology*, 82(3), pp. 225–251.
- Gourevitch, D., 2005, 'The Galenic Plague: a Breakdown of the Imperial Pathocoenosis:

  Pathocoenosis and Longue Durée', *History and philosophy of the life sciences*, 27(1), pp. 57–69.
- Gourevitch, D., 2013, *Limos kai loimos. A study of the galenic plague*, Paris, éd. De Boccard, Histoire des sciences médicales.
- Haeser, H., 1882, Lehrbuch der Geschichte der Medicin: und der epidemischen Krankheiten/von Heinrich Haeser: 3, Germany, Hermann Dufft, 1875-1882.

- Hirsch, A., 1883, *Handbook of geographical and historical pathology*, London, New Sydenham Society.
- Hopkins, D. R., 1983, *Princes and peasants: smallpox in history*, Chicago, University of Chicago Press.
- Jackson, R., 1988, *Doctors and diseases in the Roman Empire*, British Museum Publications.
- Jackson, M., 2011, *The Oxford Handbook of the History of Medicine*, Oxford, Oxford University Press.
- Littman, R. J., Littman, M. L., 1973, 'Galen and the Antonine Plague', *American journal of philology*, 94(3), pp. 243–255.
- Littman, R. J., 2009, 'The Plague of Athens: Epidemiology and Paleopathology', *The Mount Sinai journal of medicine*, 76(5), pp. 456–467.
- Mattern, S. P., 2008, Galen and the rhetoric of healing, Baltimore, Johns Hopkins University Press.
- Mattern, S., 2011, 'The art of medicine: Galen and his patients', *The Lancet (British edition)*, 378(9790), pp. 478–479.
- McNeill, W. H., 1977, Plagues and peoples, 1st edition, Oxford, B. Blackwell.
- Morgan, T. E., 1994, 'Plague or Poetry? Thucydides on the Epidemic at Athens', *Transactions of the American Philological Association* (1974), 124, pp. 197–209.
- Nutton, V., 2020, *Galen: A Thinking Doctor in Imperial Rome*, 1<sup>st</sup> edition. United Kingdom: Routledge.
- Nutton, V., 2024, 'The Life and Career of Galen', *Ancient Medicine*, 3<sup>rd</sup> edition, United Kingdom: Routledge, pp. 174–184.
- Van Rooyen, C. E., 1948, Virus diseases of man, New York, T. Nelson.
- Zinsser, H., 1935, Rats, Lice and History, Bantam Books, New York.