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Author(s): P. Salway and W. Dell

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PLAGUE AT ATHENS

By P. SALWAY *and* W. DELL

THE recent revival of interest in the Athenian Plague¹ suggested to us that it would be worth while re-examining the evidence. The very fact that it has troubled so many scholars in the last hundred years lends it a certain distinction, but their conclusions are so contradictory and unsatisfactory that many have agreed with Poppo 'eam rem diiudicare non grammaticorum atque interpretum est, sed medicorum'. Yet it is clear that the inquiry can hardly be effective without co-operation between classical and medical men.

Although several ancient authors either describe the Plague of 430–427 B.C. or draw upon it for literary material, none was contemporary with it except Thucydides, who almost certainly was the source from which the others drew. Fortunately it is generally agreed that Thucydides' description² is a masterpiece of scientific observation. He had excellent opportunities, since, as he himself says, he both suffered from it himself and 'watched its course in others'.³ Furthermore his account was deliberately written to assist diagnosis should the disease recur.⁴ Lacking other contemporary literary evidence we are forced to accept Thucydides as being as accurate as possible under the conditions of his times. Since there are mercifully no controversial passages in the text which affect the interpretation—and we lay no claim to any qualification to judge in textual matters—we have taken the Oxford text as it stands.

The symptoms of the Plague are, for the most part, so clearly stated by Thucydides that it is unnecessary to set them out in full here, but it is worth drawing attention to certain features. The most notable is the variety of symptoms present, making it extremely difficult to classify—the greatest problem to the early investigators. Though the early stages of the disease seem febrile and eruptive, the external temperature is not high but there is an acute burning sensation internally. Nervous symptoms are pronounced, including mental disturbance leading to attempts by the patient to throw himself into water, prolonged insomnia and its attendant depression, and as a complication temporary loss of

¹ D. L. Page, 'Thucydides' Description of the Great Plague at Athens', *Classical Quarterly*, n.s. iii (1953), 97–119; J. F. D. Shrewsbury, 'The Plague of Athens', *Bulletin of the History of Medicine*, xxiv (1950), i. 1–25. We are indebted to Prof. Page for allowing us to read his paper in manuscript and for much help and encouragement, and to Mr. G. T. Griffith for the second reference.

² ii. 48 ff.

³ ii. 48. 3.

⁴ *Ibid.*

memory. Serious internal effects appear in the second and third stages, including intestinal ulceration. Particularly interesting is that in some cases gangrene of the extremities seems to have been produced. Lucretius' *vivebant ferro privati parte virili*¹ is probably a misunderstanding, or possibly adaptation for poetic effect, of Thucydides' καὶ πολλοὶ στερισκόμενοι τούτων διέφευγον.² Bailey confirms this view in his commentary,³ but in his Addenda⁴ says 'Maas points out that στερισκόμενοι in Thucydides probably means that the extremities were cut off by the surgeons; in that case Lucretius' rendering is accurate'. There does not seem to be any positive evidence to support Dr. Maas's theory. Thucydides emphasizes⁵ the lack of nursing care, let alone surgical, and does not associate those who suffered this effect with any attempted remedy. Furthermore Lucretius omits one detail:⁶ κατέσκηπτε γὰρ ἔξ αἰδοῖα καὶ ἔξ ἄκρας χεῖρας καὶ πόδας, καὶ πολλοὶ στερισκόμενοι τούτων διέφευγον, εἰσὶ δ' οἱ καὶ τῶν ὀφθαλμῶν. 'For the disease descended upon the genitals, the fingers and the toes, and many recovered but lost these, and others too their eyes.' Στερισκόμενοι is obviously used as a general word for deprivation. If Maas's theory be accepted it must also be applied to the eyes. The most reasonable interpretation is that the extremities at least were affected by gangrene. Even if amputation of the extremities were meant gangrene might still be the reason.

Professor Page lays special emphasis on three features of the Plague: lack of prostration at an early stage, of delirium, and of dysentery. The first, while worthy of notice, is not of great significance as the degree of prostration in any disease will vary from patient to patient. It seems reasonably certain that dysentery was not present. Thucydides specifies diarrhoea, διάρροια, which is clearly differentiated in the medical writers from δυσεντερία. Yet the occurrence of intestinal ulceration or inflammation might well have caused discharges similar to dysentery. Delirium proper is mental excitement and disturbance due to fever. While Thucydides does not use the expressions commonly employed in the Hippocratic Corpus to denote what is apparently delirium, for example παραληρέω, παρακρούω, he mentions features which certainly indicate considerable mental disturbance which cannot be far off delirium. A noteworthy feature is that the Plague could attack and prove fatal to birds and animals.

¹ vi. 1209.

² ii. 49. 8.

³ Cyril Bailey, *Titi Lucreti Cari De Rerum Natura* (Oxford, 1947), iii. 1734.

⁴ Op. cit. iii. 1759.

⁵ ii. 51. 4.

⁶ The fact that he also adds symptoms not in Thucydides is more likely due to poetic licence than independent sources.

In diagnosis two considerations are to be borne in mind, the physical conditions at the time of the outbreak, which will be examined below and which were almost ideal for an epidemic, and the possibility that the disease may now be either extinct or so altered as to be unrecognizable. This is no more than distantly possible without the intervention of medicine developed to a degree that is only now being attained. Moreover it is only on such an assumption that this inquiry can proceed at all. It is also conceivable that the Plague was a combination of diseases. Such coincidences are not unknown, nor is the development of a case of one disease into one of another.

The name 'Plague' has unfortunately been responsible for the idea that it was bubonic plague. Despite the mental and nervous symptoms the lack of the characteristic buboes tells against it. To practically all the other theories that have been advanced equally decisive objections exist.

The latest and most interesting diagnosis is acute measles, the theory of Professor Shrewsbury, followed by Professor Page. As normally seen the symptoms are not encouraging to this. It hardly ever attacks adults, the temperature, after a slight early decline, remains at 102° – 103° until the sixth day, and though in severe cases convulsions are known these are a feature of the onset. Conjunctivitis and diarrhoea sometimes occur, but are complications. On the other hand it is known that measles attacks animals.

A rather different form of measles is described by Professor Shrewsbury. His diagnosis is based on a theory that when diseases attack a 'virgin' community, that is, one previously free from them, they present a far more serious aspect than where they are endemic. For measles he chiefly cites an epidemic in the Fiji Islands in 1875, for which the primary sources are the papers of officials and the notes of a Wesleyan minister, the Rev. Mr. Webb. Unfortunately the only medical report is not by an eyewitness. In the reports of those who were present the most notable feature quoted by Professor Shrewsbury is the recurrent observation that the patients frequently attempted to immerse themselves in water, with the result that many died of pneumonia. Contrary to the usual behaviour of measles it attacked all ages.

Despite the many similarities to the Plague there are weaknesses in the theory. In other epidemics of measles in 'virgin' communities, as Shrewsbury himself mentions, there is no sign of attempted immersion. The epidemic he quotes in Oxford in 1577 has this feature, but in general looks much more like ergotism, to which reference will be made later.

The greatest difficulty is with regard to gangrene, which has already been shown probably to have occurred in the Plague. For the measles

theory to be tenable it must be shown that gangrene is observed to occur in such a form as to produce the effects mentioned by Thucydides. In the reports on the Fijian epidemic there is no specific mention of gangrene, but Shrewsbury infers from Webb's description of the disease as 'loathsome' that gangrene must have been present. However, the vomiting and diarrhoea, apart from the undoubtedly foul condition of the houses, may have been sufficient to call forth this epithet. Shrewsbury attributes the absence of mention of gangrene in the official documents to a desire on the part of officialdom to forget the epidemic.

Shrewsbury refers to Osler and McCrae as saying that gangrene has been noted in cases of measles. However, it appears that the type which has occurred is a skin gangrene of certain areas, usually about the mouth or vulva ('noma'), and occasionally of the lung, pharynx, and prepuce.¹ Cases of noma are almost always children. Noma of the mouth is the commonest, and it seems incredible that Thucydides would have missed so conspicuous a phenomenon. None of this explains Thucydides' στερισκόμενοι.

An additional difficulty is that measles almost always confers immunity from further attack,² while Thucydides specifically states that this was not so with the Plague but rather that second attacks were not fatal.³

For these reasons Professor Shrewsbury's diagnosis is not acceptable, and we must look elsewhere. So far we have tacitly assumed that the Plague was an infectious disease. Thucydides states that men caught, ἀναπιμπλάμενοι, the disease while nursing one another.⁴ This cannot be dismissed lightly because Thucydides was an outstandingly acute observer, but it seems possible that with the mechanism by which diseases are transmitted as yet unknown even the most careful person might mistake another form of widespread and sudden illness for an infectious disease. Poisoning on a large scale is the most obvious of these, and it was in fact suspected that the Spartans had poisoned the cisterns.⁵

In favour of the Plague's being infectious is Thucydides' statement that it started in Ethiopia and passed into Egypt and Libya and thence throughout the Persian Empire, and that it started at Athens in the Piraeus.⁶ However, it is notable that Thucydides qualifies his statement on the origins by ὡς λέγεται, and the identity of the Ethiopian with the

¹ W. Osler and T. McCrae, *A System of Medicine* (1915), i. 907; T. K. Monro, *Manual of Medicine* (1925), 58; G. Dieulafoy, trans. V. E. Collins and J. A. Liebmann, *A Textbook of Medicine* (1910), ii. 1606.

² J. F. Schomberg and J. A. Kolmer, *Acute Infectious Diseases* (2nd ed., 1928), 583. ³ ii. 51. 6. ⁴ ii. 51. 4. ⁵ ii. 48. 2. ⁶ Ibid.

Athenian plague is not proved. The latter is quite unlike the former in that it did not spread rapidly outside Athens. If it was infectious, it is strange that the other cities of the Athenian Empire did not suffer. The problem of the outbreak at Potidaea will be discussed below. The outstanding difficulty in the infectious disease theory is the fact already demonstrated that the known infectious diseases will not fit the symptoms.

The conditions prevailing at the time may give a clue. The Spartan invasion drove the country population, the majority of the citizens, into Athens, where they squatted in appalling conditions. Following the usual method of warfare at that period the enemy laid waste the crops to try to force a battle. The inhabitants must have carried on the cultivation of the land in between invasions as there always seem to have been crops to destroy. These were probably mainly corn and vegetables, for vines and olives, once damaged, need many years to recover.¹ Aristophanes' picture in the *Acharnians* suggests that despite Dicaeopolis' garlic there was a shortage of fresh vegetables and certainly of such dainties as fowl, game, and the Copaic eels. Euripides' mother must have been sorely out of business! Shortages of fish may also have occurred, since Greek fishing was from small boats close inshore. During the Spartan invasions access to the shores of Attica was presumably as restricted as to the countryside.

The staple item in the Athenian diet was flour in various forms—as foreigners complained! It was the regular importing of grain by sea that made the Peloponnesian policy fruitless. There cannot have been very much left of the Attic crops when the Spartans left, for they relied on living off the land, as the fiasco of 425 B.C. shows. What they did not want they would normally burn. Nevertheless the Athenians must have salvaged some of their crops, since it was not till the occupation of Declea in 413 B.C. that the countryside was closed to them for more than a few weeks at a time.² Most of the grain, however, must have been imported.

When the various possible sources of poisoning are considered, food and water seem the most promising. Pollution of water supplies is possible, but raises the question of how those men who were away from Athens on expedition were affected. If the water at Athens were the cause the Plague could only be an infectious disease. With food, however, it is different. Presumably ships carried a certain amount of flour on board—large expeditions undoubtedly did.³ Three sets of Athenians apart from those at home are mentioned as suffering from the Plague:

¹ A. Zimmern, *The Greek Commonwealth*, 5th ed. (Oxford, 1931), 54.

² vii. 27. 4.

³ vi. 22.

those in the naval expedition to Laconia in 430 B.C.:¹ those whom Hagnon took to Potidaea that year; and, after their arrival, the men already besieging Potidaea.² This suggests a common origin in Athens, which might well be polluted grain.

Of the toxins which can be present in products made from grain, one is worthy of notice. Ergot, the sclerotium of the parasitical fungus *claviceps purpurea*, appears chiefly on rye though sometimes on other cereals and grasses.³ In England in 1762 it appeared at Wattisham on wheat, in Sweden it has occurred on barley and apparently oats, and in Germany on wild grass growing among the crops. The cause of the fungus appearing in flour is neglected crops and careless milling.

From meal ergotized in this way ergot poisoning or ergotism can result. The drug can either be taken in very small doses over a long period or in a single, still small, dose. Thus a small quantity can affect a large number of people. The latter method is clearly seen in the French outbreak at Pont Saint-Esprit, in 1951. Although large numbers of people had been affected in previous outbreaks elsewhere, this is one of the few for which we have reports based on modern methods.⁴

Ergotism is remarkable for the variety of symptoms it can produce, a variety probably due to the differing ratios of the active constituents in different samples of ergot. The disease is usually divided into two types, gangrenous and nervous, but at Pont Saint-Esprit the two seem to have been combined. Many of the symptoms show a remarkable similarity to those mentioned by Thucydides. The early stages include general depression, abdominal pains and digestive disturbances, pharyngeal constriction, and acute sweating crises. The patients were pale in colour and cold at the extremities, while the temperature was in general low. Pains were sometimes present in the neck and mydriasis was common at this stage.

These were followed by nervous effects—persistent insomnia, and an intense sensation of burning internally—and by a peculiar and unpleasant odour. Some of the patients recovered at this stage, but in others the disease proceeded further. Other severe nervous symptoms appeared, notably continued coldness of the extremities together with painful cramps of the calves. These last the weight of the sheets appeared to aggravate.

¹ ii. 57. 1.

² ii. 58. 2.

³ G. Barger, *Ergot and Ergotism* (1931), 112 ff.; C. Creighton, *A History of Epidemics in Britain* (1891), 58.

⁴ H. Gabbai, —. Lisbonne, and H. Pourquier, 'Ergot Poisoning at Pont Saint-Esprit', *British Medical Journal*, 15 Sept. 1951, 650-1. Over 200 inhabitants, out of 4,000, were attacked (*B.M.J.*, 8 Sept. 1951, 596).

This stage was followed by mental disturbance culminating in delirium, which in some cases led to suicidal attempts. There were concomitant spasms and convulsions. Most significantly gangrene of the toes was observed at a late stage of one case. These symptoms varied widely in their incidence from patient to patient. Moreover it was observed that some animals that had eaten the contaminated bread died in convulsions.

In other outbreaks further symptoms have been noted. Gangrene, particularly of the extremities, is quite common, caused by the powerful contraction of the arteries under the influence of ergotoxine, one of the alkaloids contained in ergot.¹

A yellow colour of the face is also known to occur frequently, as well as severe diarrhoea. The latter is often the precursor of death. What is most important is that the skin is sometimes affected, blisters appearing on the hands and feet. With these have been associated large purple spots. These affections of the skin are significant, for they introduce the eruptive element which is so striking a feature of the Plague in being associated with the inguinal symptoms.

A contributory factor to many of the symptoms of ergotism may be vitamin deficiency, particularly of vitamin A. This can produce degeneration of the mucous membrane of the air passages and intestines, corneal ulcer, paralysis, and other symptoms. Such deficiency has been noted in association with outbreaks of ergotism, though Pont Saint-Esprit may suggest it is not an essential condition. Nevertheless the conditions at Athens with a probable shortage of fresh vegetables and fish may be significant in this context, though the situation is unlikely to have been the same at Potidaea.

Of three points in the Plague emphasized by Professor Page, two certainly appear in ergotism. Diarrhoea has been mentioned above, and lack of prostration at an early stage is as common in ergotism. At Pont Saint-Esprit patients were capable of movement at a late stage. It is not to be denied that at Pont Saint-Esprit the nervous and mental symptoms were much more prominent than at Athens, but it appears this is by no means invariable in ergotism. In medieval epidemics the attempts of patients to cast themselves into water is a feature particularly noted.

After the similarity of ergotism to the Plague had been realized a footnote by J. H. Finley² came to our notice. He states that the Plague was diagnosed as ergotism by Kobert, and that the same theory had been put to him by Mr. Stephen Madey of the Harvard Medical School.

¹ *British Pharmaceutical Codex* (1949), 325, s.v. 'Ergota'.

² J. H. Finley, *Thucydides* (Cambridge, Mass., 1942), 158, note 2.

It appears, however, that Kobert believed that the Plague was not ergotism as such, but smallpox acting on a population suffering from latent ergotism and producing gangrene. But Thucydides makes no mention of the disfiguration caused by smallpox, which could not have escaped his notice.

Mr. Finley doubts the ergotism theory because he thinks the Plague was probably infectious, and because rye does not seem to have been used for bread in the Mediterranean area in antiquity. The first has been considered. The second objection is not as serious as it appears. The Greeks ate coarse grains in many ways, and Galen mentions rye as a crop in Thrace. Under the circumstances the Athenians may have had to make do with grains inferior to their normal varieties. Much more important is the fact already mentioned that ergotism need not come from rye.

If ergotized grain was the cause, whence did it come? The difficulty of assuming Pontus, the normal source of Athenian corn, is that other states imported Pontic grain yet did not suffer from the Plague.¹ However, particular districts may have produced specifically for the Athenian market. On the other hand, the salvaged crops of Attica, doubtless in poor condition and hurriedly harvested, may have been responsible. Only a little infected grain need have been mixed with the main supplies to cause the outbreak. A small surplus left over from Hagnon's voyage may similarly have spread it to the army outside Potidaea. Again, under the difficulties of war Athens may have been forced to seek supplies from new sources. The cessation of the Plague for the one year 428-427 B.C. can be explained by variations in the physical conditions producing ergot on the plants or by accidents of harvesting and supply. A feature of outbreaks of ergotism is their sudden and often inexplicable appearance.

Our conclusion therefore is that, despite some discrepancies between the symptoms of the Plague and those of ergotism and despite the greater ease of assuming an infectious disease, ergotism is more satisfactory than any of the other theories that have been brought forward. It cannot be claimed that an unassailable solution has been found, but we hope that it may be deemed worthy of consideration, if only in that it brings out some hitherto unnoticed features.

ADDENDUM

Sir William MacArthur's claim for typhus and Professor Page's comment thereon appeared too late to be taken into account in the foregoing

¹ We owe this point to Mr. A. G. Woodhead.

article, but require a note.¹ Professor Page rightly rejects typhus, but, I think, for the wrong reason. Sir William emphasizes the point that several of the symptoms individually suggest mental disturbance and taken together can hardly represent anything else. On the symptoms alone Sir William makes out a strong case for his diagnosis, but his concluding paragraph suggests an objection which seems insuperable. He says, 'In Europe typhus has broken out with unfailing regularity in time of war, especially in stationary armies or crowded cities, because these are the conditions in which lice multiply and spread rapidly If in these conditions the Athenians escaped typhus, their experience must be unparalleled in the history of war in Europe.' If in fact typhus broke out 'with unfailing regularity' in Greek wars it is very odd that Thucydides treats the Plague as something very extraordinary, and one would expect to hear of many other outbreaks in similar circumstances (at Plataea in 429 B.C., for example, or in the great siege of Syracuse later in the war). But while Thucydides mentions that the Plague *was said* to have occurred in many places around Lesbos and elsewhere and that the present outbreak *was said* to have originated in the Persian Empire (he does not commit himself to accepting these statements), he specifically states that no epidemic on such a scale with such mortality was remembered anywhere.² The primary purpose of his account is to permit it to be recognized 'if it should ever recur'. It seems highly improbable that in that troubled age typhus should restrict itself almost entirely to the Athenians and appear for a comparatively short time only.

P. S.

¹ *Classical Quarterly*, N.S. iv (1954), 171 ff., 174.

² ii. 47. 3.

THE CAMBRIDGE GREEK PLAY, 1956

THE *Bacchae* of Euripides will be performed in the original Greek by members of the University at the Arts Theatre, Cambridge, at 2.15 and 8.0 p.m. on 21-25 February 1956 (except on the evening of Thursday, 23 February). Mr. Alan Ker will be the producer. The music will be by Mr. Peter Tranchell, and the scenery and costumes by Dr. Malcolm Burgess. An acting edition is being published by Bowes and Bowes with the prose translation of Mr. D. W. Lucas.