Definition: **plague** from *Philip's Encyclopedia*

Acute, infectious disease of humans and rodents caused by the bacillus *Yersinia pestis*. In humans, it occurs in three forms: **bubonic** plague, most common and characterized by vomiting, fever and swellings of the lymph nodes called 'buboes'; **pneumonic** plague, in which the lungs are infected; and **septicaemic** plague, in which the bloodstream is invaded. Treatment is the administration of vaccines, bed rest, antibiotics and sulpha drugs. See also Black Death.

Summary Article: **Plague, Historical** from *International Encyclopedia of Public Health*

This article spans the total known history of plague from the question of original homeland to the present day and presents main points of its microbiology, epidemiology, and medical manifestations, as well as plague’s basis in rodents and rat fleas, and the typical constellation and interaction of epizootic and epidemic developments. The historical manifestations of plague disease are entirely compatible with modern bubonic plague; the new scientific discipline of paleomicrobiology has in a considerable number of studies over the last decade proved that historical plague epidemics were bubonic plague caused by *Yersinia pestis*, biovar *Orientalis*. The rhythm of epidemics in the two certain historical plague pandemics, namely the first pandemic, often called the Justinianic, of 541-767 and the second pandemic of the period 1346-1722 are outlined and explained. Evidence on mortality is presented and discussed. Also the main aspects of the aborted third pandemic in the period c. 1894-1940 is presented and the breakthroughs of modern medical and microbiological research associated with it.

**Keywords**

- Epidemiology
- History of plague
- Medical manifestations
- Microbiology of plague
- Mortality
- Origin of plague
- Pandemics of plague
- Plague

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Why Plague Can Be Important in History

A disease can be historically important only for its mortality effects. Thus, it must be a communicable disease that combines tremendous powers of spread with huge case-fatality rates (lethality). Sharp and long-run reduction(s) of populations caused by recurrent epidemic disease with such properties can cause profound and comprehensive changes and transformations of basic structures of societies and civilizations. It can also change the balance of power and cultural exchange between ravaged and unravaged societies and civilizations. Thus, epidemic disease can unleash long-run societal changes that can shape or hasten on the advent of new social formations (social systems) and mold central lines and directions of historical developments - in short, make history.

Bubonic plague is the only disease studied and discussed in this perspective. The primary pneumonic droplet-spread mode of plague that may arise from septicemic bubonic cases (with plague bacteria in the blood stream) has very low communicability and is of no consequence in this context. (Clearly, the sudden introduction of many new serious but less lethal diseases to a region may engender much the same effects, as happened in Mesoamerica in the wake of the Spanish conquest.)

Nature and Pattern of Spread of Bubonic Plague

Plague is caused by a bacterium called *Yersinia pestis* and is basically a disease of rodents. Areas or regions where plague circulates continually in large wild rodent populations are called ‘plague foci’ (plague reservoirs). Interaction between diseased wild rodents and black rats, *Rattus rattus*, also called house rats and ship rats, introduces plague contagion in the habitation and habitats of human beings and gives rise to plague epidemics. In plague epidemics, contagion is transmitted to human beings by fleas of the black rat, principally *Xenopsylla cheopis*. This occurs when such fleas have been infected by drawing highly septicemic blood, causing development of a blockage of the stomach system that forces them to regurgitate back into the bite wound new feeds together with bits of the blockage that contain many thousand plague bacteria. In the large majority of cases, plague contagion introduced into the bite wound will be drained through a lymphatic tract to a lymph node, which soon begins to swell and take form of a bubo. Epidemic occurrence of buboes is a diagnostic distinguishing feature, a defining feature of plague that allows certain identification.

Plague is a disease of the warm(er) seasons. This seasonality is a distinguishing feature of plague epidemiology, reflecting its epidemiological basis in rats and their fleas. This feature has two main causes. Temperatures below 5 °C stop the procreation of fleas and cause a rapid reduction in the population of rat fleas, in other words, the means of plague transmission. Furthermore, temperatures below 10 °C impede or prevent reproduction of plague bacteria in rats and in the stomach system of fleas so that fleas do not become infected, or become only insignificantly infected and do not develop blockage. These are data based on studies on modern fleas in tropical countries like India. One should take into account that animals with high reproduction rates and short life cycles have a considerable ability to adapt by selection to various environments and biological niches (biotopes). This evolutionary perspective is relevant for both (black) rats and their fleas. The properties of black rats and their fleas in modern India and in Europe and that of historical plague epidemics are probably not identical.

As should be expected, during the winter in Southern Europe, plague’s ability to spread is either strongly reduced or the epidemic disappears altogether. Disappearance is a regular feature of plague epidemics in areas with colder winter climates, in mountain areas like the Alps, and in Europe north of
about the 50th parallel (mid-Germany), and it is a systematic feature in Northern Europe. In Norway there never has been a case of a winter epidemic in the 300 years of the pandemic comprising over 30 waves of epidemics (Benedictow, 2002).

Rat fleas attack human beings and unleash a plague epidemic when the number of their rat hosts has been so sharply reduced by a plague epizootic that many do not find new rat hosts.

Because the black rat has a strong predilection for grain as food, *Xenopsylla cheopis* has by evolutionary selection developed the ability to live on grain debris and farinaceous elements. This property is a central factor in the spread of plague at a distance by trade of grain or farina by ship or land transport, because when the rats die of plague, infected fleas can live on for several weeks and attack rats on arrival.

In recent decades, some alternative but untenable ideas have been suggested with respect to the microbiological agent: that historical plague could, for instance, have been caused by Filoviridae, Ebola disease, or Marburg disease (Scott and Duncan, 2001) or by some unknown and since disappeared (and therefore untestable) virus (Cohn, 2002). The untenability of these alternative theories of the microbiological identity of historical plague epidemics is demonstrably shown by a number of defining features of bubonic plague that are also exhibited by historical plague epidemics as an ordinary clinical feature, such as buboes, inverse correlation between mortality rate and population density, seasonality (spreads in warm seasons), and latency periods (delay between introduction of contagion and the first case or delay between the first and second case and next case and epidemic developments). It is definitely demonstrated also by achievements of the new scientific discipline of paleomicrobiology. In the last decade, scholars of this discipline have published a number of papers reporting reclamation of DNA of *Yersinia pestis* from dental pulp taken from skeletal remains in plague graves. Three of the papers relate to the so-called first pandemic, the Justinianic pandemic (541-767), in Sens in the Paris region, Aschheim near Munich, and Vienna, respectively. Similar paleomicrobiological studies have been performed with material taken from ten sites of plague graves relating to the second pandemic, spanning the whole plague period from the Black Death to Marseilles 1720-22, all French. Since the development of this new discipline has been pioneered by French scholars, prominent among them Drancourt, Raoult, and Signoli, nine studies relate to southern France and one to Dreux in northern France, west of Paris. They have also succeeded in determining which of the three biovars (the main type) of the plague contagion *Yersinia pestis* was the (main) agent of the two historical pandemics, namely, the biovar *Orientalis*.

This is, thus, a rapidly expanding and very promising new field of research. It holds out hope as well for resolving the microbiological identity of the great epidemics that ravaged the Roman Empire and that here have been cautiously indicated could have been bubonic plague.

Another rapidly expanding and promising new field of research is archeological zoo-osteoarcheology. In recent decades, skeletal remains of the black rat dating back to the Roman period and the Middle Ages have been identified in large parts of Europe and all over Europe respectively, and also in the areas of medieval Sweden, Norway, and Denmark. All assertions to the effect that the black rat could only live in southernmost parts of Europe and that the historical plague epidemics could not therefore have been bubonic plague can now freely be rejected (and for other reasons as well).

The Origin and Early History of Plague

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Plague seems to have originated in southeastern Africa or in the western coastal region on the Red Sea of the Arabian peninsula where there are ancient plague foci. One should expect that plague would spread out of these foci first to northern Africa and the Middle East. Probably, plague is first mentioned in the Bible, in I Samuel 4-6 and corresponding texts of the Septuagint that relate to events in the 12th century BC.

Correspondingly, the oldest medical descriptions of plague are found in case-oriented descriptions in classical medical writings that traditionally are ascribed to Hippocrates, a mythical Greek physician who lived around the middle of the 5th century BC. However, studies have shown that these texts were written by several physicians, some of whom must have lived in the following centuries. Nonetheless, technically, this opens the possibility that the much-discussed account by Thucydides of the so-called “plague of Athens” in 430 BC that raged at the time of the Peloponnesian War could have been bubonic plague. This hypothesis is strengthened because Thucydides asserts that the disease came out of Ethiopia, which in the loose geographical notions of the time could be taken to mean southeastern Africa in a broader sense and refer to the ancient plague focus there. However, the diagnostic description does not really fit with bubonic plague, and the Greek term translated traditionally by ‘plague’ has the general meaning of ‘epidemic,’ which could, however, reflect that it was a new disease and therefore had not acquired a name of its own.

Hellenistic (323-30 BC) medical writings contain a certain description of a plague epidemic in North Africa around 300 BC and again repeatedly later. Around the year 100 AD, the leading Greek physician Areteus of Cappadocia described epidemic plague within his Hippocratic medical frame of reference “the epidemic buboes in the groin are caused from the liver; they are very malign.” Cappadocia, where he grew up, contained the end of the plague focus that stretches from the Persian Gulf all the way into southeastern Asia Minor (Turkey) that here will be called the Middle Eastern plague focus (see following discussion). The works of Rufus of Ephesus, a physician of the first century AD who lived on the western coast of Asia Minor (Turkey), include a certain description of plague in Egypt, Libya, and Syria.

Good or certain diagnostic descriptions of plague disease are much older in the region comprising North Africa, the Middle East, and the Near East than in China, where plague is first mentioned in an identifiable way in 610 AD, again in 652 AD, and then not again until 1642, or in India, where it is first mentioned in an identifiable way in the 11th century AD and then no new mention until 1615.

A Catastrophe Waiting to Happen

Today, there are permanent plague foci where plague circulates continuously in nature among wild rodents in much the same regions where plague is mentioned in the Bible and in classical medical writings, namely, in central Libya and in the eastern parts of the Middle East, where a plague focus, as mentioned, stretched continuously from western Persia into northern Iraq, eastern Syria, and southeastern Asia Minor (Turkey). Undoubtedly, these plague foci are of long standing. Plague could also be episodically transported from the old plague foci in southeastern Africa and western Arabia via caravans moving all the way to the large Egyptian seaports, especially Alexandria and Pelusium. Alexandria was the most vulnerable to contamination transported along the caravan route via Ethiopia and Sudan, and Pelusium on the eastern debouche of the Nile may have been more exposed to contamination from the Arabic plague focus along the Red Sea, especially by ship. Thus, plague epidemics must have been a catastrophe waiting to happen for wider areas, dependent on the establishment of interregional economic and political integration and busy trade lines for wider...
dissemination.

The Roman conquest of these regions established these conditions and must have exposed the empire to importation and spread of plague. Numerous finds of skeletal remains show that black rats accompanied Roman legions into those regions where this species was not already present, all the way to England, to the borders of Germany, and by trade also into the Germanic and Slavic regions further to the east. Furthermore, the establishment of a continuous huge export of grain from Egypt to Ostia, the seaport of Rome, in order to feed Rome’s poor masses makes it convenient to assume that it would be highly likely or even almost inevitable that plague at some time would be introduced into the Roman capital and the Italian mainland with the numerous ships regularly arriving with their cargos of grain.

Did Plague Cause the Fall of the Western Roman Empire?

Emperor Marcus Aurelius (AD 161-180) sent an army against the Parthian Empire, which at the time included Persia and also the area of the plague focus stretching all the way from the Persian Gulf across eastern parts of the Middle East and into southeastern Asia Minor. His generals were victorious, but in 165 the returning army brought back a terrible epidemic disease that claimed many thousands of lives in Rome, spread widely in the empire, all the way from Persia to the Rhine River and Gaul, and was recurrent throughout his reign. Presumably, it was the same epidemic disease that struck under his successor Emperor Commodus, when it was reported that mortality in Rome often reached 2000 persons a day. In a population with a normal mortality rate of at least 4% that was, in addition, regularly visited by more or less serious epidemic diseases, only epidemics that caused very severe or disastrous mortality would be taken notice of. This is especially true in view of the fact that Roman chroniclers generally took little or only superficial notice of epidemic disease because this was not considered or regarded an important subject according to the humanistic ideals of writing in which they were trained. Extraordinarily severe epidemics could be briefly mentioned, but usually without any additional diagnostic or epidemiological information that today would allow certain identification of the disease(s).

However, chroniclers noted that new waves of very severe epidemics swept over the empire under the emperors Valerianus and Gallienus (253-266) and again under Emperor Diocletianus (284-305), when for the first time deserted tenements (agri deserti) are mentioned as a problem, and radical steps were taken to bind the free peasants to the land and to secure manpower for the legions. A somewhat unreliable source states that the epidemic came from Ethiopia, passing through Egypt on its way to Europe, and spreading all the way to Scotland; another source provides a very dramatic account of its ravages in Alexandria, which strengthens the credibility of the indicated geographical origin. Again, this can be seen in light of the ancient plague focus in southeastern Africa south of Ethiopia, the term ‘Ethiopia’ probably representing the diffuse limits of the author’s geographical knowledge of this part of Africa. It could also refer to an origin of the plague focus in Western Arabia. One should note that medieval and early modern Arabic authors time and again assert that plague originated in Ethiopia, providing, as stated by Dols (1977), the impression that plague was recurrent in Ethiopia during the Middle Ages and that it served initially as the center of transmission from other parts of Africa to the Mediterranean littoral by trade. One can only add that there is every reason to believe that this pattern of spread and recurrence was much older and that the establishment of the Roman Empire provided the dynamics that caused much wider spread and more frequent recurrence. Thus, again, the severity and recurrence of the epidemic disease and the indication of geographical origin conform to important
criteria for identification of the epidemics as plague, but cannot be considered sufficient criteria for
certain identification. The sources do not allow studies of the specific demographic effects of these
epidemics.

For fundamental reasons of the methodology of social science and historical sociology, analogies
cannot be drawn across the boundaries of historical periods or civilizations from the demographic
effects of the much better known late medieval plague epidemics, because great differences in
societal structures between the Roman and the late medieval civilizations imply corresponding
differences in the dynamics of spread and rhythm of recurrence and demographic effects. However,
plague may for the first time have exerted effects of great historical significance, because these
epidemics probably made at least a significant and quite possibly a substantial contribution to the more
or less continuous fall of the empire’s population from the second century AD. In the long run, the
negative demographic developments undermined both the economic basis and the basis of manpower
that were required to defend the borders and the political structure of the empire against frequent
invasions by various tribes and peoples. Within the prolonged and comprehensive societal processes
operating in the crumbling and fall of the western Roman Empire, a realignment and rejuvenation of
social and cultural structures adapted to the new circumstances began to emerge, and eventually around
500 AD matured into a discernible societal outline of early medieval Europe, the first phase of the
Middle Ages, the first historical period of a new European civilization.

The Plague Pandemic of 541-766: A Turning Point in History?

In the years 541-766 AD, the first plague pandemic identified with certainty ravaged the Byzantine
Empire, the surviving eastern part of the Roman Empire, including Asia Minor, much of Northern Africa,
the Middle East, and, in addition, large parts of the other regions surrounding the Mediterranean littoral.
Ireland and England were probably ravaged only in 664. Northern Frankland (France), most parts of
Germany, and the Nordic countries appear to have avoided the scourge altogether.

This series of waves of plague epidemics is usually called either the ‘Justinianic’ or ‘Justinian’ after
Emperor Justinianus in Constantinople at the time of the arrival of the first epidemic there in 541/542,
or the ‘early medieval plague.’ Since plague spread far outside Constantinople or the eastern empire,
and since it was not at all confined to Europe, for which the term ‘medieval’ designates the first
historical period of the new European civilization, both names are inappropriate. It is also called the
‘first plague pandemic’ and “that earlier plague” (Russell, 1968), which also is somewhat unfortunate
because these terms will tend to veil the important possibility that the severe epidemics hitting the
Roman Empire were plague. Here it will be called the plague pandemic of 541-766.

According to the maps provided by Biraben and Le Goff (1969), the series of waves of plague
epidemics constituting the plague pandemic of 541-766 had several origins, in the southeastern African
plague focus, in the Middle Eastern plague focus, and quite likely in some cases also in the Arabic
plague focus. The available source material for many of them is quite poor; thus, our knowledge of
some of them is quite unsatisfactory. This means that the microbiological identity of some of the
epidemics is uncertain and that for many of them the areas or regions affected are only partly or even
episodically known. It also means that it is certain that not all waves of plague epidemics are known.
According to the available sources (Biraben and Le Goff and Dols), the pandemic may have comprised
15-17 (known) waves of epidemics, in 541-4, 558-61, 570-5, 580-3, 588-92, 599-600, 608 (?), 618,
627-9, 638/9-40, 654, 688-9, 694-7, 699-700 (?), 716-9, 740-50, and 766. In addition, in the period

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638-745 there appear to have been some local outbreaks in Syria and Iraq that in all likelihood were due to infection from the local plague focus; however, their localized nature reduces their historical significance.

Importantly, the geographical incidence was noticeably skewed. Egypt and Syria were ravaged by plague four times and nine times, respectively, while Mediterranean Europe and Constantinople with western Asia Minor were ravaged 12 times and nine times, respectively. There is no indication that plague ravaged the Arabian peninsula. Taken together, these facts represent demographic perspectives with great significance for the understanding of the subsequent triumph of Islam (as is discussed in the following). The skewed incidence must reflect a much more developed commercial sector comprising much larger exchange of goods at longer distances in Constantinople with western Asia Minor and in Mediterranean Europe than in Arabia, the Middle East, and North Africa.

Although the incidence over time appears quite uneven, which could be due to incomplete information, it provides the basis for reasonably tenable and meaningful observations. The basic rhythm or structure of recurrence appears quite similar to that of the better known late medieval pandemic, but the average interval of about 14-15 years is considerably longer, which for several reasons is to be expected (as is discussed later). As in the next pandemic, the first disastrous outbreak appears to have occasioned most of the population decline; the epidemics following in the ensuing decades were quite severe, cutting down all tendencies of demographic recuperation and quite likely causing over time a further slight decline. Although the following epidemics appear to have had a more limited territorial spread and smaller overall demographic effects, the penultimate wave in the 740s was widespread and obviously caused severe mortality in the Middle East, in Constantinople, and on the western coastal regions of Asia Minor, in Greece, and southern Italy. The fact that new long-run population growth appears to have commenced in the wake of the last known epidemic of the pandemic can be seen as supporting this general outline.

The end of this pandemic in Europe was probably due to the Muslim conquest of North Africa and Middle East, which in 100 years’ time reduced sharply shipping and commercial exchange between these parts of the world, and also to the concomitant development of a manorial subsistence economy in Europe and the corresponding decline of urban culture, importation of goods, and intraregional commercial exchange.

Population Losses 541-766

There is no evidence suitable for direct demographic study of population losses with respect to either individual epidemics or the cumulative long-run effects. Chroniclers speak in general terms of enormous mortality or give rounded mortality estimates without providing evidential basis for their assessments, which therefore take on a general character of guesstimates (performed by persons untrained in demographic or statistical studies). The scholars who dare to approach the question of demographic effects and discuss the various bits of indirect evidence suggest that the first explosive wave of epidemics caused a population decline of one-fourth, one-third, or one-half, and that the ensuing epidemics of the sixth century appear to have cut down tendencies of population growth and caused further net decline, while later epidemics appear more or less to have produced a stationary net effect.

These assessments may be, or quite probably are, affected by usual views on the demographic effects and line of development caused by the late medieval plague epidemics. However, the available data make it reasonable to assume that the pattern of long-run developments actually was quite similar to

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the late medieval pattern. As for population losses, much will depend on how effectively these waves of plague epidemics were disseminated in the attacked territories. Is it reasonable to assume that they succeeded in blanketing countries and regions in the way that the Black Death and ensuing late medieval epidemics can be seen to have done? Undoubtedly, the dynamics of spread of the late medieval plague epidemics reflected the (often underrated) level of development of late medieval society, where capitalistic and proto-industrial dynamics (since the 12th century) had begun to mold social structures and stimulate urban developments and the dynamics of long- and short-distance economic and social exchange, a process leading to the transition to early modern society around 1500.

At the time of the pandemic of 541-766, in the countryside where the overwhelming majority of the population lived, the economic system was characterized, even increasingly characterized, by self-sufficient manorial subsistence economies and peasant tenancies, which must have served to weaken the epidemics’ powers of spread. Presumably therefore, districts and regions in this pandemic were less prone to be reached by epidemics and to become blanketed than in the late medieval period. This can also explain the longer intervals between epidemics in this pandemic than in the next. This line of analysis suggest that the pandemic of 541-766 did not spread quite so dynamically and cause quite so extremely high mortality as the late medieval pandemic. Nonetheless, population losses were undoubtedly very severe; in the seventh century, it can legitimately but cautiously be suggested that net population reduction may have been in the order of magnitude of 30-40%. Russell (1968) argues for 50-60%, in other words, more in line with the effects of the late medieval plague epidemics, which cannot be rejected out of hand.

**Historical Impact of the Plague Pandemic 541-766**

The great impact on history of this pandemic of plague is greatly underrated, often even completely ignored, both in general textbooks and in scholarly studies of early medieval history alike. Politically, severe and lasting demographic losses caused by recurrent plague epidemics will translate into long-run and profound historical change through their strongly negative effects on production, taxes, and military manpower. This will weaken governmental structures and change the balance of power between ravaged and unravaged or only slightly ravaged states and regions.

Scholars taking a serious interest in discussing the historical consequences of the pandemic of 541-766 largely agree on the main perspectives and their great importance. There are immediate indications of a new weakness in the Byzantine Empire. Before the arrival of plague in 541-2, Emperor Justinianus had the great ambition to re-establish the Roman Empire and reconquer the lost provinces. He reconquered North Africa from the Vandals (534) and, in a long campaign in 535-553, Italy, which of course, was similarly weakened; the same goes for the conquest of parts of southern Spain. Thus, he may seem to have made good progress toward realizing this great ambition. However, in 551, Slavic tribes that had not been decimated by plague could easily plunder and settle in the Balkans. Since the Byzantine armies and their standard of equipment and provisions had to be strongly reduced, the imperial ambition had to be abandoned after 565, and the dream of re-establishing the Roman Empire was buried and substituted by a long drawn-out fight for the survival of the Byzantine Empire itself. Significantly, in 568, the Germanic people called Lombards (‘Longobards’) conquered most of Italy and established a kingdom, an event that seriously diminished further Byzantine manpower and tax income. This kingdom and the way it was defeated some centuries later would also play an important role in the development of Italian medieval history.

Another very important consequence of the recurrent plague epidemics was that the Byzantine forces
could not withstand the Arab Muslim forces as they streamed out of the Arabian Peninsula in 634 and first conquered Egypt, Palestine, and Syria. By 640, nine to ten plague epidemics had ravaged the empire and other regions along the Mediterranean, while Arabia appears to have escaped unscathed. Thus, the Arab forces of Islam had their manpower intact. Also, the ecological circumstances were favorable for them. It was well known that the desert Bedouins were rarely affected by plague, so in the face of serious epidemic developments caliphs would leave the cities with their central administrative staff and move to their desert palaces, and Arab commanders would march their troops out of their garrisons and into the desert until the epidemic ceased, a measure that was very difficult or impossible to resort to for their enemies. This measure served to bolster Arab and Muslim military strength relative to that of their enemies and contributes to explain their enormous military success.

The sharp and continued reduction of the populations in the Middle East and northern Africa in the first 100 years of the pandemic allowed Arab people to stream into these areas, fill the demographic decompression, and establish Arab political, cultural, and religious dominance. This was a great historical event in the profound sense that it shaped the ethnic composition and the political history of the Middle East and still, in our own day, is a fact of the greatest importance for international political relations and problems.

The demographic decompression and consequent serious weakening of the Byzantine Empire had very important historical effects also on the development of the burgeoning new European civilization. After the great migration movements, Germanic peoples who had largely been spared the waves of plague epidemics dominated Europe north of the Mediterranean littoral, a development that the Byzantine Empire could no longer prevent by (re-)conquering Gaul and the large Roman parts of Germany. This served to change the political balance in Europe from southern European dominance to western and central European dominance by permitting there state-building with relatively stronger economic, political, and military resources. The emergence of a strong Frankish kingdom on the basis of the development of feudal economic, military, and administrative structures laid the foundations of a new European political system. This development found its first great expression in the personality of Charlemagne, who united large parts of Western and Central Europe into a large imperial territory and, in cooperation with the papacy, defeated the Lombard kingdom in Italy and also resurrected the title of Roman Emperor, with all its connotations of past grandeur and glory. This development also made it possible to stop the Muslim expansion in Europe and turned the tide. Charles Martel (714-741) succeeded in driving invading Muslim forces out of France back into Spain, Charlemagne managed to cross the Pyrenees and ‘liberate’ the so-called Spanish Mark, a largish swath of land along the western side of the mountain range from Tortosa on the Mediterranean along the Ebro River up to the Bay of Biscay, heralding the long liberation process of the Spanish reconquista. From now on, the new Europe was on the offensive.

Thus, the pandemic of 541-766 had wide-ranging and profound implications for subsequent historical developments in the Middle East, Asia Minor, and Europe.

The Late Medieval and Early Modern Plague Pandemic, 1346-c. 1670: Arrival, Pattern of Spread, and Rhythm of Recurrence

The next plague pandemic began in 1346. This time it originated in the plague focus on the northwestern side of the Caspian Sea. Like the previous pandemic, it started with an enormous wave of epidemics. In the years 1346-53, it ravaged Asia Minor, the Caucasian region, and Northern Africa and blanketed Europe almost completely, causing mind-boggling mortality everywhere (as is discussed

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Several centuries later, it acquired the frightening name of the Black Death (which has nothing to do with diagnostic manifestations). In the next 320 years, it was followed by a large but varying number of waves of epidemics according to region, from probably another 25 in northern Germany to 40 in England, more usually probably around 30-35 (Benedictow, 2002; Biraben, 1975). Thus, a rhythm of waves of plague epidemics at an average interval of 8 to 12 or roughly around 10 years can be identified. This time, much the same pattern of recurrence is found in the Middle East where, in the period 1347-1517, Egypt and Syria appear to have been ravaged by about 19 and 15 plague epidemics, respectively (Dols, 1977).

This makes for interesting comparisons with the much more skewed and limited geographic incidence of the plague epidemics in the previous pandemic, highlighting, in the first place, a great change that had developed during the high medieval centuries, namely, a new intensity of trade across the Mediterranean. This development was primarily due to the tremendous vitality of early European commercial capitalism, which unwittingly also served to integrate the flow of microbiological agents within the new economic system of the Mediterranean littoral.

Second, in contrast to the previous pandemic, this pandemic was characterized by an almost universal spread across Europe and a quite coordinated rhythm of recurrence that highlights the almost complete economic integration of Europe.

In Europe, this plague pandemic acquired new powers of spread and recurrence from the modernization of its civilization, and the level of modernization at the mid-14th century, on the eve of this pandemic, is often much underrated. The Black Death's tremendous dynamics of spread in Europe reflected quite developed capitalistic financial, commercial, and proto-industrial structures in northern Italy and Flanders and, to some extent, also elsewhere. Far-flung trade routes were by now sailed by quite developed ships fit for long-distance trade, like the galley, the nef, and the cog. Italian galleys from Venice and Genoa, for instance, sailed directly on Kaffa in the Crimea, on Constantinople, on Alexandria and Tunis in North Africa, and in substantial numbers also all the way directly to Bruges and London in northwestern Europe. There the Hanseatic merchants of the North German commercial coastal cities took over and exchanged great amounts of goods within a complex network linking the commercial centers of northwestern Europe with the commercial centers on the Baltic Sea and in Norway, all the way to Novgorod and Bergen. There was also quite lively inland trade along a wide network of roads and waterways that reflected the more general development of local, regional, and interregional market economies, with numerous ramifications into the countryside. This vast commercial network permitted plague to ride triumphantly with ships over great distances and to penetrate into distant inland districts and mountain settlements with the unwitting help of merchants, tradesmen, local peasants selling and buying goods in local towns and market boroughs, pilgrims, fugitives from plague, and so on.

This exchange of goods and people took place within the framework of a dynamic urban setting. Around 10% of Europe's population were by now living in more or less autonomous towns and cities that were fairly often quite intensively, but at least in some way, interconnected. In the late Middle Ages, the European commercial network was so wide-ranging, complex, and intensively trafficked that plague contagion tended to circulate continuously in Europe.

The larger cities, especially, contained such vast rat populations that plague continued to circulate among them, albeit in a slow and episodic fashion, even after they had been severely decimated and

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the epidemics had ended. Because many of the rats would now often be survivors with particularly
good innate immune apparatus and also had some transient acquired immunity, cases among humans
stemming from this process would only be episodic (endemic) and pass largely unnoticed until the
ordinary rat population was reconstituted both physiologically by interbreeding and numerically, and the
preconditions for a full-scale plague epidemic were re-established. This process of reconstitution of
rat populations takes about seven years and is a crucial factor behind the rhythm of recurrence in that it
creates a minimum interval of about seven years between large-scale epidemics. This also means that
plague contagion now was continuously present in Europe, having urban instead of natural zoological
reservoirs.

Consequently, there was hardly a year without outbreaks of plague at least in a few urban centers in
Europe (Biraben, 1975); a recent study of plague in the emerging new commercial heartland of early
modern Europe, namely the Netherlands province of Holland, starting in 1450, shows that there was
an outbreak of plague in at least one town or city, and often in several, almost every year in the
following 200 years (Noordegraaf and Valk, 1988); in London, cases of plague were identified every
year for long periods at least from the 16th century. This time, therefore, the plague pandemic, in
addition to manifesting itself in the central form of great waves of epidemics, also found expression in
quite numerous local outbreaks within the intervals between the epidemic waves and in (almost)
continuous endemic presence in large cities.

The Conquest of Plague

In Europe, the pandemic petered out in the 17th century (as is discussed in the following), although
there were outbreaks in Northern Europe in 1710-13 and in southern France in 1720-22 due to special
circumstances. However, plague continued to break out in Russia and the Ottoman (Turkish) Empire,
including the Balkans, until the 19th century. The waning and disappearance of plague was caused by
deliberate human action, the introduction of increasingly effective anti-epidemic measures from about
the mid-16th century (Cipolla), a development that about 100 years later led to the 'conquest of plague.'
This development was closely connected with the increasing rationality of the European mind that is
associated with the emergence of the early modern social formation and the concepts of
modernization and Renaissance. In the late medieval period, the usual understanding of mortal
edemics was that it was God's punishment for sins, which prevented or hampered the development
of rational understanding and reality-based effective countermeasures.

The increasing rational ability to combat plague was contemporaneous with the great increase in
economic activities and exchange of goods associated with the first phase of the early modern society
(the Renaissance), because both developments sprang from the development of the early modern
social formation. This increase in exchange of goods manifested itself in a greatly increased number of
outbreaks of plague caused especially by ship transport between seaport cities and towns. The
growing rational ability to combat plagues manifested itself, in that plague contagion was increasingly
effectively prevented from spreading to other urban centers and into the countryside. Plague
epidemics became more and more of an urban phenomenon, because in urban environments plaque
could spread through contact between the rat colonies and was, therefore, impossible to stop by
countermeasures once contagion had been introduced (and, of course, the connection between rats
and plague epidemics was to remain unknown for a long time). This meant that the proportion of
populations that were infected and died diminished strongly; long-run population growth started in the
decades around 1500, with most populations reaching their pre-plague level in the period 1560-1620,
first Italy and then France. Thus, this plague pandemic can be seen to have been formed and to have acquired defining specific features by its interaction with the specific societal structures of the late medieval and early modern periods. From c. 1450-1550, the central period of transition from the (late) Middle Ages to the early modern period, this includes the increasingly rational content of the structure of culture and mentality that produced greater understanding of the realities of contagion and epidemiology, permitting contemporaries to commence an increasingly effective battle against plague and finally, about 100 years later, to put an end to the plague era.

**The Mortality of the Black Death**

It has been shown that the lethality (case-fatality) rate caused by plague was constant from the time such data begin to appear in the second half of the 15th century until the last epidemic in 1720-22, and is similar to the usual lethality rates observed by modern physicians from the 1890s in developing countries like India, China, and Madagascar. Thus, the microbiological agent of plague maintained constant virulence (Benedictow, 1993/1996).

In the last four decades of the 20th century, there were published quite numerous demographic studies of the mortality in the Black Death, in fact over 150, relating to various parts of Europe (there are no such tenable studies relating to contemporary Muslim countries). These data have now been collected, discussed, and synthesized and give the following results for the main regions: the kingdom of Navarre, 60%; Provence, 60%; Tuscany and the Piedmont, 50-60%; the county of Savoy, 60%; and England, 62.5%. A few data from Catalonia and Languedoc and Forais show similar mortality rates (Benedictow, 2004). The data exhibit surprising consistency and reveal a much higher level of mortality than assumed previously. They are sufficiently numerous and cover sufficiently large parts of Europe to provide quite a good case for assuming that around 60% of Europe's population perished in the Black Death.

**The Demographic Effects of Subsequent Plague Epidemics: The Late Medieval Population Minimum**

For long-term perspectives on the historical impact of this plague pandemic, information is needed on the demographic losses caused by subsequent plague epidemics and the time and demographic status of the late medieval population minimum. More generally, population minimum is placed in the two decades around 1500 or more cautiously in the period 1450-1520. The best data come from England and Norway. Most British scholars agree that, on the eve of the Black Death, the English population was about 6 million and that the population minimum, occurring some time in the first two decades of the 1500s, was 2-2.5 million, corresponding to a reduction of 58.3-66.6%. The midpoint of 2.25 million indicates a diminution of 62.5%, corresponding exactly to the estimated loss in the Black Death about 150 years earlier. In Norway, within its present borders, there were 64 000 peasant holdings and tenancies in operation on the eve of the Black Death but only 23 000-24 000 around 1520, a reduction of 64-62.5%, corresponding probably quite closely to the population loss, which is surprisingly similar to the English estimate (the urban population was quite small, probably about 10%). In Tuscany, the population fell from about 300 000 in 1338 to about 100 000 in 1427, and declined by about 10 000 more persons in the following three decades, which may have corresponded to a possible small fall in the Tuscan population in the decade preceding the advent of the Black Death. Thus, the population had declined by roughly 70% at the time of the minimum in the period 1460-80, after which sustained population growth began. With respect to France, data for the regions Provence, Dauphine, and Normandy show a decline of 60-70% in the populations from the pre-plague years to
the 1460s or 1470s (Dubois, 1988). The population of Catalonia fell by about 55% from the level around 1300-1490, when the population may have grown a little from the late medieval minimum that may have occurred a few years earlier. The population of the Netherlands is said to have declined by about 50% by c. 1450 compared to its pre-plague level (Benedictow, 1993/1996). Thus, a pattern emerges where the mortality in the Black Death generally appears to correspond quite closely to the late medieval population minimum some 150 years later (Benedictow, 2004).

This finding makes it clear that the sharp reduction of European populations characterizing the late Middle Ages was very much established on the morrow of the Black Death, and that the net effect of the subsequent plague epidemics mostly was to cut down tendencies of demographic recuperation in the intervals between the waves of plague epidemics or, in the long run, to produce a slight further diminution of the populations.

**Historical Impact of the Pandemic 1346-c. 1670: A Turning Point in History?**

By causing dramatic and lasting diminution of populations all over Europe, this plague pandemic engendered profound societal change. The motor of great societal change was the profound alteration in the nexus of economic and demographic relations, the great social dynamics springing from the new interrelationship between a sharply reduced size of population and unchanged ‘size’ of the available means of production. Suddenly, tenants were in critically short supply. As the economic meaning of the new situation became apparent, rents and fines fell precipitously as landlords and substantial landowners of every kind had to compete sharply for tenants who understood that they were in great demand: It was better to get low rents and small fines than nothing. By the early 15th century, rents in Norway, for instance, had fallen to 20-25% of their pre-plague level.

The rural proletariat of cotters, day laborers, sharecroppers, subtenants, and so on, social classes that on the eve of the Black Death appear to have constituted around 50% of the population almost everywhere in Europe, became in even much shorter supply than tenants. Their numbers were reduced twice over, namely by the onslaught of plague like the tenants, but also by social mobility, as they triumphantly moved into vacant tenancies, entered the class of customary tenants holding land directly from their landlords, and became the social equals of their former peasant superiors and employers. As the social classes working for wages almost disappeared as a source for day laborers, real wages rose strongly, and, of course, for the same basic reasons, so did urban wages. In terms of material standard of living, the late Middle Ages were the ‘golden’ era of rural and urban wage earners and the peasantry alike.

In short, the kings, the social elites of ecclesiastical and lay lords and the upper classes of gentry and well-off peasant classes like franklins and yeomen, saw their incomes plummet. This is an important background for the Hundred Years’ War; it lasted so long only because for these social classes war became an important new source of income by war taxation, by serving for wages paid by war taxation, for the spoils of war, and so on. When the English warriors were forced to return to England in the mid-15th century, they carried on at home in the same way as they had done in France in the War of the Roses. In Spain, the impoverished gentry known as ‘hidalgos’ turned with new energy against the parts of Spain that remained in the hands of the Muslim Moors. Eventually, they succeeding in completing the reconquista in 1492, which made the king and queen of Spain so happy that they granted Christopher Columbus money for an expedition westward over the Atlantic Ocean to find a new sea route to India. Instead, he found America, and the Spanish conquistadors found a new arena for their martial arts. Thus,
important developments in European history, as well as American history, were driven by the actions of aristocratic warriors pursuing their interests according to the basic social and economic realities of their day as shaped by the Black Death and subsequent plague epidemics.

Importantly, plague hastened the development and transformation of European medieval society and civilization into its (early) modern historical form. By creating a great deficit of labor, it speeded up economic, technological, social, and administrative modernization, which especially in the capitalist centers in northern Italy and partly in Flanders found expression in a more secular and urban culture associated with the Renaissance. From the late 1400s, regions in the Netherlands and England offered increasing competition, eventually over the course of the 16th century, to take over the economic hegemony in Europe. It also hastened the breakdown of feudal economic structures and mentalities and the rise of a prevailing dynamic capitalist market economy with concomitant innovative and dynamic attitudes and thought.

Thus arose the seeming paradox and distinguishing feature that late medieval culture and thought comprised both obsession with death and salvation, fascination with economic and social opportunities, and secularization of economy and art. With respect to the history of religion and thought, this could be taken as the start of the increasing compartmentalization of religion in the European mind as a characteristic feature of the modernization and rationalization of European society and culture, in which religious notions were retreating into a steadily more clear-cut spiritual role aimed directly at salvation. With the Renaissance, these developments gained momentum: Religion's role in shaping and defending the social and economic structures of society and explaining worldly events like good or bad harvests, epidemics and disease, good luck or bad health, economic or social misfortune, personal tragedy, and so on retreated under a slowly growing pressure from the increasing rationality of the modernizing European mind and the developing alternative scientific approaches and explanations characteristic of the Renaissance. The Reformation also grew out of this social background and by interaction strengthened the dynamics of this societal process.

The improving ability of rational observation permitted a better understanding of how plague was disseminated and the rudimentary development of modern epidemiology. It was this development that, as shown by Cipolla (1976, 1981, and many other works), from the mid-16th century allowed the Italians to develop efficient anti-epidemic organizations and health boards in order to combat plague. This was no longer considered an attempt to avoid God's will, but an expression of the responsibilities of governments to protect and help their inhabitants. In the 17th century, the administrative means developed by the Italians spread over Europe, and plague disappeared gradually. The Europeans had succeeded in combating an awesome, gruesome, and invisible enemy of uncomprehended nature. The greatly increased administrative capabilities of the early modern political structures made it possible to set up efficient anti-epidemic organizations, quarantine systems, and international reporting of serious epidemics, to proclaim and implement prohibitions of trade and travel with contaminated areas or cities, to establish plague hospitals and health boards, and so on. Thus, the combating of plague gave a strong impetus to the notion that governments had responsibilities for the welfare of their peoples. What over time would become national health systems were born as organizations primarily aimed at protecting populations from invasion of plague epidemics, combating the spread of plague if the first line of defense, namely the quarantine organizations, failed, and providing assistance and succor to the diseased and their families.

Anti-Jewish sentiments had been strongly on the increase in the century preceding the Black Death,

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probably stimulated by the increasingly hard times for the great majority of ordinary people, and a consequent increasing susceptibility to notions of scapegoats. The Jews had been forced to leave both England and France in the decades around 1300, and many had settled in Germany or the Low Countries. The Black Death triggered violent persecutions of Jews over large parts of Europe, especially in Germany and the Low Countries, but also in Spain and other places where they had been permitted to stay. In the intense religious mind of the medieval period, it was generally thought that severe epidemics were God's way of punishing people for their moral depravity and grave sins. One such grave sin could be that they allowed people who did not worship Christ or God in the required way and who, in addition, could be seen as the descendants of Christ's murderers to stay among them. Because Jews in many places also functioned as pawnbrokers and moneylenders - activities that were prohibited for Christians by the Catholic Church - persecution, exiling, and murdering of Jews could also serve personal economic motives. Many people found it hard to imagine that the Lord would really punish them so severely with plague for their sins; they were, after all, only human beings. They developed instead a theory that the great mortality was caused by Jews and other 'enemies of Christendom,' who poisoned their wells and other sources of drinking water. One may wonder how it could be that the contemporaries did not observe that the mortality of the Jews in the Black Death was as great as for others. Pope Clement VI for one attempted to stop the persecution of the Jews, but without success.

Surviving Jews fled to Eastern Europe, where they were allowed to stay by rulers anxious to include in their populations persons with great skills both in the financial sphere and as artisans and jewelers. Thus, the Black Death had two main functions in this context. Tragically, it transformed the process of exiling and eviction of Jews from countries in Western Europe into a sort of medieval holocaust with extensive and indiscriminate murder of Jews; it also hastened the movement of Jews into Eastern Europe where their descendants were, to a large extent, annihilated in a new and even far more violent Holocaust 600 years later.

See also
Social Dimensions of Infectious Diseases

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Citations

Further Reading


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