

Plague pits of London

(Martin Adams)



Bunhill Fields cemetery in the City Road, London

Bunhill Fields cemetery in the City Road is a quiet haven on the edge of the City of London mainly attracting office workers seeking lunchtime tranquillity or possibly a shortcut to the Artillery Arms pub in Bunhill Row. Its history as a burial ground goes back to Saxon times and it was used in 1549 for the disposal of more than a thousand cartloads of bones from the charnel house at St Pauls. As unconsecrated land, it later became widely used as a cemetery for non-conformists and is the final resting place of some literary notables such as William Blake, John Bunyan and Daniel Defoe.

Defoe had a colourful career but is mostly remembered as the author of *Robinson Crusoe*, published in 1719 and credited by some as being the first English novel. In a later work, *A Journal of the Plague Year*, he also founded the literary genre sometimes known as 'faction' where true events are subject to fictional reconstruction. Written 50 years after the events it describes, it gives a London merchant's vivid account of the plague's progress through London in 1665. This was one of the last great outbreaks of the second plague pandemic, and the worst in England since the Black Death of the 14th Century had cut a swathe through Europe killing an estimated 30-40 % of the population. It is therefore perhaps fitting that Defoe's final resting place was once designated as a burial pit for plague victims, although it was probably never used as such, and Defoe died in 1731, in hiding from his creditors and probably from a stroke.



Defoe's Memeorial

The book is often taken as an authentic account, but Defoe was only 5 years old at the time of the plague. He did however do extensive research on his subject and probably also had the recollections of his elders to draw on. Among other things, he records that the parish of St James, Clerkenwell, close by the Charles Darwin House, where the Society for Applied Microbiology previously had its office, was one of the areas where an early increase in mortality rates heralded the outbreak. It was apparent that the illness was contagious but centuries before the germ theory of disease the authorities were virtually powerless to control it. An atmosphere

A learner-centric microbiology education framework

of doom and foreboding descended on the city as an estimated 100,000 of the population died. The poor as ever were most affected; the rich mainly did what has always served them well in such circumstances and fled the scene – the King, the Court and Parliament decamping to Oxford. Their behaviour was in stark contrast to the inhabitants of the Derbyshire village of Eyam who, when the plague arrived in a batch of cloth sent from London, voluntarily isolated themselves to avoid spreading the infection more widely, incurring increased mortality rates as a result.

Identification of the plague bacillus had to wait until the heyday of the ‘microbe hunters’ at the end of the 19th Century and the start of the third plague pandemic which emerged in Eastern China. In a famous tale of scientific rivalry, Yersin, a former pupil of Pasteur, arrived in Hong Kong during an outbreak of bubonic plague shortly after the arrival of a larger, better-equipped Japanese team under the leadership of Kitasato (see the MicroDiscoverer Heroes Gallery for Portrait), a former pupil of Koch. Kitasato’s team was favoured by the Hong Kong authorities and given every facility. They soon claimed to have isolated what they thought was the plague bacillus – a Gram positive organism – from the finger of a dead sailor. Yersin had only two unskilled assistants, one of whom promptly absconded with his money, and received much less local support, having to work in a straw hut in the grounds of the main hospital. Initially excluded from access to plague victims, he was obliged to bribe mortuary guards enabling him to obtain fluid from a bubo on a victim from which he isolated the Gram negative *Pasteurella* (now *Yersinia*) *pestis* and demonstrate its transmissibility to animals.

In his paper, Yersin noted the large numbers of dead rats in infected areas and their susceptibility to the infection leading him to conclude that they were probably the major vector of the disease. In bubonic plague the organism is injected under the skin through the bite of a rodent flea. It spreads through the tissues and lymphatic system collecting at the lymph nodes where the haemorrhagic inflammation it causes gives rise to the characteristic buboes. Other forms of the disease, more rapidly fatal if left untreated, are caused when the organism is injected directly into the bloodstream (septicaemic plague) or inhaled on droplets into the lungs (pneumonic plague). These forms of transmission can also occur in a large outbreak initiated as bubonic plague.

Although there is doubt whether Bunhill Fields was ever actually used as a plague pit, archaeologists have recently been given unprecedented access to several other plague sites in London as a result of Crossrail; a project which has entailed digging 42 km of tunnels under London. This has revealed a massive burial pit at Charterhouse Square where victims of the 14th Century Black Death were interred, confirmed by detection of *Y. pestis* DNA in tooth pulp from 4 of 12 skeletons tested. Further east, next to Liverpool Street Station, a mass grave containing 45 individuals was discovered in the Bedlam Burial Ground – named after the nearby Bethlehem Hospital for the mentally ill. The presence of *Y. pestis* DNA was again confirmed in 5 of 20 individuals tested. A few years ago, samples from yet another plague burial at East Smithfield near the Tower of London, enabled the sequencing of the whole genome of *Yersinia pestis* when it was found to differ little from present day strains.

Though plague is still with us, 1,000-2,000 cases are reported to the WHO each year, its effect has been mitigated over time and effective antibiotic treatment has been a major factor in this. Ominously though, antibiotic resistant strains have been reported giving further urgency to campaigns highlighting the problem of antimicrobial resistance. In a recent quiz show a contestant was asked the name of the person, initials A.F., associated with the discovery of penicillin – they answered Aretha Franklin. Clearly we still have some way to go.