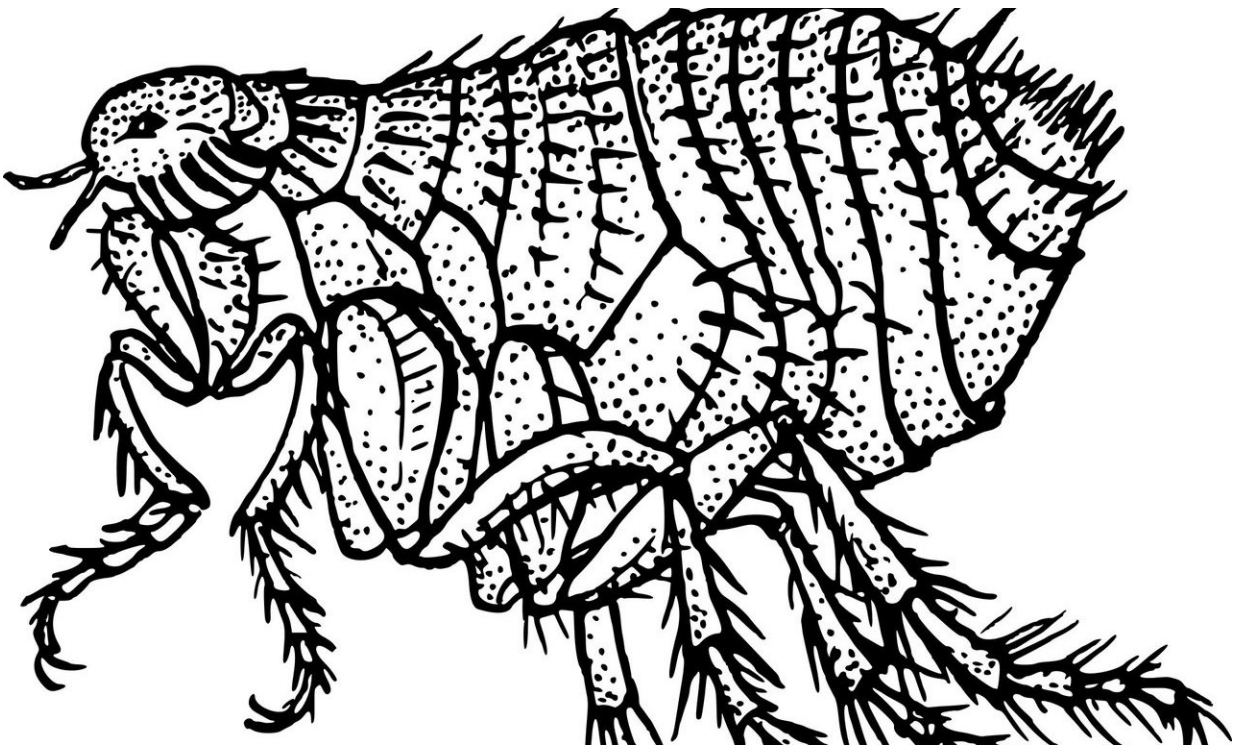


# New study suggests human fleas and lice were behind Black Death, not rodents

January 16 2018, by Bob Yirka

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A team of researchers with the University of Oslo has found evidence that suggests human fleas and lice, not rodents, were behind the spread of the plague that killed millions of people over the course of several centuries. In their paper published in *Proceedings of the National Academy of Sciences*, the group reports using mathematical models from

mortality records to demonstrate how the plague would have spread under different scenarios and what they found by doing so.

Most adults today remember reading in school about the Black Death, which killed approximately 25 million people back in the 1300s, and most also remember being taught that rodents, mostly [rats](#), spread it around. The [plague](#) was caused by the bacterium *Yersinia pestis*, which was able to move between victims through various vectors. And until recently, it was believed that fleas that lived on rats jumped from their hosts that died from the plague onto humans, infecting them. But in recent years, that theory has begun to lose credibility because it could not account for how quickly the plague spread, or why there were no reports of [mass deaths](#) of rats from the same disease. In this new effort, the researchers looked at an alternative theory that suggests fleas and lice that lived on humans were behind the spread of the disease.

The team started by amassing data from mortality records regarding the spread of several outbreaks that occurred in Europe between the 14th and 19th centuries (one of which was the Black Death). They then created a [mathematical model](#) that could be used to demonstrate how each of the outbreaks spread. They ran the model under three different scenarios: in which the outbreak was due to rats, airborne transmission, or to human fleas and lice. The researchers found that the scenario in which the outbreak was linked to human fleas and lice offered the best match to what actually occurred. Neither of the other vectors, they found, could cause the disease to spread as quickly as it did. They also note that human fleas and [lice](#) were very common in people during the period under study due to infrequent bathing.

**More information:** Katharine R. Dean et al., "Human ectoparasites and the spread of plague in Europe during the Second Pandemic," *PNAS* (2018). [www.pnas.org/cgi/doi/10.1073/pnas.1715640115](http://www.pnas.org/cgi/doi/10.1073/pnas.1715640115)

**Abstract**

Plague, caused by the bacterium *Yersinia pestis*, can spread through human populations by multiple transmission pathways. Today, most human plague cases are bubonic, caused by spillover of infected fleas from rodent epizootics, or pneumonic, caused by inhalation of infectious droplets. However, little is known about the historical spread of plague in Europe during the Second Pandemic (14–19th centuries), including the Black Death, which led to high mortality and recurrent epidemics for hundreds of years. Several studies have suggested that human ectoparasite vectors, such as human fleas (*Pulex irritans*) or body lice (*Pediculus humanus humanus*), caused the rapidly spreading epidemics. Here, we describe a compartmental model for plague transmission by a human ectoparasite vector. Using Bayesian inference, we found that this model fits mortality curves from nine outbreaks in Europe better than models for pneumonic or rodent transmission. Our results support that human ectoparasites were primary vectors for plague during the Second Pandemic, including the Black Death (1346–1353), ultimately challenging the assumption that plague in Europe was predominantly spread by rats.

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