

# Consensus and Controversy in Modern Plague Ecology

## Implications for Interpreting the Second Plague Pandemic

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### Introduction

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Plague is an immensely complicated disease and thus a singular ecological model has yet to be entirely embraced by all members of the field. This is primarily due to tremendous ecological diversity, as plague has been associated with human epidemics for thousands of years, has visited every continent except for Antarctica, is thought to be able to infect virtually all mammals, and can be transmitted by hundreds of different species of fleas. The complexity that emerges from this diversity presents many challenges when interpreting both past and present outbreaks of plague. As a result, significant controversy and debate continually emerges over the nature of human plague epidemics.

Reanalysis of the second pandemic, specifically the Black Death, has produced numerous publications describing ecological inconsistencies between medieval plague and modern outbreaks. The objectives of this paper are therefore to examine contentious aspects of the current ecological model of plague, to understand why these issues emerged, why they have not been resolved, and their implications for interpreting historical epidemics.

The acceptance or rejection of an ecological model of plague has not been exclusively based upon its robusticity or reproducibility. In many aspects, our current understanding of plague is the product of the sociopolitical and scientific climate in which discoveries were made, and also the extent to which they have been challenged. Of the numerous unresolved questions that persist today, many were apparent to careful observers in the early days of plague research. But at the turn of the nineteenth century, physicians and epidemiologists were dealing with an ever-expanding and worsening pandemic. Consequently, weaknesses and criticism were soon overlooked in favor of a simplified, and more easily testable, model of the disease [1]. Because of this contextual dependence, I will examine current consensus and contention with careful attention paid to the historical context in which these issues have evolved from. An understanding of not just what we know about plague ecology, but why we have this knowledge, will improve our ability to identify robust ecological models and new avenues of research.

# Aetiological Agent

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## Discovery

Of the numerous ecological factors involved, the most readily accepted upon discovery was the aetiological agent, *Yersinia pestis*. The late 19th century was a “Golden Age” of bacteriology following Robert Koch’s revolutionary discovery of the anthrax bacillus in 1876 [2]. Against this backdrop of medical revolutions, the determination to identify and characterize the microbial nature of plague began in Hong Kong in 1894 [3]. While working independently in plague hospitals, bacteriologists Alexandre Yersin and [[Kitasato Shibasaburo | Kitasato]] near-simultaneously discovered and cultured the plague bacillus, *Bacterium pestis*, from the blood of infected patients [???,??]. [[Alexandre Yersin | Yersin’s]] description of the bacterium has generally been considered more accurate and consistent than Kitasato’s, and thus the bacillus was later renamed [[*Yersinia pestis*]] in recognition [3]. The Yersin-[[Kitasato Shibasaburo | Kitasato]] debate continues today, and it is not likely to be concretely solvable given the available evidence. However, later reappraisal suggested that *Y. pestis* may display varied characteristics during a human epidemic [4], which may in part explain Kitasato’s observations.

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