

Online links

Yersinia pestis: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list_uids=34

Yersinia pseudotuberculosis: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list_uids=12950

BACTERIAL PATHOGENESIS

More fleas, please

The poor vector competence of fleas probably favoured the evolution of a hypervirulent *Yersinia pestis* clone through selective pressure, according to researchers at the National Institute of Allergy and Infectious Diseases.

Yersinia pestis, the causative agent of plague, diverged from the closely related *Yersinia pseudotuberculosis* during the last 1,500–20,000 years. However, *Y. pestis* differs markedly from other yersiniae — it is highly virulent and is transmitted by fleas. In a recent paper published in the *Journal of Infectious Diseases*, Lorange and colleagues examined the transmission dynamics of *Y. pestis* in *Xenopsylla cheopis* fleas, the most efficient plague vector examined to date.

Using an artificial feeding system, they found an ID_{50} for *X. cheopis* of 4.8×10^3 bacteria, whereas that of susceptible mammals is less than 10, indicating that the infectious threshold for fleas is high. In addition, the transmission efficiency of *Y. pestis* from *X. cheopis* to mice was found to be low and irregularly distributed. Because *Y. pestis* grows as a biofilm in the flea digestive tract, this might indicate that bacterial clusters of various sizes break free from the biofilm, causing varying levels of infectiousness. Using epidemiological modelling, Lorange *et al.* went on to calculate the flea density required to sustain epizootic plague infection, and their results indicate that a high flea burden per host is required even

in a susceptible population, suggesting that flea control may be a more effective disease control strategy than rodent control.

The results of this work not only suggest that the evolutionary change from oral to fleaborne transmission led to the emergence and continued maintenance of a hypervirulent *Y. pestis* clone, to overcome the high infectious threshold for fleas and the low transmission efficiency from fleas to mammals, they may also have implications for disease-control strategies.

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References and links

ORIGINAL RESEARCH PAPER Lorange, E. A., Race, B. L., Sebbane, F. & Hinnebusch, B. J. Poor vector competence of fleas and the evolution of hypervirulence in *Yersinia pestis*. *J. Infect. Dis.* **191**, 1907–1912 (2005)

FURTHER READING Wren, B. W. The yersiniae — a model genus to study the rapid evolution of bacterial pathogens. *Nature Rev. Microbiol.* **1**, 55–64 (2003)

