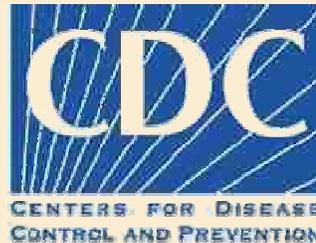


Symposium on the Ecology of Plague and its Effects on Wildlife

Fort Collins, Colorado

Tuesday, November 4, 2008 – Thursday, November 6, 2008





Technical Steering Committee

Michael Antolin, Colorado State University
Dean Biggins, U.S. Geological Survey
Christopher Brand, U.S. Geological Survey
Jack Cully, U.S. Fish and Wildlife Service
Ken Gage, Centers for Disease Control
Pete Gober, U.S. Fish and Wildlife Service
Tonie Rocke, U.S. Geological Survey

Conference Organizers

Michael Antolin, Colorado State University
Laura Ellison, U.S. Geological Survey
Pete Gober, U.S. Fish and Wildlife Service
Sean Godbey, Colorado State University
Patty Stevens, U.S. Geological Survey
Colorado State University Office of Conference Services

Acknowledgements

We wish to extend a special thanks to Lance Everette for maintaining and managing the website, Lorie Hughes for helping with travel arrangements, Jennifer Shoemaker for helping develop the Symposium Program, and Juliette Wilson for her help with publicity.

Agenda-at-a-Glance

Tuesday, November 4, 2008

Time	Session Topic
7:30 – 8:30	Registration
8:30 – 10:00	Introduction, Welcome, and Keynote Address
10:00 – 10:15	Break
10:15 – 11:55	Session Topic: Influence of Environmental Factors and Landscape Ecology
11:55 – 1:00	Lunch
1:00 – 3:05	Session Topic: Maintenance Dynamics of Plague in Natural Foci
3:05 – 3:20	Break
3:20 – 5:00	Session Topic: Role of Rodents and Vector Species in Transmission of Plague
6:00 – 9:00	Poster social at Coopersmith's Pub & Brewing, downtown Fort Collins (A shuttle from the Hilton will be available beginning at 5:00 p.m.; the last shuttle will leave Coopersmith's at 9:30 p.m.)

Wednesday, November 5, 2008

Time	Session Topic
8:00 – 9:40	Session Topic: Role of Rodents and Vector Species in Transmission (continued)
9:40 – 10:00	Break
10:00 – 11:50	Session Topic: Genetics and Evolution
11:50 – 1:00	Lunch
1:00 – 2:40	Session Topic: Genetics and Evolution (continued)
2:40 – 3:00	Break
3:00 – 4:40	Session Topic: Management, Control, and Surveillance of Plague

Thursday, November 6, 2008

Time	Session Topic
8:00 – 10:05	Session Topics: Risk Factors for Humans from Plague in Wildlife & Impacts of Plague on Wildlife Populations
10:05 – 10:30	Break
10:30 – 11:45	Session Topic: Impacts of Plague on Wildlife Populations
11:45 – 12:00	Closing Remarks

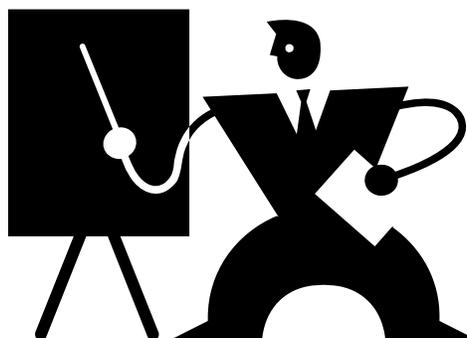
Symposium Schedule

Tuesday, November 4th

8:30a	Pete Gober U.S. Fish and Wildlife Service Pierre, South Dakota	Introduction & Welcome
8:45a	Senator Wayne Allard Colorado	Opening Remarks
9:15a	Rita Colwell Distinguished Professor at the University of Maryland at College Park and John Hopkins University Bloomberg School of Public Health	Keynote address - "Climate, Ecology, and Infectious Disease"
10:00a	Break	
<i>Ken Gage, Chair</i>		
10:15a	Mike Begon University of Liverpool Liverpool, United Kingdom	Metapopulation perspectives on the dynamics of plague: new explorations
10:40a	Nils Stenseth Center for Ecological and Evolutionary Synthesis University of Oslo Oslo, Norway	Climate change and plague epidemics
11:05a	Tamara Ben Ari Center for Ecological and Evolutionary Synthesis University of Oslo Oslo, Norway	Regional climate and the dynamics of human plague in western US
11:30a	Michel Drancourt Unité des Rickettsies Université de la Méditerranée Marseilles, France	Is soil a reservoir for <i>Yersinia pestis</i> ?
11:55a	Lunch	
<i>Mike Antolin, Chair</i>		
1:00p	Herwig Leirs University Antwerpen Antwerp, Belgium	Emergence and growth of plague foci in Africa
1:25p	Michael Kosoy Centers for Disease Control and Prevention Fort Collins, Colorado	Perspective study of plague in New Mexico: spatial and temporal patterns in epizootic dynamics
1:50p	Sandra Telfer University of Liverpool Liverpool, United Kingdom	Plague epidemiology and risk in the heterogeneous rural landscapes of Madagascar

2:15p	Lila Rahalison Institut Pasteur de Madagascar Antananari, Madagascar	Rat movement and plague indicators in rural habitats of Malagasy plague foci
2:40p	Bolormaa Galdan National Center for Infectious Diseases with Natural Foci Ulaanbaatar, Mongolia	Some results of plague investigation in Mongolia
3:05p	Break	
<i>Dean Biggins, Chair</i>		
3:20p	Daniel Salkeld IUCN-The World Conservation Union, Washington, DC	The role of carnivores in plague ecology and surveillance
3:45p	Jack Cully U.S. Geological Survey Kansas Cooperative Fish and Wildlife Research Unit Manhattan, Kansas	Plague regulates black-tailed prairie dog populations
4:10p	Paul Stapp California State University Fullerton, California	The role of rodent hosts in the dynamics of plague in black-tailed prairie dog colonies
4:35p	Rebecca Eisen Centers for Disease Control and Prevention Fort Collins, Colorado	Early-phase transmission of <i>Yersinia pestis</i> by unblocked fleas as a novel mechanism explaining rapidly spreading plague epizootics
5:00p	Meeting Adjourns	

6-9p	Meeting reconvenes for Poster Social at Coopersmith's (A shuttle from the Hilton will be available beginning at 5:00 p.m.; the last shuttle will leave Coopersmith's at 9:30 p.m.)
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Wednesday, November 5th

<i>Rebecca Eisen, Chair</i>		
8:00a	Janet Foley University of California Davis, California	Features of rodent reservoir and flea vectors contributing to enzootic sylvatic plague in highly biodiverse California communities
8:25a	Patrick Foley California State University Sacramento, California	A matrix model for community rodent-flea-plague dynamics: implementation in R and estimation of the parameters
8:50a	Hugh Britten University of South Dakota Vermillion, South Dakota	Monitoring plague epizootics in black-tailed prairie dog colonies with a sensitive PCR-based protocol
9:15a	Philip Jones University of South Dakota Vermillion, South Dakota	Landscape genetic concordance between black-tailed prairie dog and its associated flea, <i>Oropsylla hirsuta</i>
9:40a	Break	
<i>Tonie Rocke, Chair</i>		
10:00a	Mike Antolin Colorado State University Fort Collins, Colorado	What is a plague focus?
10:25a	Dave Wagner Northern Arizona University Flagstaff, Arizona	Population structure and evolutionary history of <i>Yersinia pestis</i> in North America
11:00a	Colleen Webb Colorado State University Fort Collins, Colorado	Evolution of resistance in natural hosts of plague
11:25a	Jennifer Lowell University of Montana Missoula, Montana	Single nucleotide polymorphism discovery to determine <i>Yersinia pestis</i> population structure in the western United States
11:50a	Lunch	
<i>Dave Wagner, Chair</i>		
1:00p	Joe Hinnebusch National Institute of Allergy and Infectious Diseases, National Institutes of Health Hamilton, Montana	The evolution of stable flea-borne transmission cycles of <i>Yersinia pestis</i>
1:25p	Gerald Andrews University of Wyoming and Wyoming State Veterinary Laboratory Laramie, Wyoming	Identification and characterization of in vivo-induced conserved sequences (IVICS) from <i>Yersinia pestis</i> during infection in different susceptible hosts
1:50p	Robert Perry University of Kentucky Lexington, Kentucky	Iron transport and plague pathogenesis
2:15p	Robert Brubaker Michigan State University East Lansing, Michigan	Missense mutations in intermediary metabolism of <i>Yersinia pestis</i> and expression of acute disease
2:40p	Break	

<i>Hugh Britten, Chair</i>		
3:00p	Tonie Rocke U.S. Geological Survey National Wildlife Health Center Madison, Wisconsin	Increased protection against plague in prairie dogs following oral immunization with raccoon pox virus-vectored vaccines
3:25p	Guy Cardineau Center for Infectious Diseases and Vaccinology Arizona State University Tempe, Arizona	F1-V transgenic tomatoes as an oral vaccine for plague control
3:50p	Richard Poché Genesis Laboratories, Inc. Wellington, Colorado	Efficacy of a systemic insecticide against fleas on Wyoming ground squirrels (<i>Spermophilus elegans</i>) and prairie dogs (<i>Cynomys ludovicianus</i>)
4:15p	Stephen Davis Yale University School of Public Health New Haven, Connecticut	Remote sensing of plague epizootics in Central Asia
4:40p	Meeting Adjourns	



Thursday, November 6th

<i>Jack Cully, Chair</i>		
8:00a	Richard Davis California Department of Public Health, Nipomo, California	Decreasing the risks of plague to wildlife and humans using easily applied ground squirrel baits
8:25a	Ashley Holt University of California Berkeley, California	Identification of plague foci and associated human risk areas in California: a species distribution modeling approach
8:50a	David Wong National Park Service Albuquerque, New Mexico	Fatal primary pneumonic plague contracted from a mountain lion carcass
9:15a	Kevin Castle National Park Service Fort Collins, Colorado	Pathology and seroprevalence of plague in wild felids
9:40a	Stephen Dinsmore Iowa State University Ames, Iowa	Mountain plover response to plague in Montana
10:05a	Break	
<i>Paul Stapp, Chair</i>		
10:30a	Jory Brinkerhoff University of Colorado Boulder, Colorado	Rodent assemblages change following, but not prior to, plague epizootics in black-tailed prairie dogs
10:55a	Dean Biggins U.S. Geological Survey, Fort Collins Science Center Fort Collins, Colorado	Flea control improves survival of three species of prairie dogs (<i>Cynomys</i>)
11:20a	Randy Matchett U.S. Fish and Wildlife Service, Lewiston, Montana	Enzootic plague reduces black-footed ferret (<i>Mustela nigripes</i>) survival in Montana
11:45a	Mike Antolin	Closing Remarks
12:00p	Meeting Adjourns	





Posters

(in alphabetical order by first author)

Response by swift foxes to plague epizootics in black-tailed prairie dogs

Amariah Anderson, Michael Antolin, and Kevin Crooks

Rodent host responses to viral-vectorized vaccines against plague

Willy Berlier, Andrea Carlson, Jorge E. Osorio, and Tonie E. Rocke

***Yersinia pestis* seroprevalence in pumas (*Puma concolor*) and bobcats (*Lynx rufus*)**

Sarah N. Bevins, J.A. Tracey, S.P. Franklin, V.L. Schmit, M.L. Addor, K.A. Logan, L.L. Sweanor, M.W. Alldredge, W.M. Boyce, S.P.D. Riley, L.M. Lyren, E.E. Boydston, C. Krumm, D.O. Hunter, M.E. Roelke, K.L. Gage, M.E. Schrieffer, K.R. Crooks, and S. VandeWoude

Plague in urban prairie dog colonies

Rebecca Colman, Robert J. Brinkerhoff, Chris Ray, Paul Keim, Sharon K. Collinge, and David M. Wagner

Human body louse, the vector of *Yersinia pestis* during historical plague epidemics

Michel Drancourt

Factors that influence the numbers of fleas collected from white-tailed prairie dog (*Cynomys leucurus*) burrows

Lianna K. Etchberger and Brent D. Bibles

Metapopulation dynamics of prairie dogs and plague: implications for persistence

Dylan B. George, Colleen T. Webb, Lisa T. Savage, and Michael F. Antolin

Population genetic structure of the black-tailed prairie dog flea, *Oropsylla hirsuta*, in north-central Montana with a panel of 13 microsatellite loci

Philip H. Jones, Lisa Wallace, and Hugh B. Britten

Plague in Tanzania: from a host and vector perspective

Anne Laudisoit, Rhodes Makundi, Simon Neerinckx, Boris Krasnov and Herwig Leirs

Flea community and prevalence of *Yersinia pestis* in black-tailed prairie dogs (*Cynomys ludovicianus*) from northwestern Mexico

Ana Montiel-Arteaga, Roxana Acosta, Gerardo Ceballos, and Gerardo Suzán

Plague in Tanzania – A landscape ecological approach

Simon Neerinckx, Jozef Deckers, Hubert Gulinck, Didas Kimaro, Anne Laudisoit, and Herwig Leirs



Preliminary study of fleas on rodents in three Colorado counties

Helen K. Pigage, Jon C. Pigage, Roger D. Peyton, and Marigny L. Klaber

Determination of the blood titer levels of Imidacloprid and effectiveness against *Xenopsylla cheopis* fleas on laboratory rats (*Rattus norvegicus*)

Larissa A. Polyakova and Jeff N. Borchert

Socio-economic risk factors associated with human plague cases in New Mexico

Anna M. Schotthoefer, Rebecca J. Eisen, Pamela J. Reynolds, Paul Ettestad, Ted Brown, Russell E. Enscore, Brad J. Biggerstaff, James Cheek, Rudy Bueno, Joseph Targhetta, John A. Monteneri, and Kenneth L. Gage

Seasonal and spatial changes in flea communities of black-tailed prairie dogs of northwestern Mexico

Gerardo Suzán, Alejandra de Villa-Meza, Claudia Muñoz, Rafael Ávila-Flores, Roxana Acosta, Emmanuel Rivera, Emilio Rendón, and Gerardo Ceballos

Ecology of rodents and fleas associated with black tailed prairie dogs in areas with plague

Bala Thiagarajan, Jack F. Cully Jr., and Kenneth L. Gage

Flea loads on Black-tailed Prairie Dogs (*Cynomys Ludovicianus*) During Plague Epizootics in Colorado

Daniel W. Tripp, Kenneth L. Gage, John A. Monteneri, and Michael F. Antolin

Plague Activity in California: a summary of statewide public health surveillance, 1984-2007

J. R. Tucker



REASONS FOR THE PLAGUE

*Contaminated air, poisoned ground,
Infected bodies in the cemetery, and the dead
Scattered in the fields in grievous wars,
Latrines piled with infectious dung,
Stench from garbage dumped
In fields, towns, and castles,
Great filth and heaps of excrement,
Refuse which is foolhardy to make,
Stale, polluted air, and swine:
All of these cause plague in many places.*

*To have a gluttonous mouth, scurrilous life,
To drink and eat without appetite,
To sit long at table is dangerous to do,
And likewise to eat too many courses.
Eating overly salted venison, beef, oxen and pork,
Tench, eel, conger, all beasts,
Ocean fish, dairy products, fruit, leeks,
Onions and garlic, cheap wine with murky dregs,
Hard bread and unleavened cakes:
All of these cause plague in many places.*

*To live on water from swampy ground,
To be in heavy air when fog is thick,
Waking too early, leading a lewd life,
And to be stiff with anger are death.
To be too hot or too cold when doors are open,
To partake of spas and baths among those
Who are infected, putrid and depressed
Engenders many similar diseases
And such matters as in these prime examples:
All of these cause plague in many places.*

*Prince, one would do well in these special cases
And scurrilous circumstances, for one's health,
To flee from them all, or at least some.
One should purge the body and keep warm,
Since without protection from such defects,
All of these cause plague in many places.
— Deschamps (c. 1340-1406)*



