

Researchers identify areas of plague risk in western US

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Researchers at SUNY Downstate Medical Center have identified and mapped areas of high probability of plague bacteria in the western United States.

Their findings were published in a recent edition of the journal, *PeerJ*.

This investigation predicted animal [plague](#) occurrence across western states based on reported occurrences of plague in sylvan (wild) and domestic animal hosts. Plague is a disease caused by *Yersinia pestis*, a bacterium found in rodents and their fleas in many areas around the world.

"This study used surveillance data of plague in wild and domestic animals in the American West to identify and map those areas with the greatest potential for human exposure to this infection, which can be particularly deadly when transmitted to humans," said Michael Walsh, PhD, MPH, assistant professor in the Department of Epidemiology and Biostatistics in the School of Public Health at SUNY Downstate.

"The findings can be used by [public health](#) agencies to target specific areas for enhanced plague surveillance within areas and counties predicted to be at high risk, as well as by other research teams to direct the sampling of local wildlife populations for the identification of *Yersinia pestis* in wild animals that find themselves in close proximity to humans and human developed landscapes," he added.

According to the federal Centers for Disease Control and Prevention (CDC), plague was first introduced into the United States in 1900, by rat-infested steamships that had sailed from affected areas. Epidemics occurred in port cities, with the last urban plague epidemic in the United States occurring in Los Angeles from 1924 through 1925. Plague then spread from urban rats to rural rodent species, and became entrenched in many areas of the western United States. Since that time, plague has occurred as scattered cases in rural areas. Most human cases in the United States occur in two regions: Northern New Mexico, northern Arizona, and southern Colorado; and California, southern Oregon, and far western Nevada

The CDC also notes that in recent decades, an average of seven human plague cases has been reported each year (range: 1-17 cases per year). Plague has occurred in people of all ages (infants up to age 96), though 50% of cases occur in people ages 12-45.

The authors note in their article that while zoonotic (animal) transmission to humans is much less common in modern times, significant plague risk remains in parts of the western U.S. Moreover, risk to some threatened species that are part of the epizootic cycle can be quite substantive.

This investigation attempted to predict the risk of plague across the western US by modeling the ecologic niche of plague in sylvan and domestic animals identified between 2000 and 2015. An algorithm was used to predict this niche based on climate, altitude, land cover, and the presence of an important enzootic (carrier) species, *Peromyscus maniculatus* (a rodent commonly known as the North American deer mouse).

This model demonstrated good predictive ability and identified areas of high risk in central Colorado, north-central New Mexico, and

southwestern and northeastern California.

The presence of *P. maniculatus*, altitude, precipitation during the driest and wettest quarters, and distance to artificial surfaces, all contributed substantively to maximizing the gain function. These findings add to the known landscape epidemiology and infection ecology of plague in the western U.S. and may suggest locations of particular risk to be targeted for wild and domestic animal intervention.

More information: Michael Walsh et al. Modeling the ecologic niche of plague in sylvan and domestic animal hosts to delineate sources of human exposure in the western United States, *PeerJ* (2015). [DOI: 10.7717/peerj.1493](https://doi.org/10.7717/peerj.1493)

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