



Advances in Sylvatic Plague Management: not just for prairie dogs?

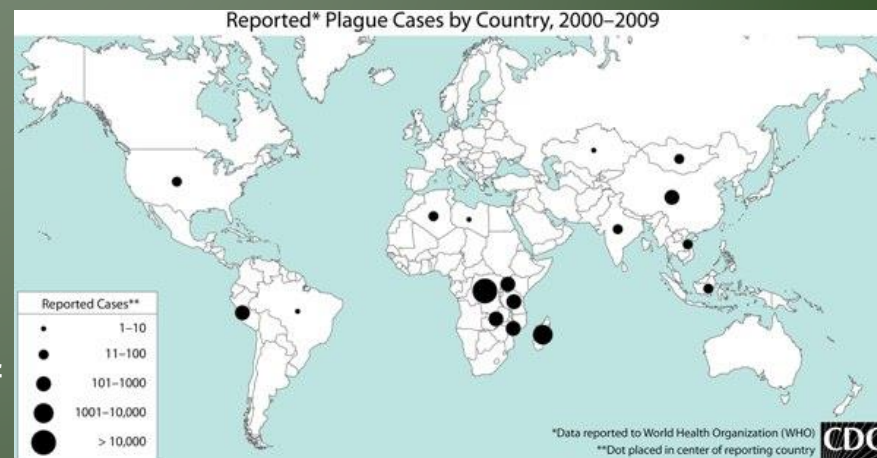
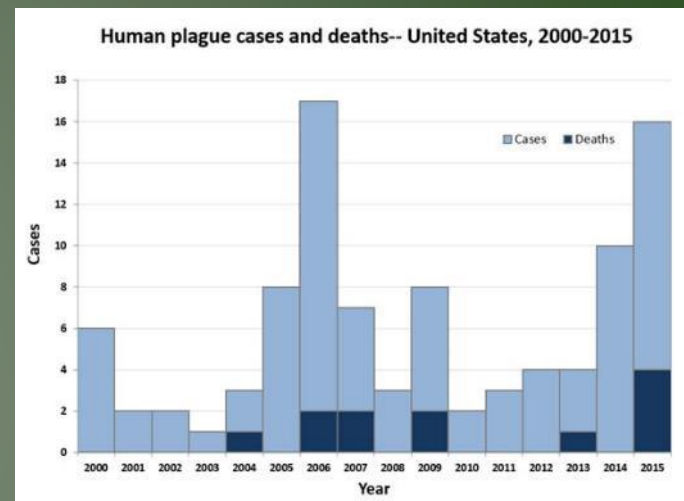
Anne Justice-Allen, DVM, MS





Sylvatic Plague and Public Health

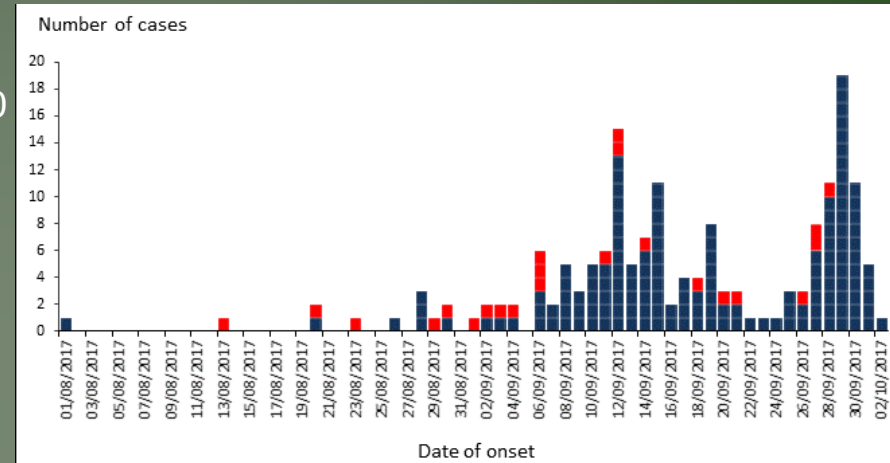
- ▶ July 2009: Sage Creek Wilderness, Badlands National Park, prairie dogs
- ▶ May 2015 and 2016: Ada and Elmore Counties, Idaho, ground squirrels
- ▶ June 2015 to 2017: New Mexico, 11 human cases distributed in 3 counties, 24 animals in 2017
- ▶ August 2015: Crane Flat campground, Yosemite National Park
- ▶ August 2017: 73 cases of pneumonic and 58 cases of bubonic plague, Madagascar





Plague Outbreak in Madagascar

- ▶ Began 23 August 2017
- ▶ As of 3 October: 194 cases and 30 deaths
 - ▶ 124 pneumonic cases (21 deaths)
 - ▶ 68 bubonic (9 deaths)
 - ▶ 1 septicemic and 1 undetermined
 - ▶ 14 of 22 central, northern, and eastern districts
- ▶ Risk for regional spread considered high
- ▶ Risk for EU travelers considered very low
 - ▶ Member states should review preparedness plans for imported cases
 - ▶ Personal protection recommended

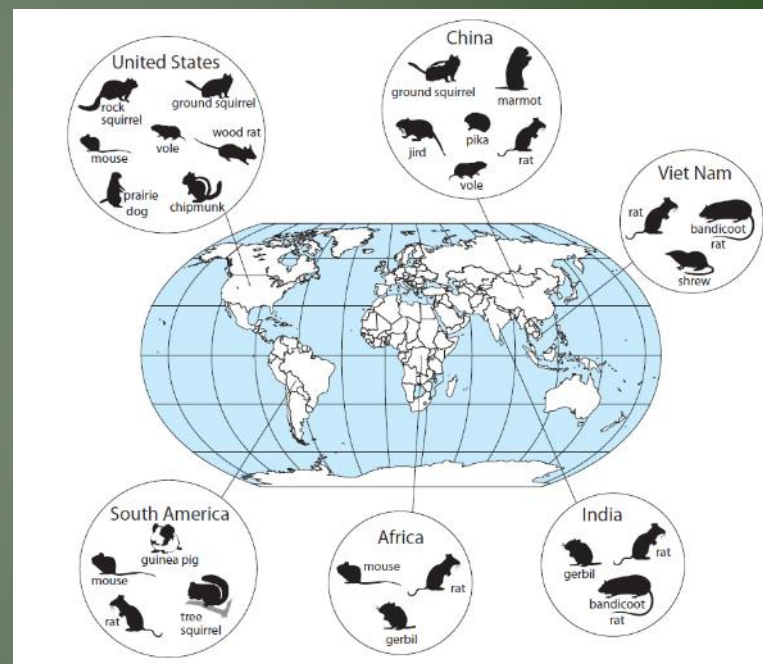


Distribution of plague cases and deaths by date of onset, 1 August–3 October 2017, Madagascar ($n=172$ cases where the date of onset is known). European Centre for Disease Prevention and Control. Plague outbreak, Madagascar, 2017 – 9 October 2017. Stockholm: ECDC; 2017.



Sylvatic Plague (*Yersinia pestis*) Ecology

- ▶ Introduced to North America
 - ▶ Western United States
 - ▶ Decline of several species
- ▶ Susceptibility
 - ▶ Rodents high but variable
 - ▶ Canids resistant
 - ▶ Felids susceptible
- ▶ Vector
 - ▶ Several flea species
- ▶ Epizootic vs. interepizootic biology



Abbot and Rocke 2012



Center for Veterinary Biologics Licensing Process

- ▶ “...ensure that the veterinary biologics available for the diagnosis, prevention, and treatment of animal diseases are pure, safe, potent, and effective.”
- ▶ Exemptions
 - ▶ Vaccines manufactured by veterinarians/individuals intended for use in client’s/own animals
- ▶ Research authorized by USDA
- ▶ Documentation
 - ▶ Production methods
 - ▶ Evaluation of purity, safety and identity data for recombinant DNA technology
- ▶ Virus, cell cultures, product samples evaluated by CVB laboratory



Center for Veterinary Biologics Licensing Process

- ▶ Host safety, immunogenicity/efficacy, back passage, shed/spread
 - ▶ Dose determination
 - ▶ Duration of immunity
 - ▶ Immunological interference; maternal immunity
 - ▶ Stability
 - ▶ Non-target safety
 - ▶ Field safety efficacy
- ▶ Environmental impact assessment



Sylvatic Plague Vaccine Development

- ▶ Recombinant raccoon poxvirus
- ▶ Antigens
 - ▶ F1
 - ▶ Truncated V protein (V307)
- ▶ Peanut butter attractant
- ▶ Effective and safe in experimental trials
 - ▶ 60% survival with 1 dose
 - ▶ 85% survival with 2 doses
 - ▶ More effective in younger animals



Rocke et al. 2014. *Vaccines* 2:772-784
Rocke et al. 2015. *Ecohealth* 12:278-287



Phase I Field Safety Trials

Colorado Parks and Wildlife & USGS-NWHC

- ▶ Bait Acceptance Trials 2009 – 2011: Baiting density was optimized.
- ▶ Black-tailed and Gunnison's prairie dogs vaccinated with SPV in 2012
- ▶ High vaccine uptake (95%) observed in both species
- ▶ No evidence of adverse effects in wild prairie dogs or other wild rodents that consumed SPV laden baits
- ▶ SPV appears to be safe for field application to prairie dog colonies

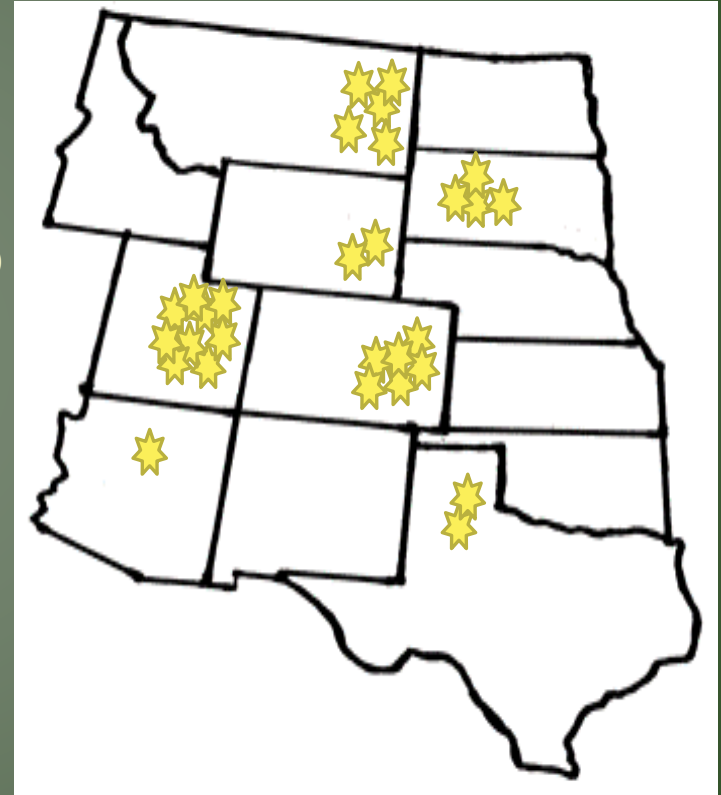


Courtesy Colorado Parks and Wildlife – D. Tripp & T. Rocke



Phase 2: Field Efficacy Trials

- ▶ Study design:
 - ▶ Paired sites -- 1 receives SPV baits, 1 receives placebo
 - ▶ Similar in size, shape, vegetation, PD density, etc.
- ▶ Study duration:
 - ▶ 29 paired sites tested for 4 consecutive years
 - ▶ Baiting ends 2016
 - ▶ Data collection ends 2017
 - ▶ Data analysis 2016-2017
 - ▶ Phase 2 results 2017.

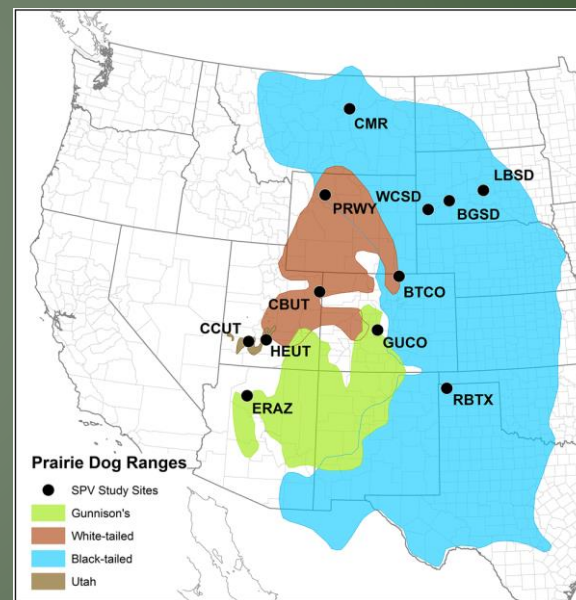


General locations of 29 paired field efficacy study sites active in the Sylvatic Plague Vaccination test project, 2013-2016.



Sylvatic Plague Vaccine

- ▶ Current Status
 - ▶ Conditionally approved
 - ▶ Government agencies
 - ▶ Prairie dogs
- ▶ Next steps
 - ▶ Additional species
 - ▶ Some data already collected
 - ▶ Experimental trials – funding needed
 - ▶ Additional habitats
 - ▶ National parks
 - ▶ Urban areas



Rocke et al. Ecohealth 2017
(doi:10.1007/s10393-017-1253-x)



Potential Benefits of SPV

- Reduced need to dust to prevent plague
 - Some dusting will still be needed as SPV is not useful during a plague outbreak
- Improved ability to balance prairie dog conservation with other land uses
- Increased economy/efficiency in black-footed ferret recovery
 - Conservation of some other at-risk species in western grasslands
- Public health application
 - Reduced exposure to domestic animals and people





SPV Project Needs

- ▶ Funding to test in additional species
- ▶ Eventually, agencies and locations to field trial



White-throated wood rat (*Neotoma albigula*) - <http://beavercreek.nau.edu>



Wyoming Ground squirrel (*Urocitellus elegans*) – photo by Beth Waterbury, Idaho Fish and Game



California ground squirrel (*Spermophilus beecheyi*) – photo by Howcheng



Acknowledgments

- Tonie Rocke and her lab
- Multiple state agencies
- Sylvatic Plague Vaccine Technical Committee
- AGFD Black-footed ferret program personnel
- AGFD interns





Questions?

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