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

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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

CDC (https://www.cdc.gov/plague/)
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
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 affects 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://beaver creek.nau.edu](http://beaver creek.nau.edu)

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

California ground squirrel (*Spermophilus beecheyi*) – photo by Howcheng
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• AGFD interns
Questions?

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