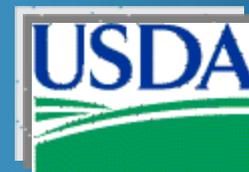


Pathogenesis and Epidemiology of Brucellosis in Yellowstone Bison

Jack Rhyan

USDA, APHIS Veterinary Services
National Wildlife Research Center
Fort Collins, CO



Outline

- Results of Prospective Pathogenesis and Epidemiology Study (1995-2001)
- Describe Course of Brucellosis in Bison
- Discuss the knowledge deficiencies



Pathogenesis and Epidemiology Study

- Co- PIs:
 - Keith Aune MTFWP
 - Tom Roffe USGS, BRD
 - Jack Rhyan USDA, APHIS



Background

- 1917 – 2 aborting bison in YNP had positive agglutination tests to *B. abortus*
- 1932 – Rush observed abortions in YNP herd and suspected brucellosis due to 53% seropositive prevalence in herd
- 1983 – Flagg reported brucellosis transmission from bison to cattle in North Dakota
- 1985 & 1991-92 – culture studies resulting in isolation of *B. abortus* biovar 1 from 32 YNP bison
- 1990 – Davis et al – demonstrated abortion and interspecies transmission in captive bison
- In 1992, 1st lab confirmation of *Brucella* abortion in Yellowstone bison

Project Goal and Design:

- Follow the natural course of infection in free-ranging bison and offspring in Yellowstone over 5 year period
- 25 seropositive and 25 seronegative adult females and their offspring; one year pilot study with 10 bison
- Collect specimens (blood, milk, feces, swabs) 3 times per year - October, February & after calving (April - June)
- Monitored pregnancies with ultrasound, rectal palpation, PSPB, and vaginal transmitters
- Immobilization by dart or helicopter capture



Results

- Immobilized and collected specimens at least once from 53 adult females (27 seroneg and 26 seropos)
- 45 had repeat captures and collections
- 28 of the original cows bore 45 calves that were captured & collected at least 1X during study
- Of 45 calves, 23 were collected once, 12 twice, 10 were collected 3 - 11 times
- Collected once from 2 “grand offspring” of original cows



Results (cont) Adults Serology

- 17 of 45 repeat captured adults remained seronegative
- 18 of 45 remained seropositive
- 8 seroconverted to positive
- 2 converted from weak pos or “suspect” to negative
- Age (years) of positive seroconversions: 2, 3, 3, 3, 4, 6, 9, & 10
- Annual seroconversion rate for adults entering study as seronegatives = 10.6 %

Results (cont) Calves Serology

- Newborn calves born to seroneg cows were seroneg
- Most newborns born to seropos cows were seropos
- At 5 months, most calves were seroneg regardless of dam's serostatus (exs)
- Annual positive seroconversion rate for 22 calves captured more than once = 22.7% (9 serocon/39.6 animal years)
- Seroconversions detected as early as 5 months of age but most numerous in 2nd year of life
- No relationship between serostatus of dam and tendency of calf to seroconvert

Results (cont) Infection

- *B. abortus* isolated at least once from 8 seroconverting bison and 3 other seropos animals
- *B. abortus* isolated from blood (n=6), milk (n=6), vaginal swabs (n=4), and feces (n=1)
- *B. abortus* isolated at time seroconversion was detected and up to 3 years after seroconversion

Results (cont) Reproduction

- For 24 post-seroconversion reproductive seasons monitored for 10 cows, 11 confirmed live calves, 11 reproductive failures, and 2 undetermined outcomes
- Of the repro failures, 4 were abortions, 4 were not pregnant on one or more tests, and 3 had inadequate testing but no calf was observed

Results (cont) Reproduction 2

- Fuller et al. 2007. Reproduction and Survival of Yellowstone Bison. J Wildl Manage 71:2365-2372
- Birth rates:
 - 3-yr-old Brucella pos = 0.40 calves/female
 - 3-yr-old Brucella neg = 0.60 calves/female
 - 3-yr-old Brucella SC = 0.10 calves/female
 - 4+ yr-olds = 0.64, 0.81, and 0.22 calves/female

Simulations suggested brucellosis eradication would lead to increased birth rates and 29% increase in population growth

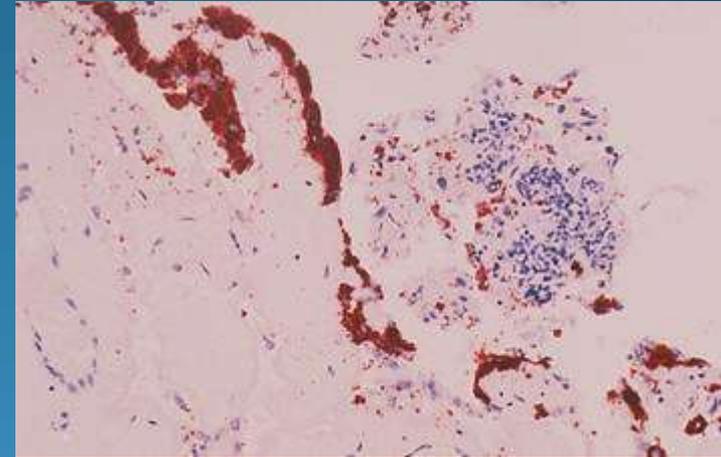
Course of Brucellosis in Bison

- Source of infection: abortion/parturition products
- Newborns may be infected at birth or via milk; most uninfected and seronegative by 6 months. They are susceptible to infection. A few remain infected.
- Animals may become infected at any age. Juveniles and young adults at higher rate.
- Post infection, males develop seminal vesiculitis, epididymitis, orchitis



Course of Brucellosis (cont)

- Following infection, females may bare live calves, bare weak calves, abort usually in last trimester
- Infected animals usually remain infected for long time
- In subsequent pregnancies, infected cows may abort or bare weak calves or may bare normal calf with or without shedding
- Females have metritis, retained placenta and mastitis
- Feces may be positive but not efficient fomite



Knowledge Gaps

- Need tighter percentages and confidence
- Venereal transmission?
- Latent infection?
- Cause of reproductive failures in years following abortion? Chronic endometritis?

