

Accidental Exposure to Cattle Brucellosis Vaccines in Wyoming, Montana, and Idaho Veterinarians

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Brucellosis Meeting

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Veterinary Occupational Exposure

- ▶ 1 needle stick per 1,000 injections
- ▶ CDC study 1998–1999 reported 26 RB51 exposures
 - 21 (81%) needle sticks
 - 5 (19%) splashes to eyes/open wound
 - 19 (73%) had ≥ 1 systemic symptom
- ▶ One of only studies to assess human exposure to RB51

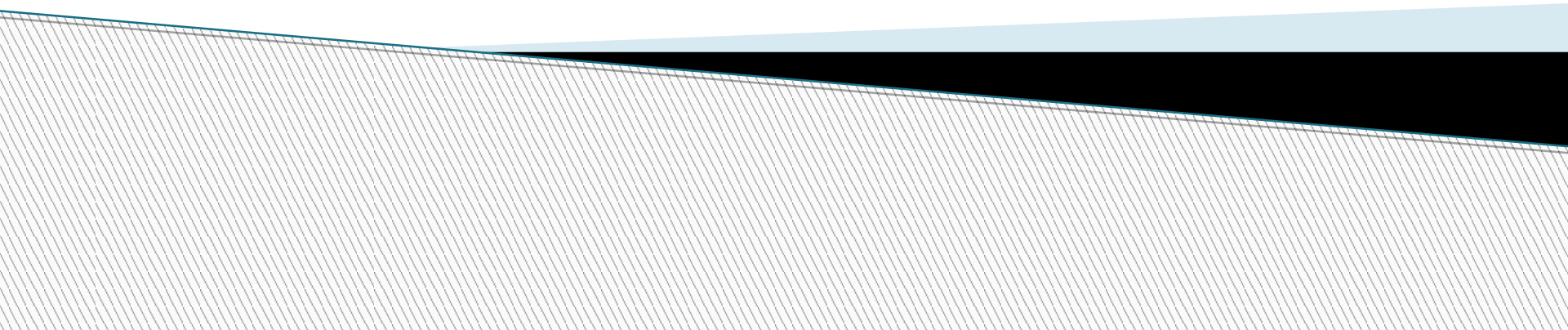
Objective

To characterize and describe risk of accidental exposure to cattle brucellosis vaccines in veterinarians in Greater Yellowstone Area (GYA)

Materials and Methods

- ▶ Online and anonymous survey instrument
 - Number cattle vaccinated annually, vaccine administration techniques, vaccine exposure, symptoms, treatments, and outcomes
- ▶ December 8, 2012 to March 4, 2013
- ▶ Survey link
 - State livestock department newsletters, state veterinary associations, and veterinary email list serves
- ▶ Descriptive epidemiology

Results



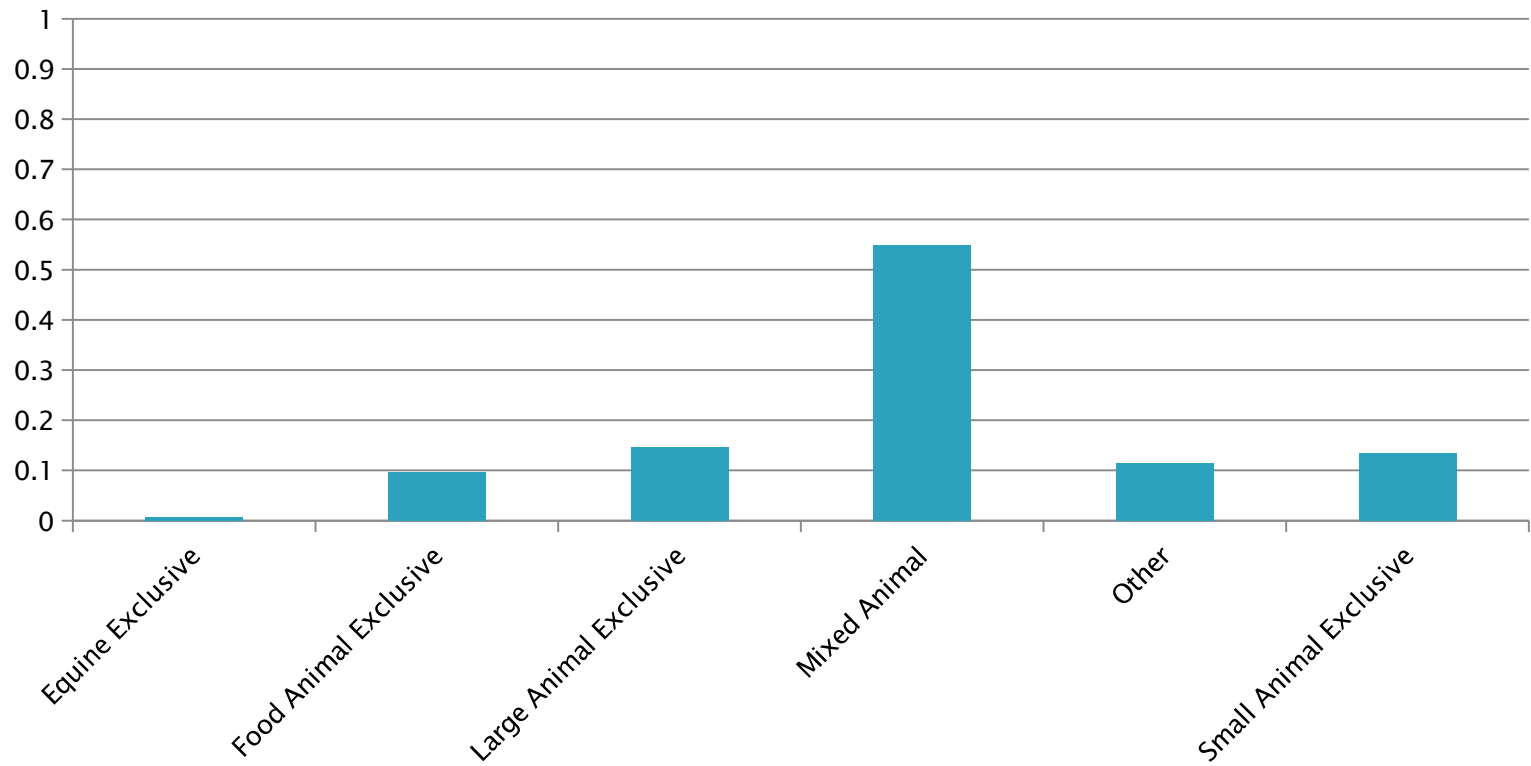
Demographics (n=143)

Demographic	
Males	70.0%
Mean Age	51.0 years
Age Range	27-76 years
Mean Years in Veterinary Practice	22.7 years
Years in Veterinary Practice Range	1-48 years

State of Veterinary Practice (n=143)

- ▶ Idaho 41.3% (59)
- ▶ Wyoming 30.8% (44)
- ▶ Montana 17.5% (25)
- ▶ Other 10.5% (15)
 - California, Oregon, Texas, Utah, and Washington

Veterinary Practice Type During Last 12 Months



Vaccine Type Used (n=143)

- ▶ Strain 19 used by 62.2% (89)
 - Mean use of 12.1 years
- ▶ RB51 used by 92.3% (132)

Veterinarian PPE Worn Last 12 Months

PPE Type	Reconstituting RB51 % (n/N)	Administering RB51 % (n/N)
Gloves	58.3% (70/120)	65.8% (79/120)
Eye Protection	19.2% (23/120)	20% (24/120)
None	41.7% (50/120)	31.7% (38/120)

PPE Required for Reconstituting RB51 for Non-Veterinarian Staff (n=29)

- ▶ 41.4% require gloves to be worn
- ▶ 58.6% require no PPE
- ▶ None required eye protection

Employee Exposure

- ▶ 12.5% respondents had employee with known exposure to either or both vaccines
 - Needle sticks 9 exposures
 - Eye splashes 8 exposures
 - Abortive material 2 exposures
 - Wound splash 1 exposure

- ▶ **None resulted in clinical symptoms**

Vaccine Delivery (n=143)

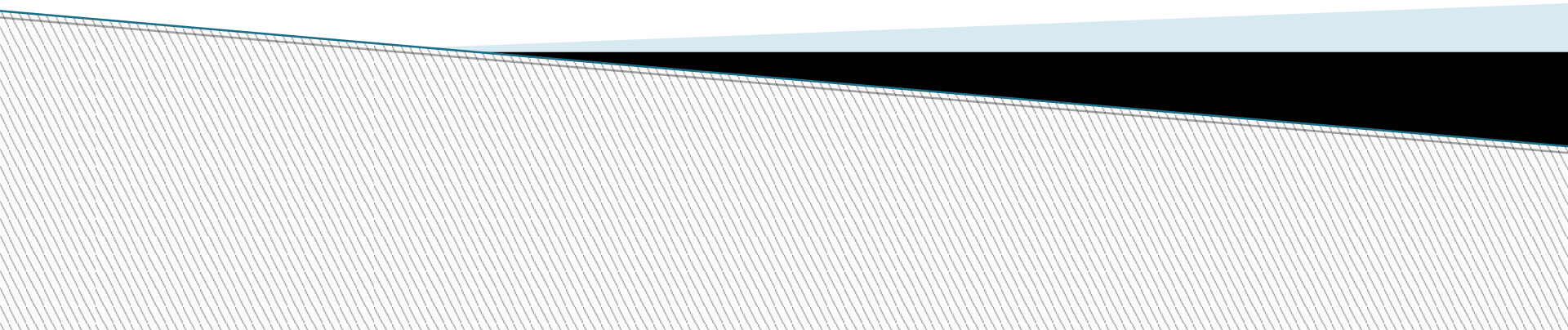
- ▶ 61.5% (88/143) use vaccine gun
- ▶ 57.3% (82/143) use syringe
 - 24.5% — 3 cc
 - 28.7% — 6 cc
 - 28.0% — 12 cc

Needles

- ▶ 72.4% respondents recap needles
 - Potential needle stick exposure point



Vaccine Exposures



Vaccine Exposure

- ▶ 51.7% (74/143) of respondents had a known exposure to either Strain 19, RB51, or both
- ▶ 55.4% (41 / 74) had multiple exposures to either vaccine

Idaho 41.3% (59)

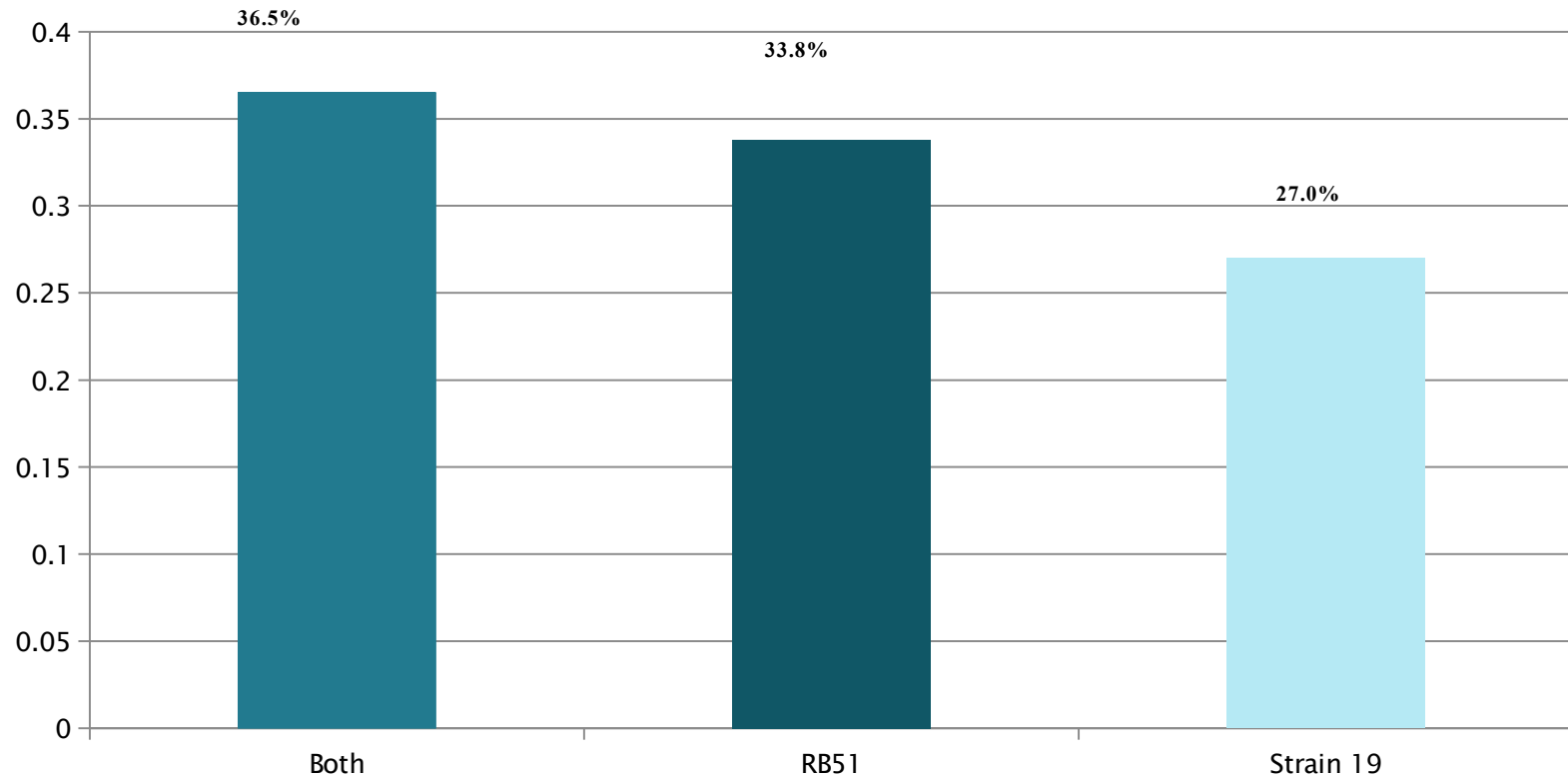
Wyoming 30.8% (44)

Montana 17.5% (25)

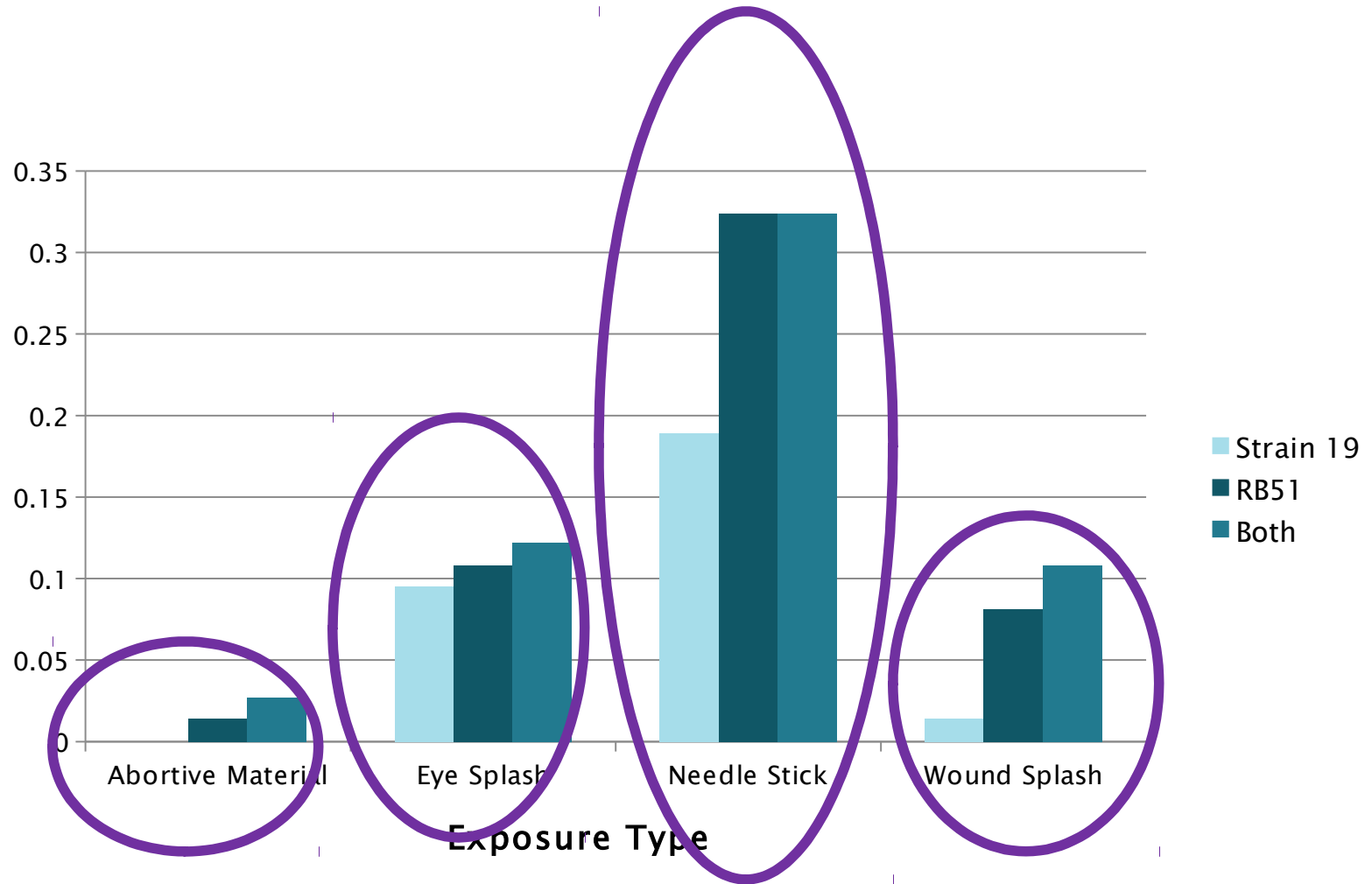
Other 10.5% (15)

California, Oregon, Texas, Utah, and Washington

Proportion of Exposures by Vaccine Type (n=74)



Proportion of Type of Exposure by Vaccine



Vaccine Injected

- ▶ 4 needle sticks
 - 2 Strain 19
 - 2 RB51

- ▶ Amount injected 1-2 drops to 2 mls

Outcomes from Injected Vaccine

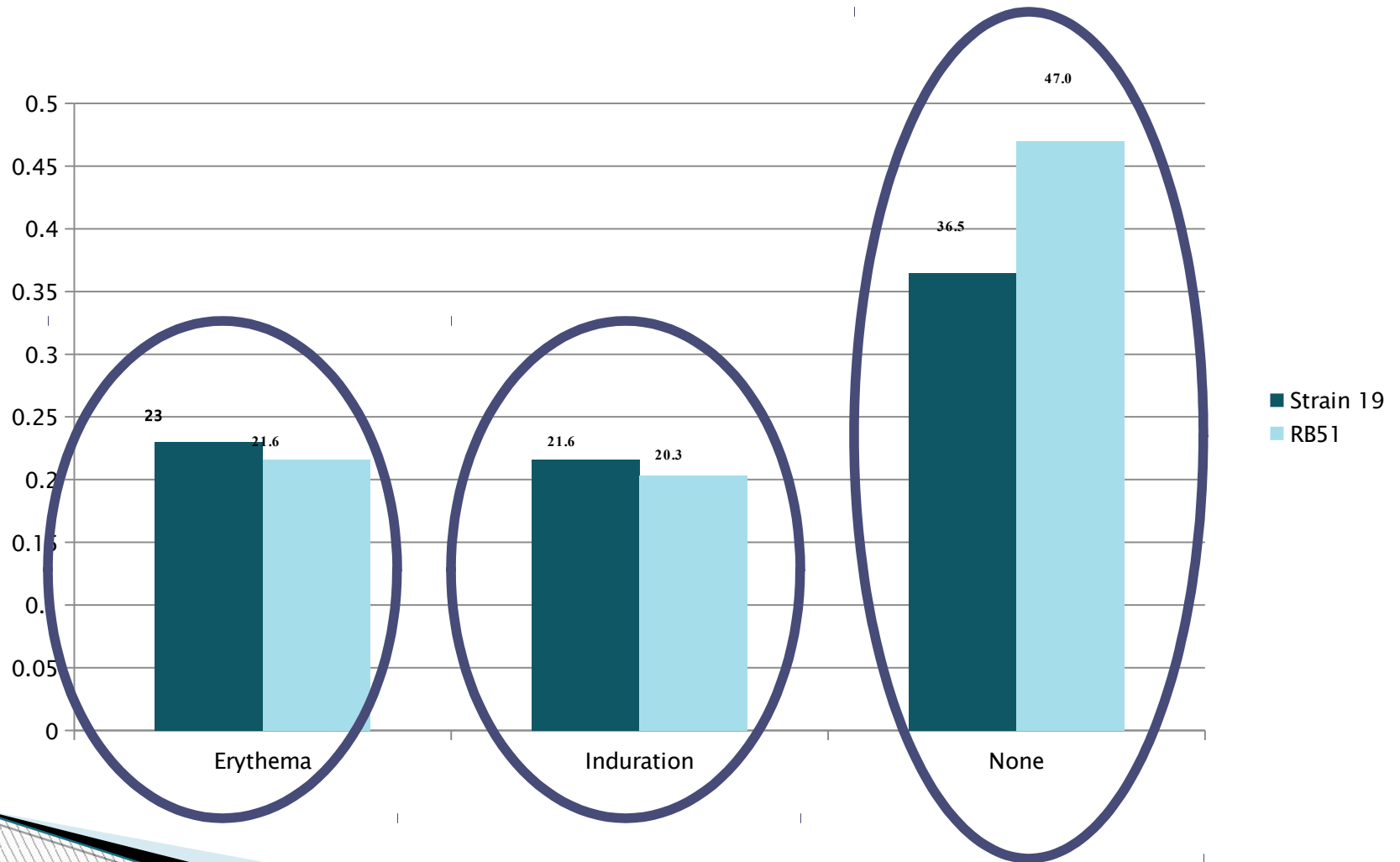
▶ RB51

- Hospitalization and surgery (2 ml dose)
- No symptoms, antibiotics post-exposure

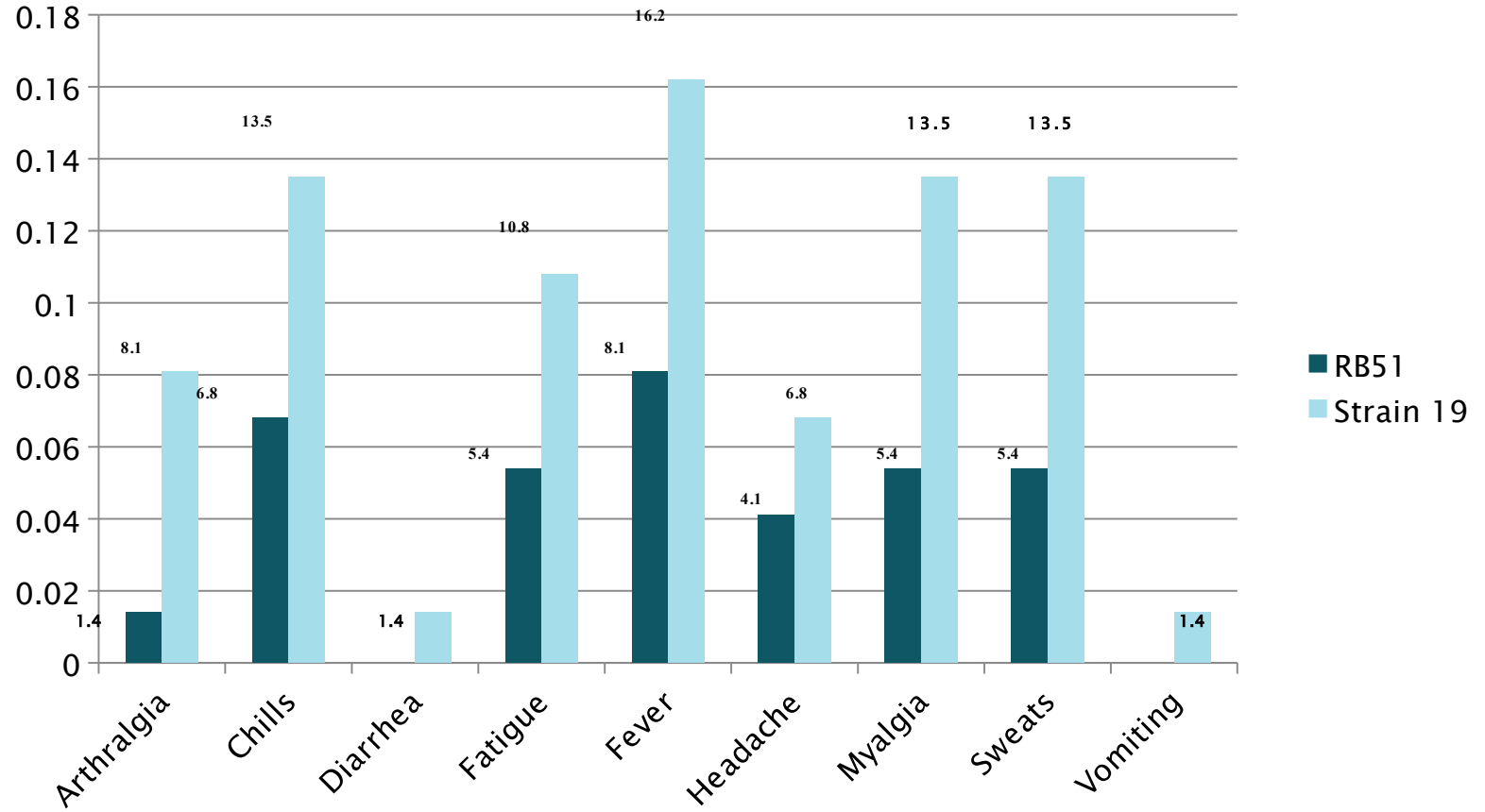
▶ Strain 19

- Localized symptoms, no antibiotics post-exposure
- No symptoms, antibiotics post-exposure

Localized Symptoms



Systemic Symptoms



Medical Treatment From A Health Care Provider

- ▶ 35.1% (26/74) sought medical attention
 - 50% (13/26) Strain 19
 - 30.1% (8/26) RB51
 - 19.2% (5/26) Both
- ▶ Diagnostics performed in 19.2% (5/26)
 - Blood culture and serum agglutination
- ▶ Antibiotics most commonly prescribed
 - Doxycycline
 - Tetracycline

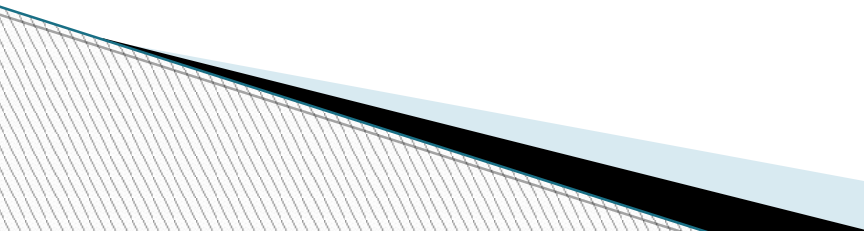
Self Medication

- ▶ 51.4% (38/74) started post-exposure prophylaxis
- ▶ 21% (8/38) reported symptoms
- ▶ Antibiotics most commonly started
 - Doxycycline
 - Oxytetracycline
 - Tetracycline

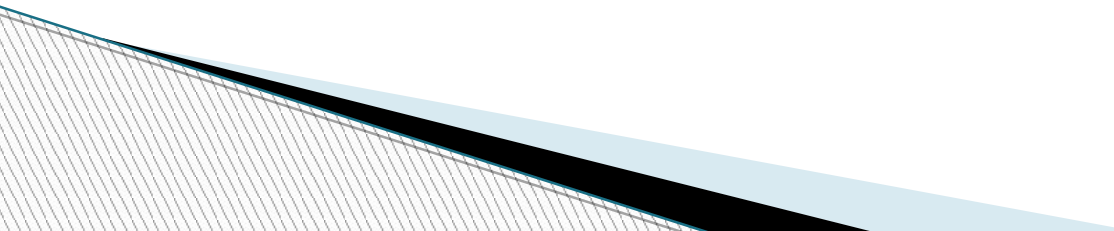
Symptoms Without Post-Exposure Prophylaxis

- ▶ 48.6% (36/74) developed symptoms
- ▶ Symptoms:
 - Small abscess at injection site
 - Night sweats
 - Swelling at injection site

Outcomes

- ▶ 90.5% (67/74) no chronic problems
 - ▶ One chronic arthritis
 - Strain 19
 - ▶ Neuropathy after injection for 3 weeks
 - RB51
 - ▶ Two hospitalized
 - One Strain 19
 - One RB51 (also required surgical intervention)
 - ▶ Two titer to brucellosis
 - Strain 19
 - ▶ One ascending infection
 - Strain 19
 - ▶ No increased severity reported with multiple exposures
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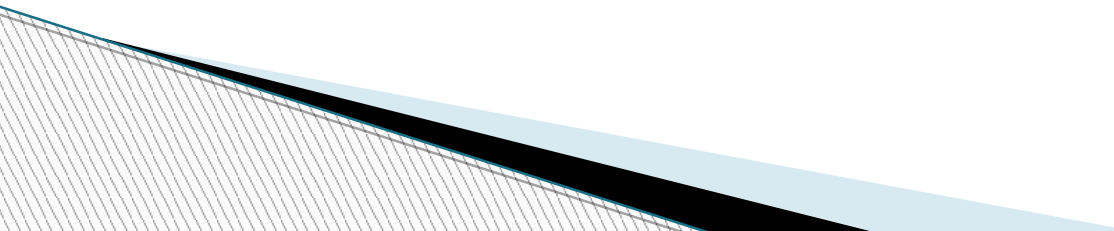
Other Brucellosis Exposures (n=10)

- ▶ Infected wildlife
 - ▶ Infected cattle in brucellosis endemic countries
 - ▶ Fistulous withers in a horse
 - ▶ Laboratory exposure
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Other Concern

- ▶ Expressed concern regarding lack of vacuum on vaccine vials
- ▶ Potential exposure

Discussion

- ▶ Exposure to RB51 occupational hazard
 - ▶ Systemic symptoms reported with RB51 exposure
 - Similar symptoms to natural infection
 - Similar symptoms to Strain 19 exposure
 - ▶ Most common exposure needle sticks
 - ▶ Appropriate antibiotic therapy
- 

Limitations

- ▶ Self reported illnesses
 - Recall bias
- ▶ Convenience sample
 - Difference between respondents and non-respondents
- ▶ Inability to perform tests of statistical significance
 - Respondents exposure to both vaccines

Conclusions

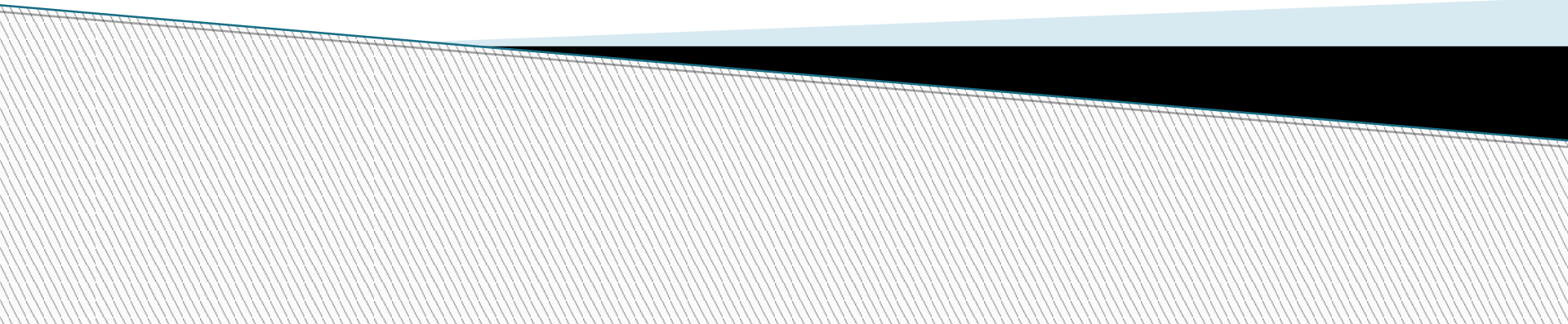
- ▶ RB51 appears to cause localized and systemic illness
 - Undetermined if causes systemic brucellosis in humans
 - Undetermined degree organism versus other vaccine components causes adverse events

- ▶ Findings similar to one other study

Recommendations

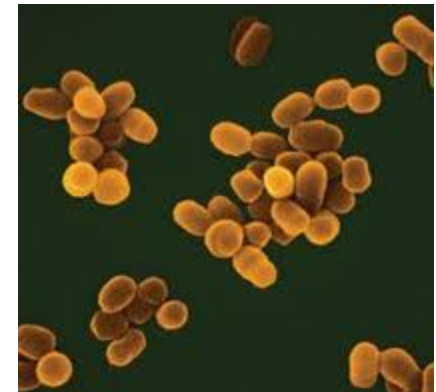
- ▶ Education regarding risk of exposure to RB51
- ▶ Education to minimize risk
 - Proper restraint of animals
 - Use of proper PPE
 - Do not recap needles

Questions?

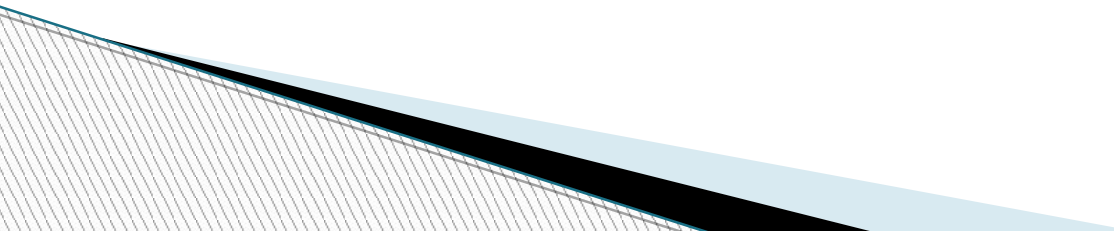


Brucella abortus

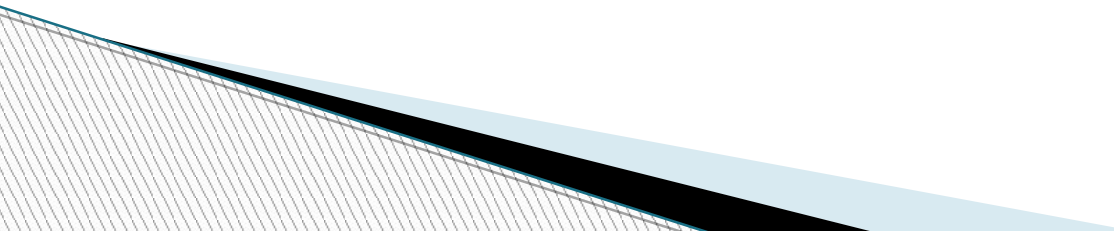
- ▶ Gram negative, non-motile, coccobaccilli
- ▶ One of 4 strains of *brucella* species that causes systemic illness in humans
- ▶ Natural host domestic cattle
- ▶ Causes abortion in cattle, elk, and bison



Human Exposure

- ▶ Breaks in skin
 - ▶ Inoculation of conjunctiva
 - ▶ Ingestions of unpasteurized dairy products
 - ▶ Exposure to live vaccines
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Symptoms in Humans

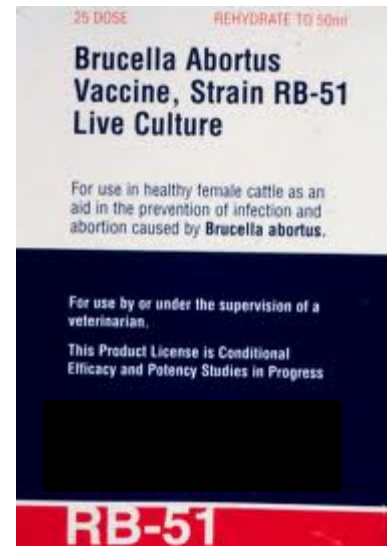
- ▶ Continued, intermittent, or irregular fever of variable duration
 - ▶ Headache
 - ▶ Weakness
 - ▶ Chills
 - ▶ Arthralgia
 - ▶ Depression
 - ▶ Weight loss
 - ▶ Generalized body aches
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Strain 19

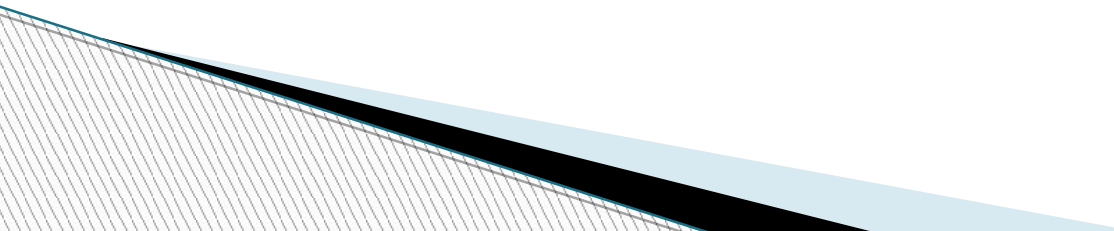
- ▶ Brucellosis vaccine from 1920s to mid-1990s
 - Officially part of Eradication Program since 1940s
- ▶ No longer available for use on cattle in USA
 - Still used in many other countries
- ▶ May cause cross-reactions on serologic tests
- ▶ Known human health hazard

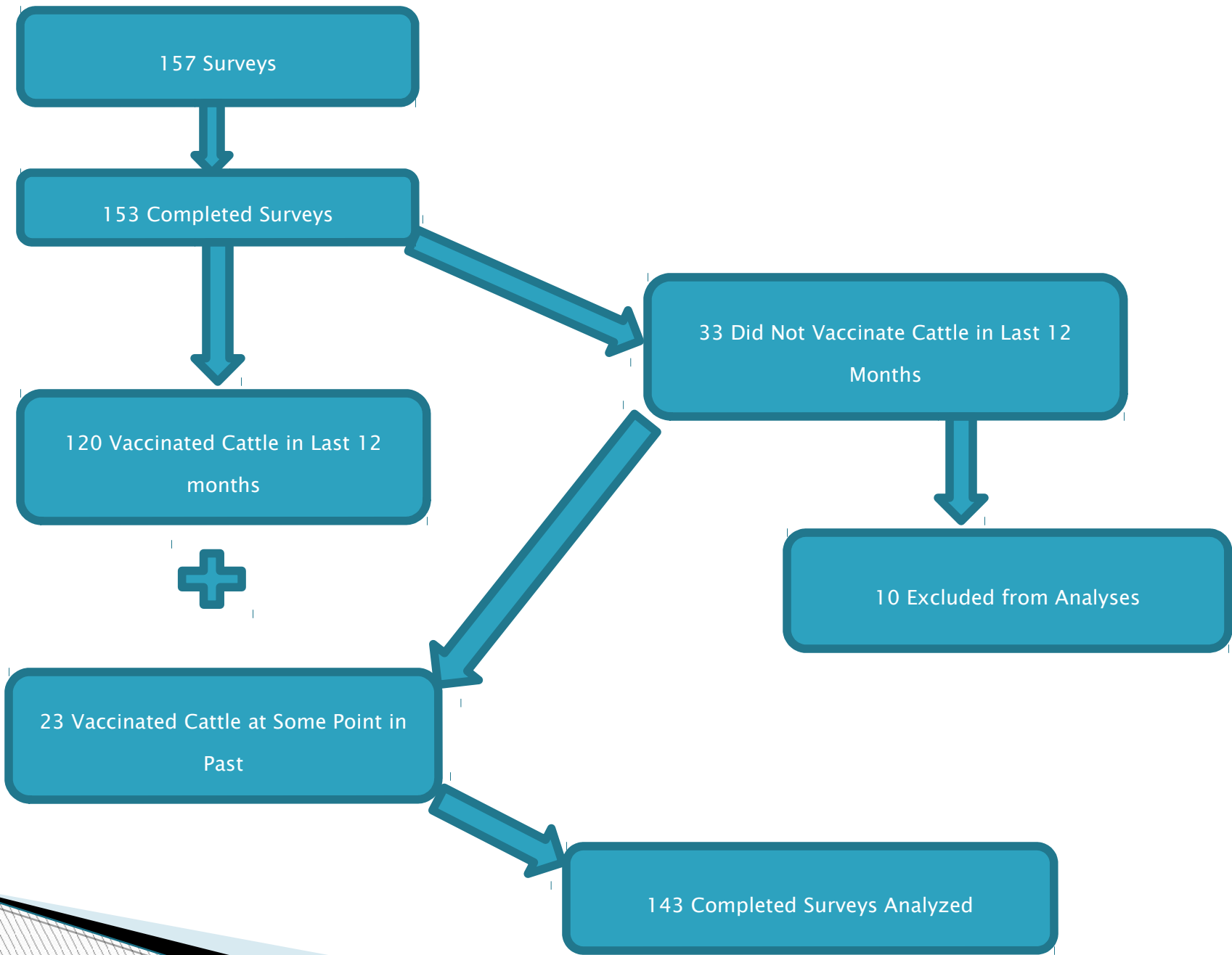
Strain RB51

- ▶ Created by repeated passage with Rifampin
- ▶ Does not cause cross-reactions on standard serologic tests
- ▶ Conditionally licensed for use in cattle in 1996, fully licensed in 2003.
- ▶ Approximately 4–5.5 million cattle vaccinated across USA/year

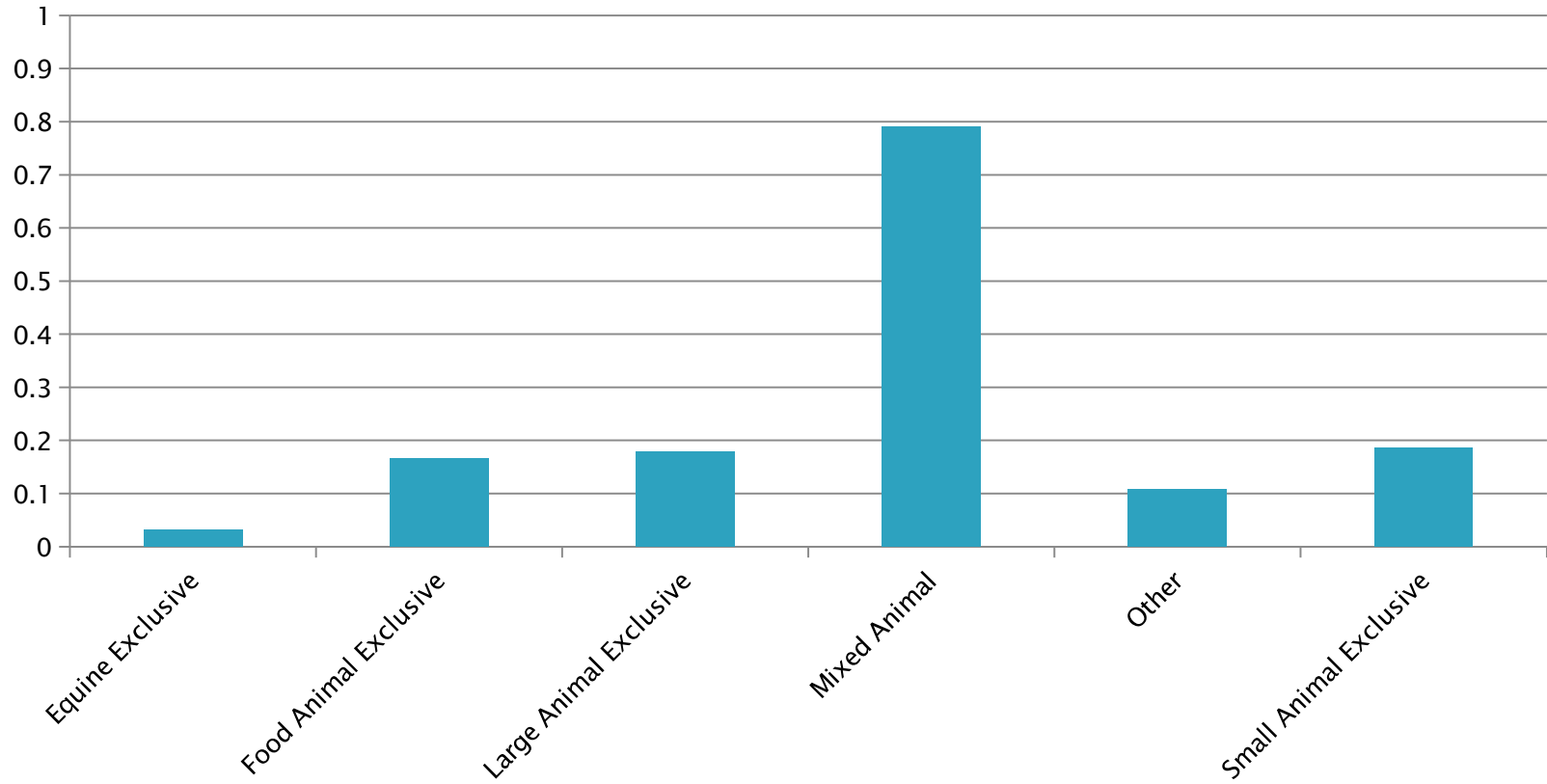


Strain RB51 — Advantages

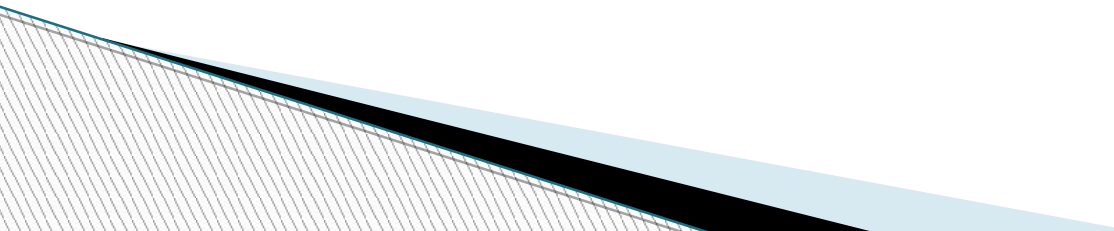
- ▶ Not shed following vaccination
 - ▶ Less abortifacient
 - ▶ Less virulent to humans (?)
- 



Veterinary Practice Type During Career



Veterinary Staff Last 12 Months (n=120)

- ▶ 75.8% do not allow veterinary staff to reconstitute RB51 vaccine
 - ▶ 70% do not allow veterinary staff to administer RB51 vaccine
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Vaccine Gun Disinfection Methods

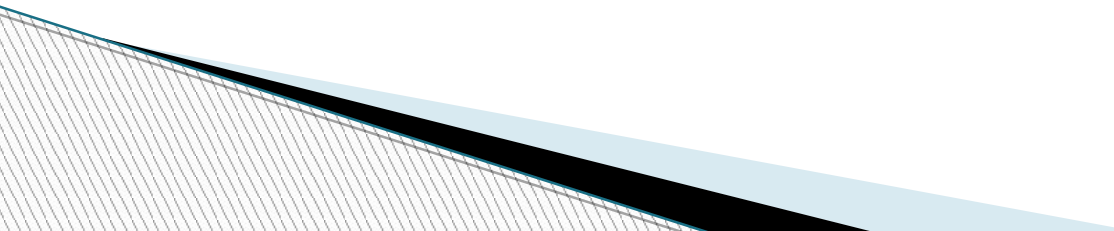
Disinfection Method	% (n/N)
Hot Water/Boil	46.2% (66/143)
Chemical Disinfection	23.8% (34/143)
Soap and Water	4.9% (7/143)
Autoclave	3.5% (5/143)

Vaccine Delivery Method

- ▶ 88.1% use the one hand technique
- ▶ 7% use the two hand with skin tent technique



Needles

- ▶ 74.8% use 16 gauge needle
 - ▶ 24.5% use 18 gauge needle
 - ▶ 26.6% change the needle between every 5–10 calves/cows
 - ▶ 35.7% change the needle between >10 calves/cows
 - ▶ 14% change the needle when it gets dull
- 

Vaccine Vial Disposal Methods

Disposal Method	% (n/N)
Trash	60.1% (86/143)
Burn	15.4% (22/143)
Autoclave	7% (10/143)
Biohazard	7% (33/143)
Chemical Disinfection	7% (10/143)