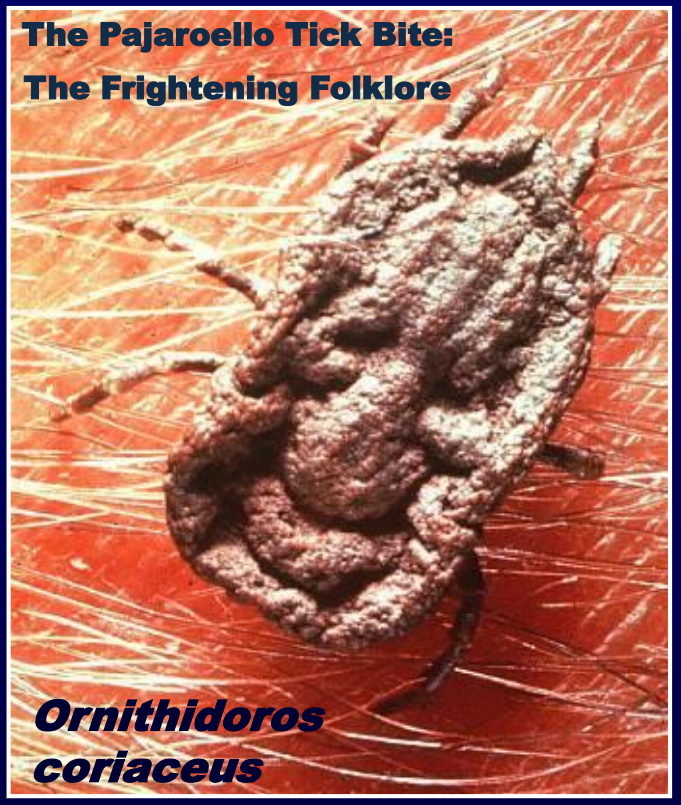
# FOOTHILL ABORTION




Fetal mortality / ***TERM ABORTIONS*** / weak calves

Up to 90% fetal mortality (1st exposure to ticks)

Window of susceptibility (-30 to 150+ days gestation)

Distribution: CA, NV & OR

Diagnosis: Pathology does not develop until ~100 days post-infection

Distribution:, CA, NV OR & Mexico

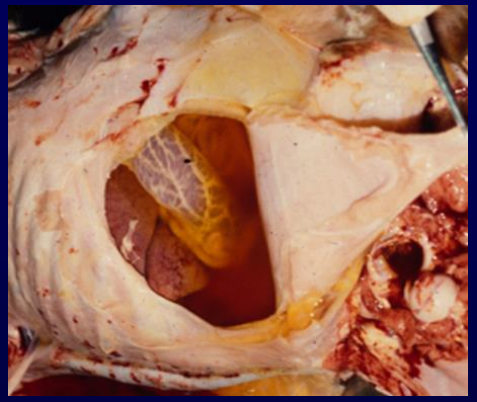
Rapid feeders (15-20 minutes)

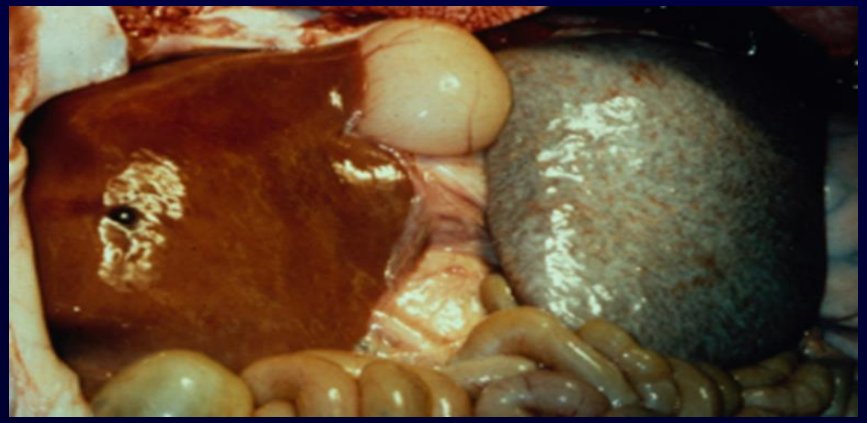
Larvae > nymphs (multiple stages) > adult

Long-lived (10+ years)

Greatest activity: May-October (warm weather)

# GROSS PATHOLOGY





# The Pajaroella tick is the vector of foothill abortion (1970's)



D


B

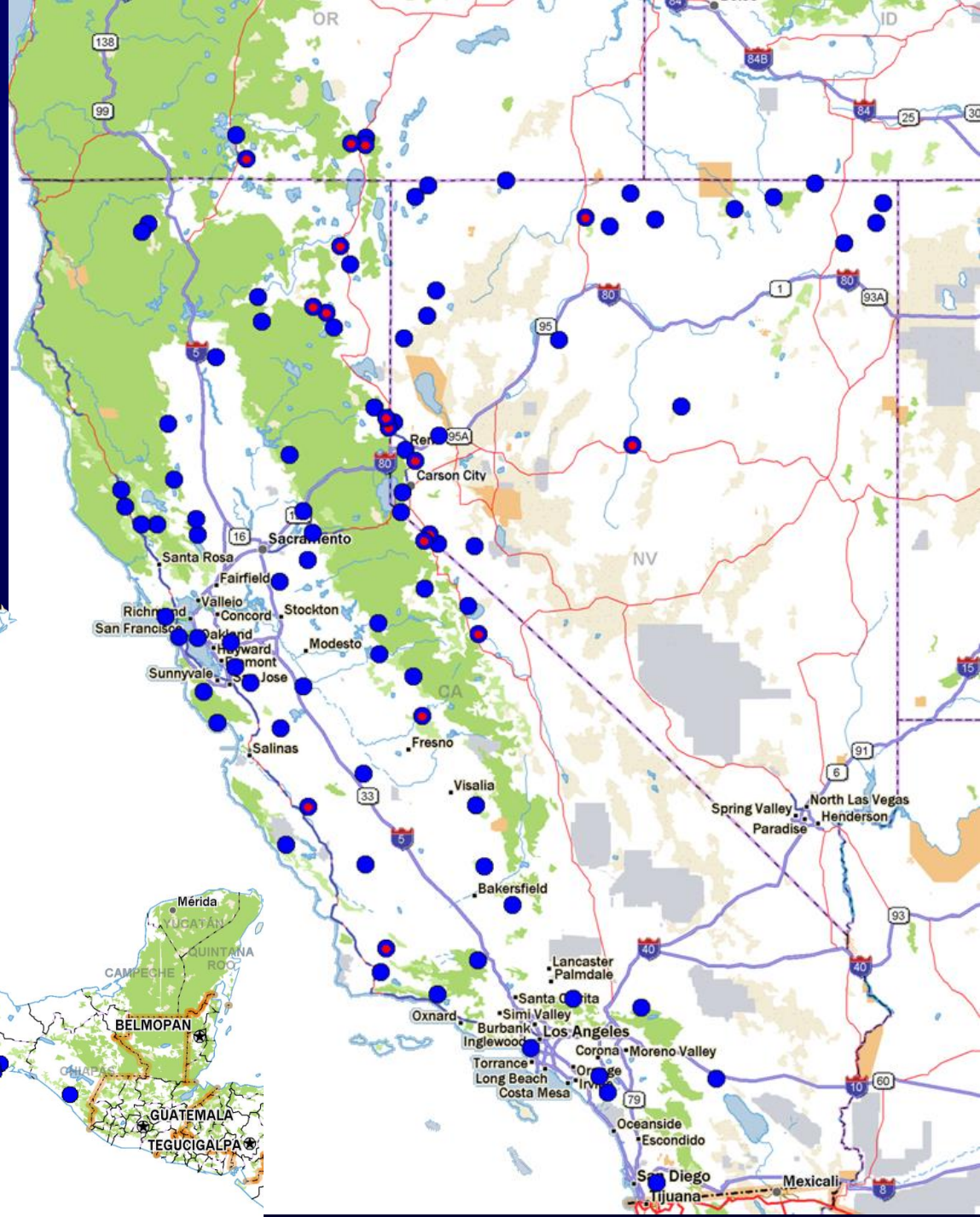
[A] Typical terrain inhabited by the Pajaroello tick (sage, bitter brush & pinion pine)
[B] Collection of Pajaroello ticks using dry ice traps (hungry ticks attracted by $CO_2$)
[C] Hungry Pajaroello ticks (desiccated appearance)
[D] Pajaroello tick following a blood meal (engorged)

# DISTRUBITION OF THE PAJAROELLO TICK,

## *Ornithodoros coriaceus*

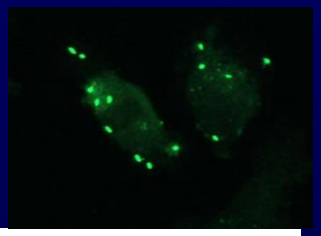
- **Blue Circles: Published reports of trapped *O. coriaceus*.**
- **Blue circles with red centers: EBA-positive results from select collections of ticks subjected to TaqMan-based detection.**

**The majority of tick collection sites were sampled prior to the identification of aoEBA and associated PCR-based diagnostics. Tick collections in Mexico are based upon historical literature and their locations roughly approximated.**

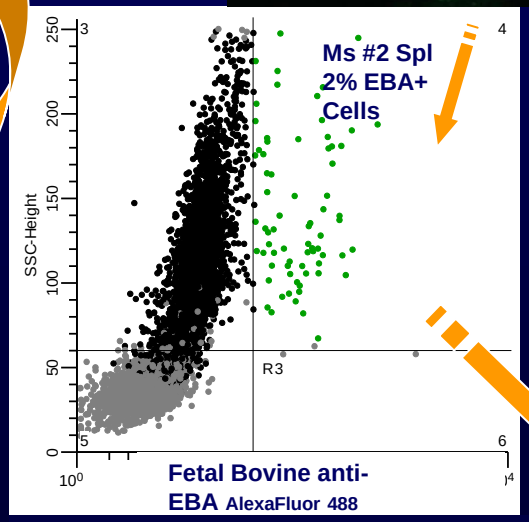



# FOOTHILL ABORTION VACCINE:
## Cryopreserved mouse-derived live bacteria

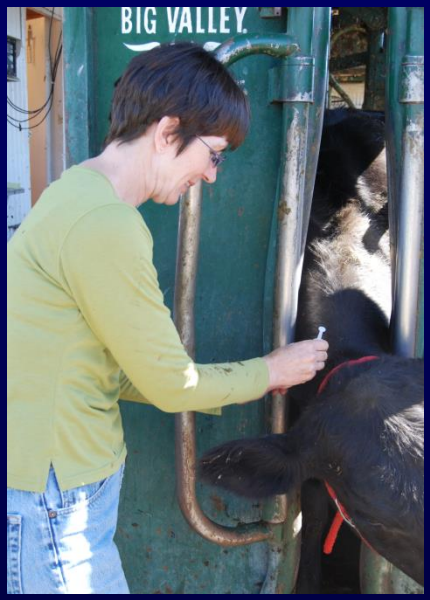
Infected thymus &/or spleen



SCID MOUSE




INFECTED MOUSE SPLEEN CELLS



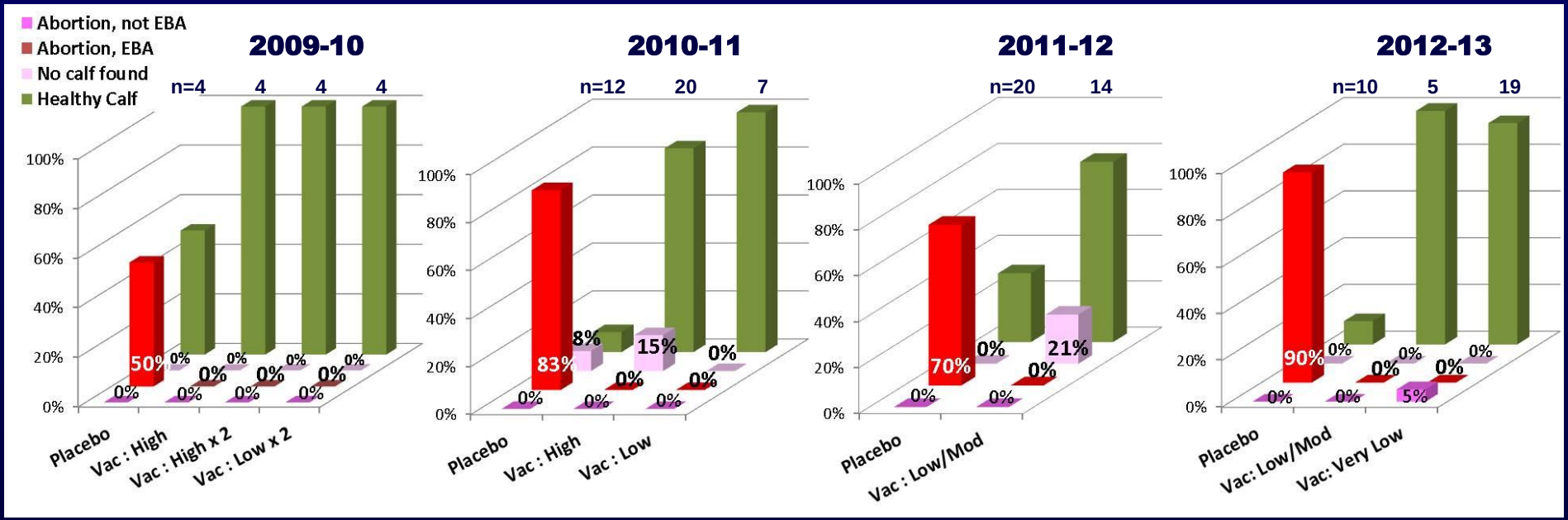

VACCINATE

Determine # of Infected Cells

# VACCINE EFFICACY

## Experimental Challenge of Immunity

### (Heifers that were pregnant prior to entering the foothill abortion window)



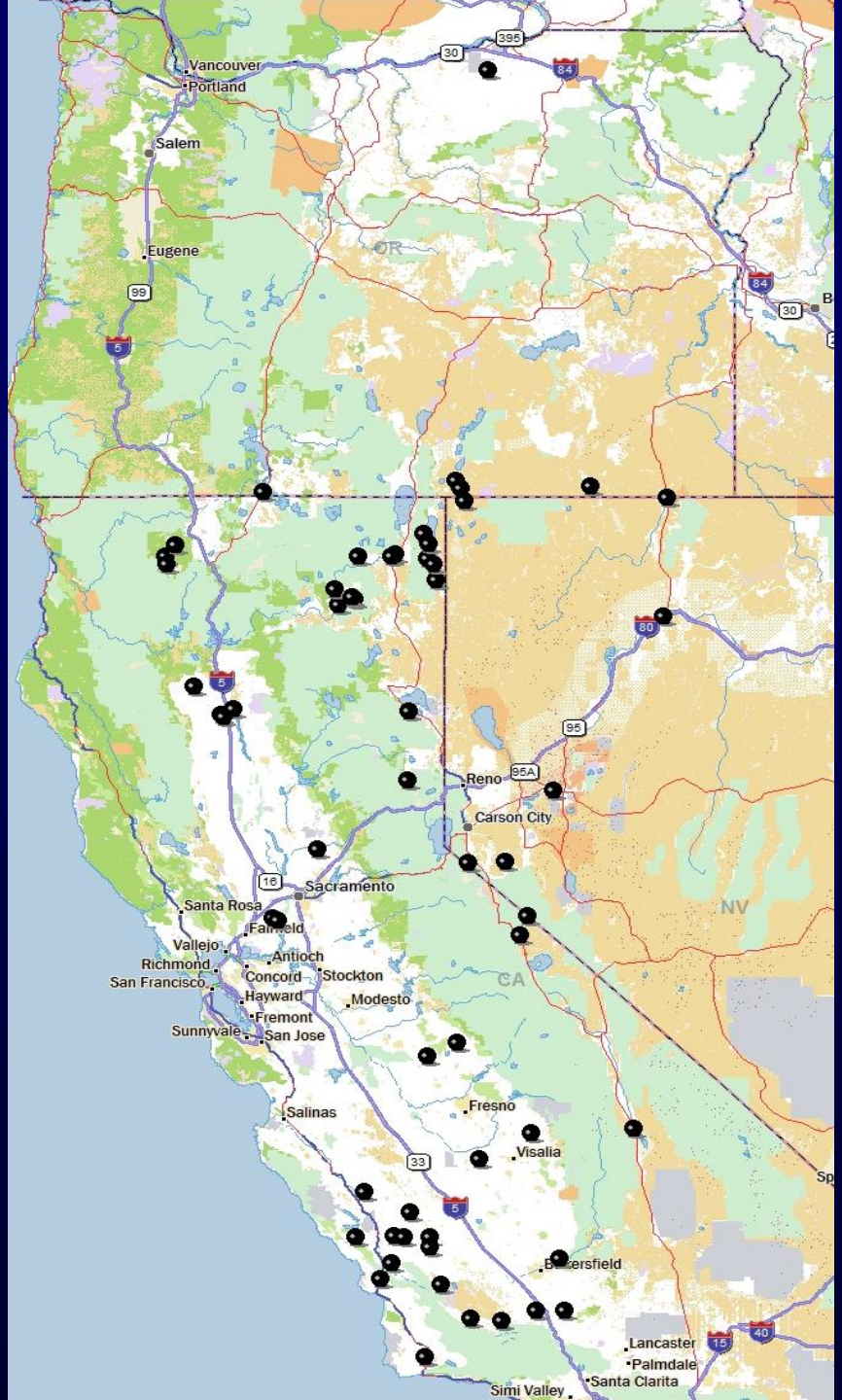

**CONTROLS: 10-50% HEALTHY CALVES**
**VACCINATES: 79–100% HEALTHY CALVES**

*No detected EBA in fetuses from vaccinated heifers*
*Cause for fetal loss in open, vaccinated heifers (Years 2 & 3) unknown*

*High, Low/Mod, Low and Very Low refers to relative vaccine potency*

# 2015-18 UCD/CCA EXPANDED TRIALS

- Mar 2015 – May 2016 Trials
  - 57 producers in 3 states
  - 8792 vaccinated
  - 483 additional head used in research studies
- June 2016 – May 2017 Trials
  - 93 producers in 3 states
  - 12,791 vaccinated
  - 366 additional head used in research studies
- June 2017 – to date
  - 26 producers
  - 2346 vaccinated
  - Total #s expected to be similar to 2016-17



# FOOTHILL VACCINE SAFETY & EFFICACY

## After vaccination of >25,000 head

### SAFETY

- Anaphylaxis: None reported
- Illness or death linked to vaccination: None
- Skin reactions?: Yes
  - Soft swellings, usually noticed only by palpation of injection site
  - Noted 21-56 days post-vaccination
    - Most between 30-45 days post-vaccination
  - Indicative of an active immune response and probably indicates that live bacteria a the site are providing a natural "booster shot"
- Interference from other vaccines?: None noted
  - Brucellosis vaccine can be given at the same time.
- Pregnant animals or ones that are likely to become pregnant within ~60 days post-vaccination should not be vaccinated!!! They will loose the fetus to Foothill.

### EFFICACY:

- Excellent! Probably >95%
  - Serologic data suggests ~2% of animals don't sero-convert and are not likely protected
  - Reasons?? Unknown, but may be due to underlying health issues

### DURATION OF IMMUNITY:

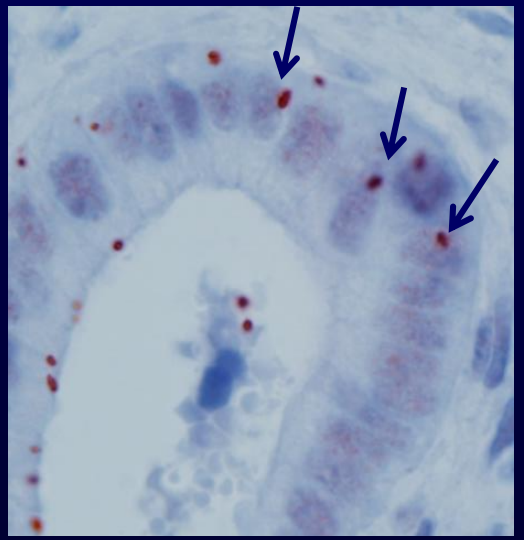
- > 3 YEARS!! (based on controlled studies in conjunction with UNR)

# EVIDENCE OF EMBRYONIC LOSSES:

## DOES *P. abortibovis* HAVE AN AFFINITY FOR UTERINE EPITHELIAL CELLS?

**A series of studies were conducted in collaboration with UC Animal Science Dept and DANR/DeTar over a period of 6 years.**

- **Losses when vaccinated within 4 weeks of breeding***
  - **Animal Sci 2010-11: 8% loss** (total pregnant** = 70)
  - **Animal Sci 2011-12: 18% loss** (total pregnant** = 95)
  - **DANR/DeTar 2014-15: 11% loss** (total pregnant** = 174)
    - ***Increases to 22% when looking at those that conceived 29 to 36 days post-vaccination!!***
- **Losses when vaccinated >60 days of breeding***
  - **Animal Sci 2012-13: -2% loss** (total pregnant** = 99)
  - **Animal Sci 2013-14: 0% loss** (total pregnant** = 47)
  - **DANR/DeTar 2016-17:-3% loss** (total pregnant**= 150)



**Murine endometrium w/ *P. abortibovis*-infected (intracellular) glandular epithelium and stromal cells in the lamina propria**

**% difference in early fetal losses between vaccinated and controls when pregnancy exams are conducted at ~2 mo and again at ~5 mo gestation*

***Total # of pregnant animals in the herd; placebo and vaccinated head combined*

# EXPANDING VACCINE TRIALS

## MULTI-ORGANIZATION COOPERATION

## 2015-18

- UCD VET SCHOOL (JL Stott & MT Blanchard)
- CCA (B Gatlin, T Talbot)
  - Memorial Livestock Research Fund (MLRF)
- PRODUCERS IN CA, NV & OR
- LOCAL VETERINARIANS
- REGULATING AGENCIES
  - USDA Center for Veterinary Biologics
  - California Dept of Food and Agriculture
  - Nevada Dept of Ag
  - Oregon Dept of Ag

# THANK YOU's

UCDAVIS VETERINARY MEDICINE
*Pathology, Microbiology and Immunology*

**Myra Blanchard**
**Mark Anderson & CAHFS**
**Bret McNabb & Vet Repro**

CALIFORNIA CATTLEMEN'S ASSOCIATION
CCA
SINCE 1917

**Tom Talbot**
**Billy Gatlin**
**Valeria Garcia**
**CCA Staff**

UNIVERSITY OF NEVADA RENO 1874

**Mike Teglas**
**Mark Hall**
**Don Hanks**
**MSFL Staff**

## ANIMAL SCIENCE

**SFREC & UCD Feedlot Staff**

## UC Division of Ag and Natural Resources

## UC Office of the President

**Discovery Grant: "Proof of Concept"**

## Participating Producers