Practical Applications of Biosecurity and Biocontainment in Beef Cattle Health Programs

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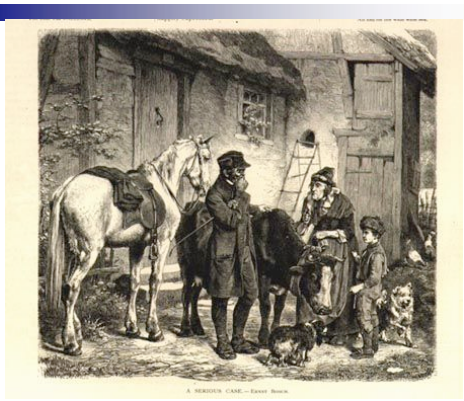
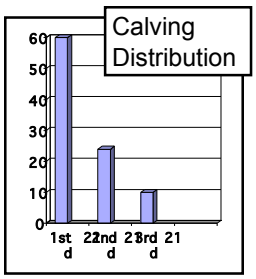
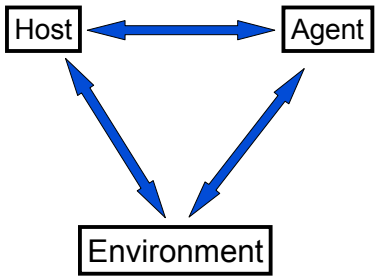


Begin With the End in Mind



- % calf crop – number calves weaned divided by number females exposed
- Pounds weaned/ females exposed
- Price/pound
- Cost of production

Epidemiologic Triad for Disease Occurrence



Options for Disease Control

Heartland Cattle Company
McCook, NE

- Biosecurity &/or Biocontainment – including vaccination
- Vaccination only
- Do nothing

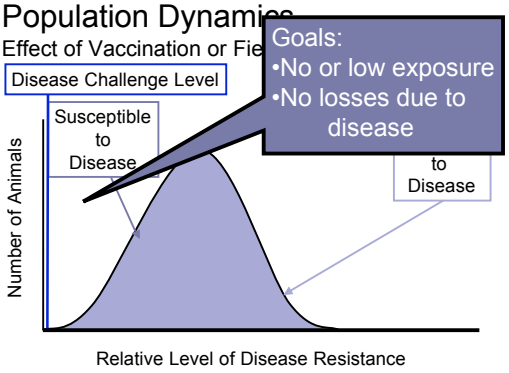
Reduced risk for disease, control or elimination of disease

- Biosecurity – the outcome of all actions used to prevent disease agent entry into a unit of interest.
- Biocontainment – the outcome of all actions resulting in control of a disease agent in a unit of interest

Dargatz, Vet Ø FoodAn 18 (2002) 1-5.

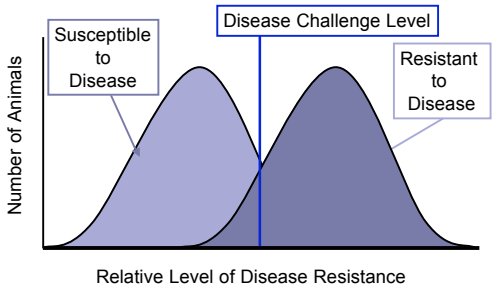
Population Dynamics

Effect of Vaccination or Fie



Population Dynamics

Effect of Vaccination or Field Exposure



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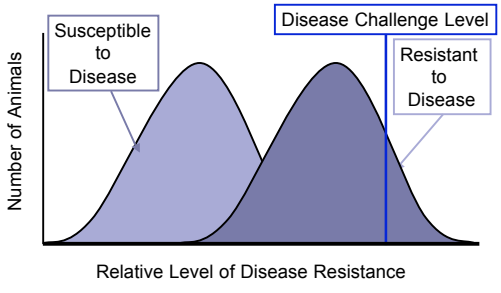


Vaccination

- Must induce sufficient herd immunity.
- Must reduce probability of not-yet infected animals becoming infected
- Levels of herd immunity may be manipulated (examples)
  - choice of vaccine
  - interval between vaccination and exposure
  - proportions to be vaccinated in the population.

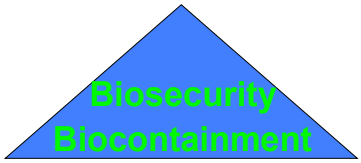
Herd Immunity - Model

- Rate of spread varies between viruses
- Vaccine coverage for herd BVD immunity need be (based on mathematical models)
  - 57% in herds without PI BVD cattle.
  - 97% in herds with PI BVD cattle.
- To avoid episodic manifestations of disease.

Cherry, et al Prev Vet Med 33:91-108, 1998

Disease Control Fundamentals

Prevent Transmission



Eliminate Agent

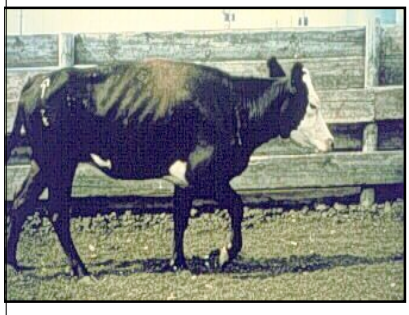
Increase Immunity

Dargatz, et al, Vet Clin Food An 18 (2002) 1-5
Smith, Vet Clin Food An 18 (2002) 157-175

New Herd Introductions – Part of a Herd Biosecurity Plan

These bulls are genetically superior and possess excellent quality characteristics.
Is there a downside to purchasing one or more of these bulls?

This cow has Johne's disease



- Chronic diarrhea
- Contagious
- Leads to Death
- Possible link to Crohn's disease in humans
- Other cattle in herd (including calves) are carriers

Is there a downside to purchasing one or more of these bulls IF THEY ORIGINATED FROM THE SAME HERD AS THE COW?

Is there a downside to purchasing this heifer or 100 like her?

#624 BVD PI Non-symptomatic Heifer

This is a PI BVD Calf

Offspring of a purchased replacement heifer

This Ranch……

- Calved these replacement heifers separate from the resident herd.
- Tested calves and then dams of positive calves.
- Positives were culled before commingling with resident herd.
- No added vaccination was needed
  - Resident herd (as part of existing health program) and new arrivals were already vaccinated

This Ranch……

- Bottom line…..BVD was not introduced into the herd even though PI animals resulted from the purchase.
- Spent about $150-200 on tests that potentially saved thousands over the next years.

Calf Diarrhea

- Introducing cattle during calving increases risk for scours
- Most cattle carry 1 or more scours agents

This includes grafting calves from any outside source

New Herd Introductions
Management Considerations

- Do not immediately commingle with resident herd.
  - About 3-4 weeks may be sufficient
  - Allows time for arrival tests
  - Allows recovery time if acute disease occurs
    - Treat sick animals if illness occurs, isolate longer if needed
  - Pursue confirmed diagnosis if illness occurs.

New Herd Introductions
Management Considerations

- Do not commingle during calving season
- Use vaccination to reduce risk when commingling is done

New Herd Introductions
Management Considerations

- Plan for testing new arrivals (prior to or on arrival) to minimize risk- set goals-examples……
  - Test for BVD PI status (including offspring of pregnant cattle-calve separate from resident herd)
  - Bovine Leukemia
  - Johnes Disease (testing new arrivals may not be the best animals to consider)
  - Other
- Introduce only virgin bulls or test to reduce risk
- Introduce only animals from "high health" sources
  - What is a "high health" source?

What is the take home message?

- The disease condition or disease outbreak prevented by a good biosecurity or biocontainment plan will never be recognized.
- Success is business as usual
- Design a "new herd introductions" plan that fits the goals of your operation

BVD Control
Applied Biosecurity and Biocontainment

- Combined use of resources and knowledge to control BVD virus
  - Application of disease control strategies
  - Management
  - Appropriate use of tests
  - Appropriate use of vaccines

BVDV Disease - Acute

- Incubation 5-7 days
- Viremia (virus in blood circulation) 4-5 d after infection (up to 15 d)
- Seroconversion 2-4 wk later
- Virus shedding - low concentrations compared to PI
- Diarrhea,slobbering, fever
- Ulcers - lips, gums, esophagus, etc.
- Immune suppression
- Fetal infections
- Most infections are not noticed - estimate 70-90% are subclinical but can be severe (death)

Ref: Baker, Vet Cl. N. Am. 11:3, 1995

Persistent Infection - Routes

Acute infection- pregnant female exposed to NCP BVDV

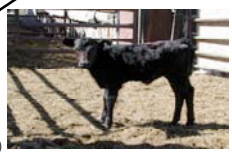
1_-4+ months gestation

93%

Persistently Infected calf

Persistently infected female giving birth

7%



(Wittum, et al, Prev Vet Med 49 (2001) 83-94)

BVD Economics

Effects of Persistent Infection

- 10 year farm profitability model
  - Reduced pregnancy rate (5%)
  - Increased preweaning mortality (10%)
  - Decreased weaning weight (0.5%)
- Economic effect was $14.85-$24.84 per year decreased return to fixed costs per beef cow exposed.
- Herd BVD control is economically beneficial

~20 Bucks

Larson, et al, Bov Pract 36(2) 106-112, 2002

Transmission of BVD Virus

- Between Herds
  - Most commonly by PI animals introduced to herds.
  - If prevalence is 2%, risk of purchasing PI animal in a group of 20 is 33%.
  - P = 1- probability of buying non PI animal. $P = 1 - 0.98^{n}$ n = number of animals purchased.

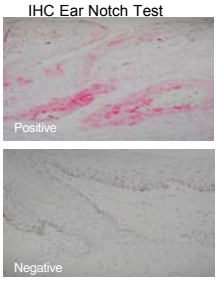
Houe, Vet Microbiology 1999

BVD PI Diagnostic Tests

Each has advantages/disadvantages

- IHC Ear Notch Immunohistochemistry
- Microplate Virus Isolation
- ELISA –serum and fresh tissue
- PCR (Polymerase Chain Reaction)
- Virus isolation

IHC Ear Notch Test



Photos courtesy of Dr. Bruce Brodersen, Univ of NE

Testing and Culling PI Cattle

- Critical for elimination of BVD
- Identify goals before testing
  - Monitoring
  - Biosecurity
  - Biocontainment

BVD Control: Role for vaccine in breeding herds

- Prevention of PI calves is the primary goal.
- BVD fetal protection studies in Europe, UK & US show effectiveness but variability.
- Vaccines do not prevent all PI calves
- Expectations
- Not all vaccines have been tested for ability to prevent PI calves.

Fundamental Components of BVD Control Plans

- Prevent BVD entry into herds-Biosecurity
  - Especially new herd additions, effective contacts
- Targeted vaccination-prevent PI calves
  - In the event exposure occurs
- Identify BVD infected herds-Biocontainment
  - Test strategies to eliminate PI BVD animals
- Surveillance/Monitoring

Beef Herd Prevalence For PI BVD

Herd Prevalence Estimates

- 2.7% to 3.9% (95% CI 0.5-12%) of herds randomly selected from veterinary clinic client listings.
- 19.2% (95% CI 10-33%) he previous history, clinical sig of BVD.
- Cows had 5% lower pregnanc with 1 or more PI calves

A minority of herds contain PI calves-likely fewer than 10%

95% CI (confidence interval) is used to report the range of values that the data indicate has a 95% probability of containing the true population mean.

Wittum, et al, Prev Vet Med 49 (2001) 83-94

BVD Biosecurity Plan

- Test all herd additions - PI BVD
  - Prearrival test
  - Isolate and test on arrival
  - Isolate and test offspring of pregnant females
- Prevent effective contacts
  - Cattle flow (on premises, between premises)
  - Fencelines
  - Trailer use by others
  - Other cattle on premises
  - Other contacts

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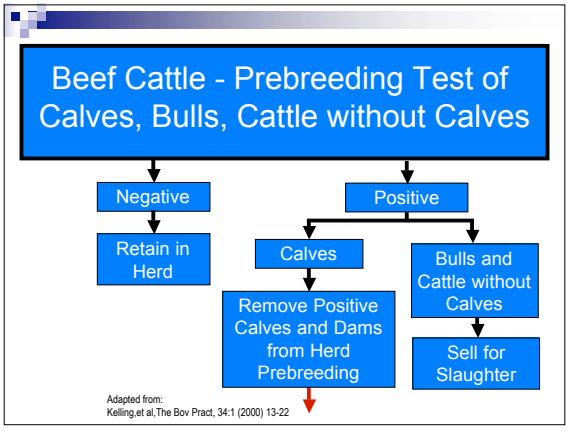

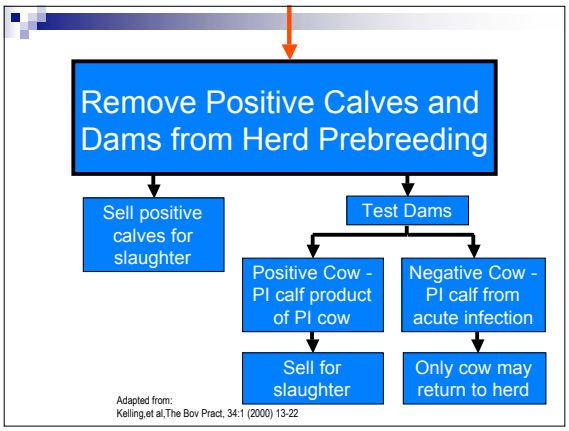

Disposition/Disclosure of PI BVD Animals

- Defective animals
- AVC Standards of Practice and AABP statements
  - …moral, ethical and potentially legal obligation……
  - ……. strongly opposes marketing or movement of BVD PI animals in any manner that potentially exposes at-risk cattle.

What goals do I have? Examples

- Keep BVD out of my herd.
- Prove BVD is not present in my herd
- Eliminate BVD from my herd
- Need assurance I do not market PI BVD cattle to my customers

What's the take home message?

- Cow/calf operations need a BVD control plan-including goals.
  - Prevent entry of BVD virus into your herd
  - Use BVD vaccine with strong data proving effectiveness in preventing PI calves.
  - Eliminate PI BVD animals from your herd if present
  - Monitor for presence/absence of PI BVD cattle
- Watch for updates, marketing opportunities, etc. associated with BVD Control

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