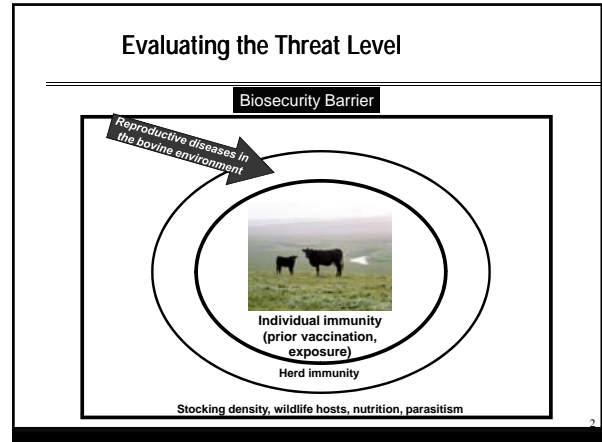


# Reproductive Disease in the Cow Herd

## Defining the "Threat Level"

3/4/2010



### Reproductive disease in the bovine environment - Neospora

- ❖ Protozoan v. similar to *Toxoplasma gondii*
- ❖ Very efficient trans-placental transmission
  - Some herds, very high % calves born seropositive, but asymptomatic
- ❖ Abortion
  - Mostly early second trimester, mummified fetus or autolytic
  - Epidemic (>15% in 4 weeks)
    - Naive dams, point source exposure contaminated with infective oocysts (oocysts v. environmentally resistant)
    - Acutely infected canid host sheds up to half million oocysts
    - Coyotes definitive hosts, also domestic dogs
  - Endemic
    - Latent infection in dams either vertically or postnatally

### Neospora Biosecurity and Control

- ❖ Testing of replacements
- ❖ Control definitive hosts
- ❖ Reduction of putative risk factors
  - Moldy feed, mycotoxins → immune suppression
- ❖ Vaccination

### Diseases Affecting Reproductive Performance: Leptospirosis

- Has to be a reservoir host in the environment (Lepto serovar host-adapted)
  - Pomona – skunks, possums, feral hogs, deer, dogs, cats
  - Icterohemorrhagica – rodents, especially mice and rats
  - Grippotyphosa and Canicola – wild canids (AKA coyotes), dogs, raccoons
  - Hardjo – cattle
    - Biosecurity may apply only with this serovar

### Diseases Affecting Reproductive Performance: Leptospirosis

- Best prevalence study in FY
  - hardjo-bovis and pomona most prevalent
- Difficult definitive diagnosis, should be ruled in/out by laboratory diagnosis specific to serovar (MAT), FAT, PCR
- If HB diagnosed, eliminate carrier state from the herd
  - OTC, Micotil, Excede, Draxxin effective vs h-b
  - Bulls- seminal vesicle infection, poor response

## Diseases Affecting Reproductive Performance

- Good vaccines available
  - 3 US licensed vaccines that have been h-b challenged via intraocular challenge and passed (prevents renal colonization): Spirovac (1 yr, h-b), Vista (28 d- prajitno), and Pyramid (28 d -data on file, prajitno)
  - Virashield h-b vaccines were licensed via add'n of h-b, serology, challenge in progress
  - Unusual to have epidemic pregnancy wastage in adequately vaccinated cows with h-b (+/- 3%, mostly EED), or any other serovar

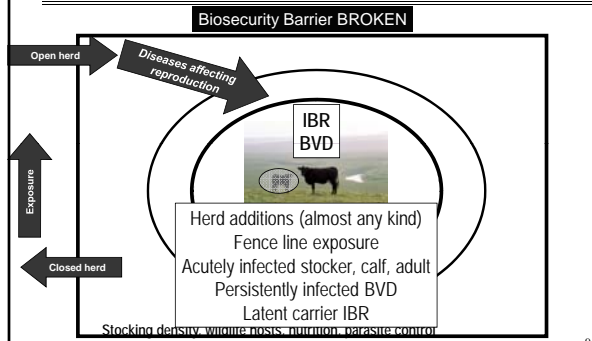
7

## Diseases Affecting Reproductive Performance: Leptospirosis

- Recent publication evaluated whole herd TX, vacc w/ Spirovac, found NOT to significantly improve reproductive performance in beef cows (JAVMA Vol 231 No 11, Dec 1, 2007 pp 1709-1714).
- Control
  - Maintain effective vaccination program
  - Timing of vaccination is of importance, especially with HB

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## Evaluating the Threat Level



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## Diseases Affecting Reproductive Performance - IBR

- ❖ Herpes virus, goes latent, in-apparent carrier sheds with stress, most herds have carriers
- ❖ HRP- congegration, stress (winter feed grounds)
  - Potential abortion losses if unprotected (replacement heifers) -
  - Unusual to find a herd that does not have some IBR circulating
  - Control
    - Vaccination – replacement heifers 2X with MLV or good KV with 2<sup>nd</sup> just prior to breeding, annual booster w/ good KV or MLV
      - Be careful of timing with IBR
    - Bio-security
    - Herd immunity

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## Diseases Affecting Reproductive Performance - BVD

- Signs:
- ❖ Fever
  - ❖ Pneumonia
  - ❖ Diarrhea
  - ❖ Sudden Death
  - ❖ Abortions / Reproductive Disease
- Bovine Respiratory Disease

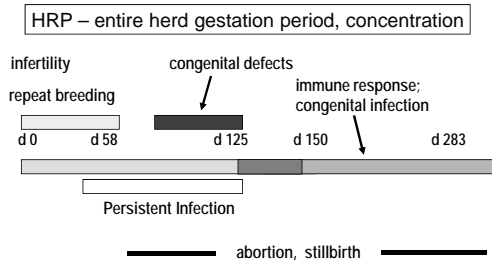
11

## Reproductive BVD

- ❖ Infertility (Repeat breeders, embryonic death)
- ❖ Abortions
- ❖ Weak Calves
- ❖ Birth Defects
- ❖ Persistently Infected Animals

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## BVDV Infection During Gestation



## BVD in Early Pregnancy

- ❖ Exposure during the first 60 days, embryo may die and be reabsorbed.
- ❖ Cow or heifer may recycle.
- ❖ They may be open or late when preg checked.

## BVD Abortion

- ❖ Occurs because BVD virus infects and kills the fetus
- ❖ Occurs from 60 days on
- ❖ Late term abortions due to BVD have become more common.

## Weak Calves

- ❖ Infected prior to birth
- ❖ Born weak, may not be able to nurse
- ❖ May be normal at birth, but become weak within a few days

## BVD Birth Defects

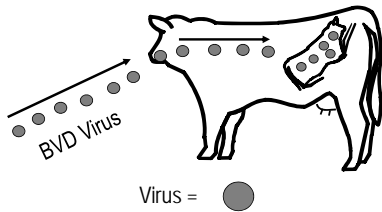
- ❖ Results in BVD causing organ damage during fetal development.
- ❖ Some of the more common defects:
  - Brain defects – cerebellar hypoplasia
  - Small or cloudy eyes
  - Hair loss

## Persistent Infection

- ❖ Occurs when fetus is infected with non-cytopathic BVD between day 40 & 125 of gestation

## Persistent Infection

- ❖ Occurs when fetus is infected with non-cytopathic BVD between day 40 & 125 of gestation



## Persistent Infection

- ❖ Occurs when fetus is infected with non-cytopathic BVD between day 40 & 125 of gestation
- ❖ Calf can be born normal or weak
- ❖ It will shed virus its entire life
- ❖ Often these are unthrifty & grow slower, but some can be healthy and become adults
- ❖ Vaccination of PI calf will not be beneficial
- ❖ If these stay in the herd, they continue to expose more cows

## Bovine Virus Diarrhea (BVD)

- ❖ What is a CI animal? – Congenitally infected
  - Exposed in utero when fetal immune system capable of responding
  - Calves are born seropositive to BVD at birth
  - These calves do not spread virus like PI animals
  - CI animals are 5-10X more common than PI's
  - Pre-colostral screening of newborn calves can be used for BVD surveillance in large

## Bovine Virus Diarrhea (BVD)

- ❖ Congenitally infected (CI) animals:
  - Have a greater likelihood of health events post calving\*
    - 2X as likely to experience severe illness during the first 10 months of life
    - Experience breeding difficulties - poor conception rate
  - Both due to the in-utero immunosuppressive effects of BVDV

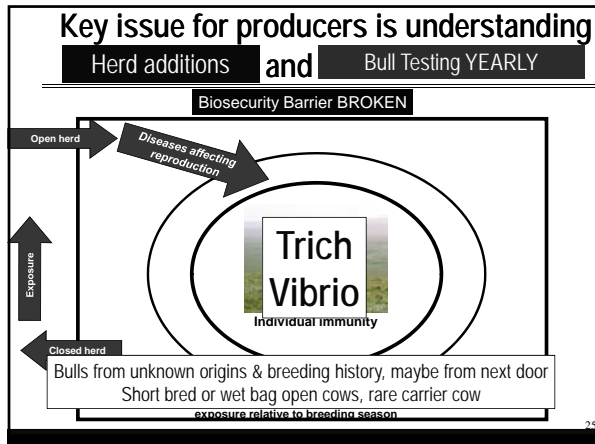
\*Munoz-Zanzi et al., 2003

## Bovine Virus Diarrhea (BVD)

- ❖ 3 Keys to controlling BVD:
  - 1. Seek and destroy all PI animals
  - 2. Vaccinate
  - 3. Practice biosecurity
    - *If you don't remove PI animals or practice biosecurity, vaccination may not be completely protective!*
    - Due to overwhelming exposure to BVD virus

## Diseases Affecting Reproductive Performance - BVD

- Control –
  - Determine herd status
  - Bio-security – test all additions (bulls, cows and calves) and calves born to additions if buying bred cows
  - Sound **TIMELY** vaccination yielding fetal protection if high risk-
    - must in replacement heifers prior to breeding
    - MLV while open initially (check labels)
    - Annual booster KV or MLV
  - Don't forget Bambi – deer on winter feed grounds



**Diseases Affecting Reproductive Performance**

- ❖ **Vibriosis (Campylobacteriosis)**
  - Bacterial venereal disease, abortions 30+ days, return to estrus, strung out calving
  - A “Must” – always risk if herd additions, aged bulls
  - Since this is an STD, vaccination should be as close to breeding as possible (30-40 days pre) – oil adjuvant is best
  - Vaccines for vibrio have been very effective – don’t leave the gate open!

**Best way to deal with this one is prevent it!!!**

**TRICH**

3/4/2010

**Trich**

**Caused by:**  
 A protozoan, *Trichomonas foetus*. Trich lives in the cow’s reproductive tract & on the surface of the bull’s penis & prepuce.

3/4/2010

**TRICH**

**Basic Facts**

- ❖ Venereally transmitted, similar to Vibrio (*Campylobacter fetus*)
- ❖ IF the producer has a controlled breeding season:
  - Results in a reduced calf crop –
    - 5-10% reduction to 30 to 50% reduction
  - infertility, abortions, pyometras (uterine infections)
- ❖ IF NO confined breeding season:
  - calving season becomes stretched out with reduced calves/year
  - accompanied by lighter weaning weights

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**Trich**

**History**

- ❖ **No clinically (visibly) ill COWS**
- Producer sees:
  - Bulls back at work
  - Too many open cows
- Late abortions (?).
- Extended calving season.
- Pyometra.


Parsonson et al 1976

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## Trich

### Infection

The bull is the reservoir and vector of the disease



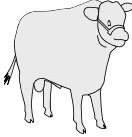
Trich lives in the folds of the penis and sheath

- ❖ Most chronically infected bulls are four years of age or older.
- ❖ Some bulls 1 to 3 years of age can be chronically infected.

Clark et al 1974

## Trich

### Transmission



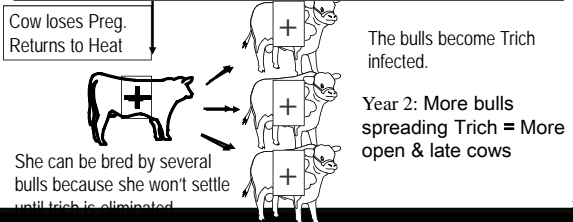
- ❖ 80% to 90% of the cows bred to an infected bull become infected.

Parsonson et al 1976

### Trich in the Cow

- ❖ The cow aborts after about 60 days.
- ❖ She may then cycle 3 to 5 times and infects any bulls that breed her.
- ❖ Cow develops immunity (humoral – clearance associated with IgA, IgG1) - re-breeds - carries a calf to term.
- ❖ Calving season extended.
- ❖ A few cows may remain infected and still carry trich from one year to the next.
- ❖ Immunity short lived < 15 months; cow subject to re-infection.

## The second year can be a major financial disaster!



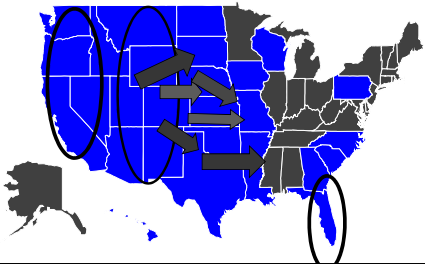
Cow loses Preg. Returns to Heat

The bulls become Trich infected.

Year 2: More bulls spreading Trich = More open & late cows

She can be bred by several bulls because she won't settle until trich is eliminated.

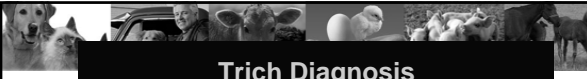
## Trichomoniasis Movement



## Trichomoniasis

| % Infected bulls (200 cows)               | None        | 20%                 | 40%                  |
|---|-------------|---------------------|----------------------|
| Conceived in three cycles                 | 191 (95.5%) | 164 (82%)           | 96 (48%)             |
| Calves born                               | 191         | 190 (-22 lb)        | 138 (-53 lb)         |
| Average Weaning Weight                    | 520         | 498 (-22 lb)        | 467 (-53 lb)         |
| \$ Return/cow exposed to bull 1989        | \$349       | \$331               | \$298                |
| \$ Return/cow exposed to bull 2005 prices | \$496.60    | \$473.10 (-\$23.50) | \$322.33 (-\$174.27) |
| Lost return vs unexposed per 100 cows     |             | \$2350.00           | \$17427.00           |

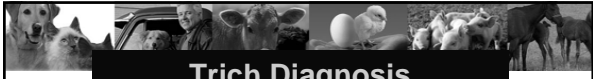
Computer simulation D.O. Rae DVM MPVM 1989



## Trich Diagnosis

- Culture
  - ❖ Can be used for defensive bio-surveillance
  - ❖ Suspect herds – primary test – PCR pouches if any positives are revealed
  - ❖ One infected animal equals an infected herd
  - ❖ After testing all bulls, if one bull is positive, then others should be tested a total of 3 times because the test is ~85-90% accurate

3/4/2010



## Trich Diagnosis

- PCR
  - ❖ Amplifies genetic material of the organism in question
  - ❖ Much more sensitive than culture?
    - ❖ One organism in a sample
    - ❖ (100 organisms for culture)
    - ❖ Some publications disagree as to sensitivity

3/4/2010

## Campylobacter and Trich

|                  | C. fetus venerealis   | T. foetus  |
|------------------|---|--|
| Agent            | Bacterium G- curved rod, best seen in dark field microscope, highly motile, single polar flagellum      | Protozoan: 5x12 microns 3 anterior, 1 posterior flagellae, undulating membrane along one side. Slowly motile (rolling, jerking)                                |
| Best sample      | preputial scraping or vaginal mucus   | preputial scraping bull  |
| transport medium | Cary-Blair, Amies, Weybridge, Clarks, others, contact lab for recommendations, ship cool, not room temp | InPouch transport/culture packet, store upright to prevent leakage, room temp ok 24 hr, 35 to 36 degrees C will help reduce overgrowth of gas forming bacteria |
| Invitro culture  | Skirrow's medium; Greenbriar Plus agar; blood agar; microaerophilic atmosphere                          | InPouch transport/culture packet; Diamond's TYM medium; aerobic incubator OK   |

3/4

## Campylobacter and Trich


|                         | C. fetus venerealis                     | T. foetus                                    |
|-------------------------|---|--|
| Tentative diagnosis     | Pos culture and biochemical phenotyping | Pos culture based on morphology and motility |
| Confirm diagnosis       | PCR of pos culture                      | PCR of pos culture                           |
| Serology                | useful, but not performed               | Research work only                           |
| Carrier state- female   | up to 2-6 mo                            | 1-3 mo, rarely longer                        |
| Carrier state, male     | bulls > 3 yoa                           | same   |
| Vaccine efficacy female | Very good, with proper adjuvant         | Fair to good, used as labeled                |
| Vaccine efficacy male   | good- very good with proper adjuvant    | No data available                            |

4/1

## About PCR

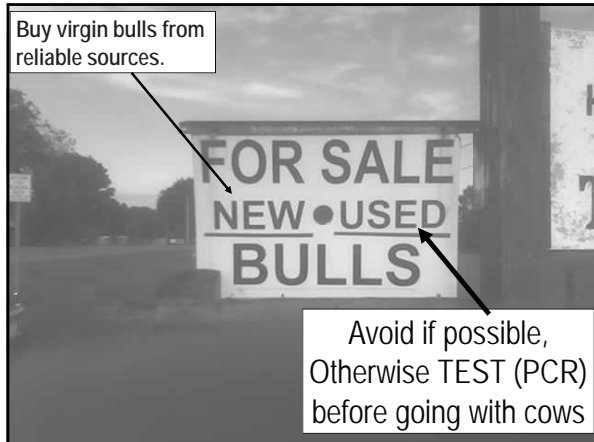
- ❖ Differentiates intestinal trichomonads from *Tritrichomonas fetus*
- ❖ Recommendation: culture, using PCR as confirmation (esp where time is a factor)
  - Negative confirmation in herds with suspect history
  - If turn-around time is acceptable, and bulls need to go out, use as primary
  - Remember that sampling technique is critical!

4/1



## Trichomoniasis Control

3/4/2010



**Keep it out:**  
**Absolutely minimize risk for introduction**

- ❖ TEST bulls annually as part of a Breeding Soundness Exam
- ❖ Biosecurity = Good perimeter fences when/where possible
- ❖ Consider risk of "intentional" herd additions
  - Short bred cows, bull of unknown origin/condition
- ❖ Cull open cows
- ❖ Focus on breeding efficiency
  - Condition scoring, repro disease control, nutrition
- ❖ Monitor "accidental herd additions"
  - TEST "visitors"?
- ❖ Vaccinate

**Trichomoniasis Control**  
*High Risk or Infected Herd*

- ❖ Test all bulls & remove infected bulls.
  - Sell to slaughter only!
- ❖ Cull open cows
  - May not be financially practicable.
- ❖ Use bulls 4 yrs. of age or younger
  - Buy new bulls from a known source.
- ❖ Repair fences/control strays
  - Don't be in the Trich export / import business
- ❖ Artificial insemination.
- ❖ Vaccinate.

BonDurant 1985

**Trichomoniasis**

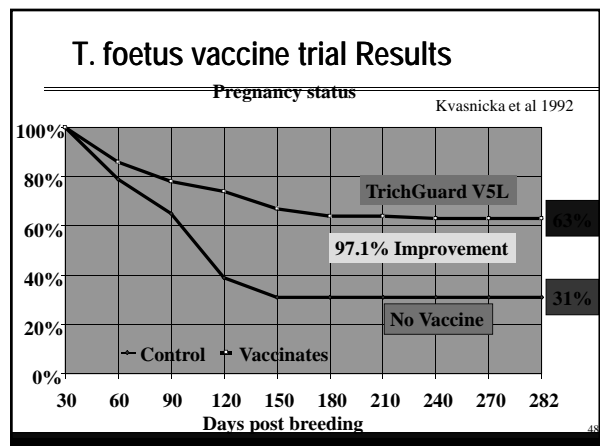
Vaccine developed by:  
 University of Nevada  
 &  
 Fort Dodge Animal Health

3/4/2010

**T. foetus vaccine trial**

Materials & Methods

|  |   |
|--|---|
| <p>Treatment.</p> <ul style="list-style-type: none"> <li>❖ Vaccine. TrichGuard V5L           <ul style="list-style-type: none"> <li>➢ Fort Dodge Trich-Vibrio-Lepto. (5cc per dose)</li> </ul> </li> <li>❖ Two SC shots 3 weeks apart.</li> <li>❖ 45 day breeding 4 weeks after vaccination.</li> <li>❖ Daily estrus detection.</li> </ul> | <p>Trial herd.</p> <ul style="list-style-type: none"> <li>❖ 120 virgin heifers. (60V-60C)</li> <li>❖ Two naturally infected bull groups, six per group.           <ul style="list-style-type: none"> <li>➢ Rotated weekly.</li> <li>➢ Re-infected at start &amp; finish of each rotation.</li> </ul> </li> <li>❖ 30 day preg status, blood assay, palpation every 30 days starting at day 60.</li> <li>❖ 20 cultured weekly.</li> </ul> |
|--|---|



## T. foetus vaccine trial Results

Kvasnicka et al. 1992

### Tritrichomonas foetus infection rates among control and vaccinated heifers

| Treatment Group      | % Infected heifers                |    |    |    |    |    |     |    |     |    |
|----------------------|-----------------------------------|----|----|----|----|----|-----|----|-----|----|
|                      | Weeks after 15-day breeding cycle |    |    |    |    |    |     |    |     |    |
|                      | 1                                 | 2  | 4  | 6  | 8  | 10 | 12  | 14 | 16  | 18 |
| Vaccinate            | 60                                | 10 | 20 | 20 | 20 | 10 | 0   | 0  | 0   | 0  |
| Control              | 80                                | 70 | 80 | 60 | 60 | 60 | 30  | 0  | 10  | 0  |
| Preventable Fraction | 25                                | 86 | 75 | 67 | 67 | 83 | 100 | NA | 100 | NA |

\*Culture Samples were collected beginning 1 week after each of the three 15 day observed estrus cycles during which breeding occurred. Therefore, the weeks after 15-day breeding cycle represent a mean, ( $\pm$  7.5 days) Reduction in infection determined according to the formula:

$\frac{\% \text{controls positive} - \% \text{vaccinates positive}}{\% \text{controls positive}}$

## Antibody Development

Table 2—Production of antibodies to *T. foetus* by vaccinated and nonvaccinated heifers after breeding with infected bulls

| Serum sample day                | Vaccinates           |                       | Controls             |                       |
|---------------------------------|----------------------|-----------------------|----------------------|-----------------------|
|                                 | Immuno-fluorescence* | Serum neutralization* | Immuno-fluorescence* | Serum neutralization* |
| 0                               |                      |                       |                      |                       |
| (1st vaccination)               |                      |                       |                      |                       |
| 21                              | 9.43                 | <16                   | 9.87                 | <16                   |
| (2nd vaccination)               |                      |                       |                      |                       |
| 49                              | 215.5                | 35.5                  | 10.53                | <16                   |
| (28 days after 2nd vaccination) |                      |                       |                      |                       |
| 79                              | 862.0                | 165.3                 | 10.53                | <16                   |
| (58 days after 2nd vaccination) |                      |                       |                      |                       |
|                                 | 330.1                | 60.7                  | 14.60                | <17.1                 |

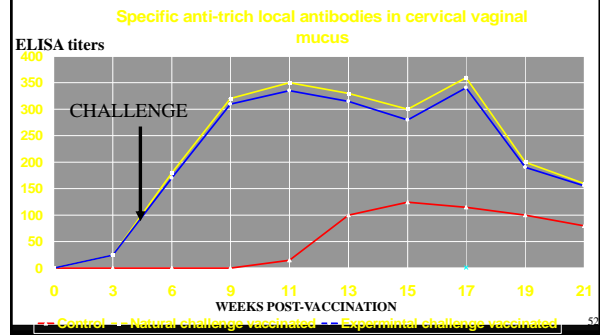
\* All titers are reciprocal geometric mean of appropriate serum dilution.

## The Label

- ❖ TRICHGUARD®
- ❖ *Tritrichomonas foetus* Vaccine
  - Killed Protozoa
  - For vaccination of healthy cattle as an aid in the prevention of disease caused by *Tritrichomonas foetus*.
- ❖ DOSE:
  - Cattle, inject one 2 mL dose subcutaneously under aseptic conditions.
  - A second dose should be administered 2 to 4 weeks later. The last injection should precede the breeding season by 4 weeks. Revaccinate annually.

## T. foetus vaccine development

Hall et al 1995



American Journal of VETERINARY RESEARCH

June (2004) 65, No. 6

### Development of a simulation model to evaluate the effect of vaccination against *Tritrichomonas foetus* on reproductive efficiency in beef herds

Aurora Villamor, DVM, MPVM; Tim E. Carpenter, PhD; Robert H. BonDurant, DVM, MS

**Abstract**

**Objective**—To develop a model to evaluate the effect of vaccination against *Tritrichomonas foetus* on reproductive efficiency in beef herds.

**Sample Population**—A beef herd of 300 cows, 12 Bulls (10 and 4 bulls > 3 years old).

**Procedure**—The model was developed by use of data for various risk factors and vaccine efficacy. The reference herd was considered to be one in which *T. foetus* had been diagnosed and bulls were tested for *T. foetus* before the breeding season. This showed desirable use for

In all simulations vaccination resulted in significantly higher calving.

\*Results of this simulation indicate proper vaccination can decrease economic losses attributed to abortions caused by *T. foetus*.

## Prevention/Control of Trich

