Venereal diseases in beef cattle

- *Tritrichomonas foetus* and *Campylobacter fetus subspecies venerealis* (Cfv) can cause early embryonic death or abortions.

Common features:

- **Cows** can remain infected for weeks to months.
- **Cows** that have cleared these infections do not have long-term immunity.
- Younger **bulls** are most likely to clear the infection.
- Some **bulls** will become permanent carriers.
- Infected **bulls** have NO clinical signs.
- Transmission – exposure to infected bulls or cows from other herds.

Trich testing:

- Most clinics collect samples into InPouch media.
- Incubate 35°C for up to 6 days for culture.
- Incubate for 48 hrs if shipping to lab for PCR for DNA.
- **Three negative cultures** provide a high degree of certainty the bull is actually free of infection.
Some laboratories will suggest that one negative PCR test is adequate

- e.g. Texas has adopted recommendations that advocate for the PCR test and allow a single test under specific conditions for some aspects of their control program
- One test **can not** provide sufficient evidence a bull is negative in moderate or high risk situations

**Factors to consider:**
- Shedding is not consistent
- Sexual rest
- Preputial scrapings are extremely inconsistent samples and contain a number of different PCR inhibitors
- Feces, blood, other organisms, urine, semen, and cellular debris
- Inhibitors can increase false negatives
- The risk of false positives is low based on recent data

**Can we pool samples from more than 1 bull to reduce lab costs?**
- Sensitivity consistent to 25 samples.
- Laboratory will pool 5 samples to save laboratory costs.

Have also investigated the use of pooled samples collected without commercial pouches (PBS):
- Further $$$ savings

<table>
<thead>
<tr>
<th>Test</th>
<th>n</th>
<th>Sensitivity</th>
<th>95% Confidence intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>InPouch™ TF</td>
<td>121</td>
<td>95.0%</td>
<td>89.6 – 97.7</td>
</tr>
<tr>
<td>Pouch real-time PCR</td>
<td>121</td>
<td>95.8%</td>
<td>90.7 – 98.2</td>
</tr>
<tr>
<td>Direct real-time PCR</td>
<td>121</td>
<td>90.1%</td>
<td>83.5 – 94.2</td>
</tr>
</tbody>
</table>

There were no significant difference in sensitivity estimates.
**Trichomoniasis**

Sensitivity estimates for pooled samples

![Graph showing sensitivity estimates for different numbers of samples.](image)

Different letters between number of samples indicate significant differences (P < 0.05).

**Campylobacter fetus** subspecies *venerealis* (Cfv)

- Organism is very difficult to grow
- Field diagnostics use direct detection of organisms with PCR
- Sample collection identical to that for *T. foetus*
- Laboratory protocol validated when sample collected into tubes with PBS
- Can also pool 5 samples for laboratory testing

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**Campylobacter testing is affected by outside temperature**

Sensitivity varies with environmental temperature

![Graph showing sensitivity variation with temperature.](image)

- Plan testing for vibrio during warmer environmental conditions

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**Summary of results from 2015 screening project**

- 735 bulls from 78 producers
- *T. foetus* suspects: 1 bull from each of 2 herds
- Cfv positives: 5 bulls from 1 herd and 3 bulls from a 2nd herd
  - Cows from herds where at least one bull was test positive for Cfv were 2.9 times (95%CI 1.3-6.4, p=0.007) more likely to be open than cows from herds with no positive bulls.
Summary of results from 2015 screening project

- Community pastures
  - 10% (73/735) of bulls from 28% (22/78) of herds
    [vs 26% (29/110) of all WCCSH herds]
- Semen testing bulls (before 2015)
  - 90% (70/78) [vs 87% (96/110)]
- Trich testing (before 2015)
  - 21% (16/78) [vs 22% (24/110)]

Interpreting test results

**T. foetus**

- **Sensitivity** of rtPCR direct preputial samples collect into PBS: **90.1%**.
- **Specificity** for rtPCR testing of samples collected in InPouch TF pouches: **>99%**
- **Expect some false negatives**
- **Risk of false positives in specific situations**

**Campylobacter fetus** spp.

**venerealis**

- **Crude sensitivity**: 85.4%
- **Crude clinical specificity**: 85.0%

Expect some false negatives and some false positive – the chance of a false test result depends on how we are using the test.

### Sensitivity

Se = probability that a diseased animal will test positive

\[
Se = \frac{a}{a + c}
\]

Se = true positives / all with disease

<table>
<thead>
<tr>
<th>Disease</th>
<th>+</th>
<th>-</th>
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</thead>
<tbody>
<tr>
<td>Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>-</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>a+c</td>
<td>b+d</td>
<td>n</td>
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</table>
Specificity

Sp = probability that an animal with NO disease tests negative
Sp = $d / b+d$
Sp = true negatives / all without disease

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<tr>
<td>+</td>
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<td>b</td>
<td>a+b</td>
</tr>
<tr>
<td>-</td>
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PDS results: 2014 to 2016
- 16 / 947 Cfv +
- 20 / 5606 *T. foetus* +
  (3 suspect)

What testing is necessary for your herd?

Estimate the herd risk level:
- Reproductive problems
- Large and expanding herds
- Communal grazing
- Previous animal positive for BVDV/Trich/Cfv
- Purchase non-virgin bulls / open cows
Positive Predictive Value

PPV = probability that a test positive animal does have the disease
PPV = \( \frac{a}{a+b} \)

* Affected by prevalence

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<td>b</td>
</tr>
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<td>Test -</td>
<td>c</td>
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a + c | b + d | n

Scenario 1: Screening very low risk bulls
Virgin yearling - chance of infection < 1 in 1000

You get a negative test result from one sample:
➢ Almost 100% sure the bull is free of infection (for trich or vibrio)

You get a positive test result for vibrio
➢ < 6 in 1000 chance that it is real

You get a positive test result for trich
➢ < 30% chance that it is real

Negative Predictive Value

NPV = probability that a test negative animal does not have the disease
NPV = \( \frac{d}{c+d} \)

* Affected by prevalence

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a + c | b + d | n

Scenario 2: Screening moderate risk bulls
Mature bull (unknown source) - chance of infection < 10 in 100

You get a negative test result from one sample:
➢ 98-99% sure the bull is free of infection (for trich or vibrio)

You get a positive test result for vibrio
➢ ~40% chance that it is real

You get a positive test result for trich
➢ 98% chance that it is real
Scenario 3: Screening VERY HIGH risk bulls
Mature bull (herd outbreak other causes ruled out)
- chance of infection about 80 in 100

You get a negative test result from one sample:
➢ Only ~60% sure the bull is free of infection for vibrio and only ~70% for trich

You get a positive test result for vibrio
➢ 96% chance that it is real

You get a positive test for trich
➢ 99% chance that is real
Interpret negative Trich test

### Trichomoniasis Management Options

- No approved, effective drug for treatment of infected bulls
- Vaccine is not available in Canada
  - No good evidence that it prevents infection
  - It might help to minimize fetal loss
- Testing and culling of infected bulls is the primary tool for control

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**Campylobacter fetus** subspecies *venerealis (Cfv)* control

**Vaccination**

- Many sources recommend bacterins with oil-adjuvant
- Also suggest booster at 1 month after first vaccination (label: single dose)
- Annual revaccination shortly before breeding season
- **60 day** withdrawal time
- Very few recent peer-reviewed studies with commercial products

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Trich in your bulls?

- Test and cull

Vibrio in your bulls?

- Test and cull
- Vaccinate cows
- Vaccinate remaining bulls
Testing incoming bulls?

- Yearling bulls: BVDV (skin biopsy - IHC)
- Older bulls: Trich test

Routine screening is not yet recommended. But Cfβ should be considered as a differential for Trich when investigating herd problems...

Questions?

Some of the folks responsible for this work at the Western College of Veterinary Medicine were:

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