Are Your Clients Asking About Selective Dry Cow Therapy? – Here’s What You Need to Know

S. Godden, E. Royster, J. Timmerman and K. Patel
College of Veterinary Medicine, University of Minnesota

Outline

• Importance of dry cow mastitis
• What is selective dry cow therapy (SDCT) and why are we talking about it?
• Components of a successful SDCT program
• Examples of successful and unsuccessful SDCT programs
• Logistics of adopting SDCT
• Economics of SDCT
• What herds could consider SDCT

What is Dry Cow Mastitis?

• Intramammary infection (IMI) that:
  – Is present at dry off and fails to cure during the dry period or
  – New infections acquired during the dry period
The Significance of Dry Period Infections

- 20 – 30% of quarters will develop a new infection during dry period
  (Dingwell et al., 2001, Green et al., 2002, Godden et al., 2003 & Cook et al., 2004)
- 50 – 60% of all new environmental infections during the lactation cycle occur during the dry period. (Bradley and Green, 2000)

Consequences of Dry Period Infections

- Increased clinical mastitis and ↑ SCC in the next lactation
- Over 50% of clinical coliform mastitis events in the first 100 DIM originated during the dry period (Bradley and Green, 2002)

Core strategies to control mastitis during the dry period

- Blanket dry cow therapy
- Internal or External Teat Sealants
- Vaccination programs / Immunity
- Nutrition
- Limiting stressors / improving cow comfort
- Dry-off strategies
- Hygiene: Housing, bedding and manure management
Blanket Dry Cow Therapy

• Infuse all cows with long-acting antibiotic at dry-off
• All labelled DCT products in the U.S. are effective
• Very successful
  – Eliminates existing IMI caused by susceptible bacteria
  – Prevents new IMI during the early dry period
  – Has helped to reduce contagious pathogens
• Adopted by ≥ 80% of U.S. producers
  (Smith, 1986; Browning, 1990; Bradley & Green, 2001; Bradley & Green, 2004; NAHMS 2007)

Historical rational for using blanket DCT

• There was a high prevalence of infection at dry off (> 30-35% of quarters infected)
• Contagious mastitis was more prevalent (e.g. S. aureus, Strep. ag)
• We lacked rapid, accurate on-farm tests to differentiate infected from uninfected quarters
• We had no method of protecting untreated quarters from acquiring a new infection during the dry period

Do we still need blanket DCT?

• Many herds now have a low prevalence of IMI at dry off:
  – U.S. DHIA avg SCC dropped from 322,000 to 200,000 cells/mL in last 15 years
  – Only 15-30% of quarters infected at dry off in many herds
• Accurate on-farm tests now available to identify infected quarters (or cows) needing antimicrobial treatment
• Teat sealants are now available to protect untreated quarters from new infections during the dry period
What is Selective Dry Cow Therapy?

- Only cows or quarters with a high likelihood of intramammary infection (IMI) are infused with antibiotic at dry off
- Options for level of SDCT decision:
  - Cow level: If one or more quarters are infected, then the whole cow (all 4 quarters) is treated with antibiotic
  - Quarter level: Only infected quarters are treated with antibiotic
- Greater opportunity to reduce antimicrobial use if target quarter-level treatment decisions (vs cow-level)

Why are we talking about selective dry cow therapy (SDCT)?

- Increasing pressure to demonstrate good drug stewardship:
  - Using antimicrobials only when necessary
  - Properly target therapy based on known bacterial infection
- Mastitis an obvious target - The majority of antimicrobials used on dairy farms is for the treatment or prevention of mastitis
- Reducing antimicrobial use in mastitis control:
  - Step 1. Clinical mastitis therapy - Culture based treatment of clinical mastitis reduces antimicrobial use by approx. 50% (Lago et al. JDS. 2011)
  - Step 2. Selective Dry Cow Therapy (SDCT)?
    - Already mandated in some European countries
    - Many of our herds are ready for this

Components of a successful dry cow therapy program?

1. A highly sensitive diagnostic test to identify infected quarters needing antimicrobial treatment:
   - If we miss identifying & treating infected quarters, these IMI will carry into the next lactation, causing increased SCC and clinical mastitis
2. A mechanism to protect untreated quarters from new IMI during the dry period
   - If we can satisfy the above 2 requirements, SDCT should result in equal udder health vs BDCT, while reducing antimicrobial use
### Options for diagnostic tests at dry off

<table>
<thead>
<tr>
<th>Test Level</th>
<th>Test</th>
<th>Diagnostic Sensitivity (%)</th>
<th>Diagnostic Specificity (%)</th>
<th>Convenience / Speed</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow level</td>
<td>CMT (≥ trace)</td>
<td>70%</td>
<td>48%</td>
<td>Rapid (cowside)</td>
<td>Sanford et al., 2006</td>
</tr>
<tr>
<td></td>
<td>SCC (&gt; 200,000)</td>
<td>70%</td>
<td>51%</td>
<td>Rapid (if DHIA test data)</td>
<td>Torres et al., 2008</td>
</tr>
<tr>
<td></td>
<td>On-farm culture</td>
<td>85%</td>
<td>73%</td>
<td>1-2 day turnaround</td>
<td>Cameron et al., 2013 (Petri dish system, 3M)</td>
</tr>
<tr>
<td>Quarter level</td>
<td>CMT (≥ trace)</td>
<td>61%</td>
<td>80%</td>
<td>Rapid (cowside)</td>
<td>Middleton et al., 2004</td>
</tr>
<tr>
<td></td>
<td>SCC (&gt; 200,000)</td>
<td>57-64%</td>
<td>66-86%</td>
<td>0.5-1 day turnaround</td>
<td>Pantoja et al., 2009; Middleton et al., 2004</td>
</tr>
<tr>
<td></td>
<td>On-farm culture</td>
<td>92%</td>
<td>52%</td>
<td>1-2 day turnaround</td>
<td>Royster et al., 2016 (MN Easy™ 4Cast™ system, UMN)</td>
</tr>
</tbody>
</table>

**Trade offs:** Culture (a direct test) is more sensitive, but less convenient.
What are they currently doing in Europe?

- Adoption of SDCT:
  - Mandatory: Netherlands, Denmark, Sweden, Germany
  - UK and New Zealand on track to adopt
- Basis of treatment: Usually cow level (some quarter level)
- Diagnostic test used:
  - Varies, but usually SCC at last test or for last 3 DHIA tests:
    - e.g. < 50,000 SCC for heifers, < 150,000 SCC for cows
  - Some try to factor in clinical mastitis treatment history
  - Culture not widely available yet
- Use of teat sealants? Variable

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**Example of a SDCT Program that Failed**

Scherpenzeel, et al., 2014. JDSci 97

<table>
<thead>
<tr>
<th></th>
<th>BDCT</th>
<th>SDCT</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of IMI at calving</td>
<td>38%</td>
<td>49%</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Clinical mastitis (cases/day at risk)</td>
<td>0.24 x 10^4</td>
<td>0.41 x 10^4</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>SCC at 14 DIM (median, x 10^3 cells/ml)</td>
<td>30,000</td>
<td>40,000</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Drug use at dry off (ADD, animal daily doses)</td>
<td>3,314</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Drug use by 100 DIM (includes Clx mastitis tx)</td>
<td>3,692</td>
<td>542</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: SDCT reduced drug use but resulted in more clinical mastitis and ↑ SCC

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**Example of a SDCT Study that Failed**

Scherpenzeel, et al., 2014. JDSci 97

**Why did this SDCT program fail?**

1) Insensitive diagnostic test (SCC) and/or
2) No teat sealant

There are many other unsuccessful SDCT studies like this one that took a similar approach.
1st successful study: Culture-guided SDCT Program to make cow level treatment decisions

- 16 herds; 1,584 cows due to dry off in 1 d come through parlor:
  - Eligibility: SCC < 200,000 last 3 tests & no Clx mastitis last 3 mos
  - Randomly assign to study group

SDCT Group
- Cultured a composite milk sample with Petrifilm system

- Bacterial Growth
- No Bacterial Growth

BDCT Group
- Antibiotic & Orbeseal

DCT + ITS all 4 qtrs
ITS only all 4 qtrs

Results: SDCT (at cow level) had same udder health as BDCT, but reduced antibiotic use by 21%

Successful Pilot (UMN): Culture-guided SDCT program to make quarter level treatment decisions

- Patel et al., 2017. In review

Percentage Quarters or Cows Affected (%)

- Cures
- New IMI
- Prev. of IMI at Calving
- Cows w/ Clx Mastitis ≤ 120 DIM
- Cows treated with Antibiotic w/ Antibiotic

 Percentage Quarters or Cows Affected (%)  

- 84.5 89.0
- 13.8 14.5
- 15.3 15.8
- 9.1 9.0
- 79 79
Sample at enrollment and post-calving for bacterial culture

Dry off Calving 1 - 7 days

Milk sample for culture

Results: SDCT at quarter level had same udder health as BDCT, but reduced antibiotic use by 48%
(larger study needed to investigate longer term outcomes)

Successful pilot (Cornell U): Algorithm-based approach to target cow level treatment decisions
(Vasquez et al., in preparation)

1 herd: 953 cows due to dry off
- High vs Low Risk cows: Last test SCC < 200,000;
  last 3 tests SCC Avg. < 200,000, & no Clx mastitis at dry off

Apply algorithm before dry off

Day of dry-off

Calving to 1st DHIA test

- Culture post-calving
- DHIA records at first test
Preliminary Results:
Algorithm-based SDCT targeting cow level treatment had same udder health as BDCT & reduced antibiotic use by 60%
(follow-up ongoing)

<table>
<thead>
<tr>
<th></th>
<th>Low risk cows treated with Antibiotic and ExTS (BDCT)</th>
<th>Low risk cows treated with ExTS only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cures (%)</td>
<td>93%</td>
<td>88%</td>
</tr>
<tr>
<td>New Infection rate (%)</td>
<td>5.5%</td>
<td>7.3%</td>
</tr>
<tr>
<td>Milk yield at 1st test (kg)</td>
<td>40.5</td>
<td>41.2</td>
</tr>
<tr>
<td>SCC at 1st test</td>
<td>2.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>

What differentiates successful from unsuccessful SDCT programs?

• Successful programs:
  – Used a sensitive diagnostic test (i.e. milk culture) to make cow or quarter level treatment decisions and/or
  – Used an internal or external teat sealant to protect untreated cows/quarters
  – The relative importance of these 2 factors needs study

• Unsuccessful programs:
  – Used a less sensitive indirect diagnostic test (e.g. SCC) and
  – Did not use a teat sealant

Logistics of Adopting a SDCT Program

• It’s more work

• Requires dedicated person (or team) and increased time to:
  – Apply diagnostic test
  – Interpret test data and make treatment decisions
  – Correctly administer assigned treatments at dry off
  – Use clean infusion techniques, particularly when infusing teat sealant into an untreated gland
Considerations for Test Requirements for a SDCT Program

- On-farm milk culture:
  - Must set up on-farm lab, trained staff (DVM can help)
  - OR: Local vet clinic can do the culture work
  - Must sample cows 1-2 days prior to dry off (culture 24-48 hr)

- DHIA SCC data (+- clinical mastitis history):
  - Must be on DHIA test or have rapid cow-side SCC test
  - Must take time to evaluate the records

- CMT test:
  - Staff training in test procedures & interpretation

SDCT is an opportunity for vet clinics to offer a valuable service to clients

- Not all producers can or want to...
  - Set up an on-farm culture lab
  - Accurately and cleanly administer treatments at dry off

- Vet clinics can offer this service:
  - Team of trained veterinary technicians visit farm on a weekly basis to collect samples for testing
  - Vet clinic conducts testing
  - Technicians return to farm to dry off cows

- New Zealand Vet Tech model: Sample cows, dry cows off, pretreat heifers with teat sealant, dehorn, etc.

Economics of a SDCT Program

- It depends...

- Factors affecting economics:
  - Prevalence of IMI at dry off => If lower prevalence, greater opportunity to reduce antibiotic use
  - Cow-level vs quarter-level SDCT program => Greater reduction in antimicrobial use if making quarter-level treatment decisions
  - Sensitivity and specificity of test used:
    - If poor sensitivity, more mastitis next lactation
    - If poor specificity, more false positive cows treated
  - Cost of test used (including labor)
  - Cost of dry cow antibiotic tube being used
Examples of SDCT Program Economics

• You could lose money if:
  – You adopt a failing SDCT program model that results in more clinical mastitis and higher SCC (vs BDCT)
    (e.g. If use a poor diagnostic test or don’t use teat sealant) (Scherpenzeel et al., 2016. JDSci. 99:3753)

• You can make money if:
  – You adopt a successful SDCT program model
  – MN pilot study estimated a net benefit of $2.62 per cow assigned to the SDCT group

• Even if we only cover costs, but reduce antimicrobial use while maintaining udder health, it is a win for our industry

What herds could consider a SDCT program?

• Science based thresholds for herd selection are lacking

• However, well managed herds will benefit more:
  – Bulk tank SCC < 250,000 cells/mL ?
    (Ekman, T. and O. Østerås. 2003; Cameron et al., 2014)
  – Good control of contagious mastitis: S. aureus/Strep. ag
  – Lower prevalence of IMI at dry off
    => greater opportunity to reduce antimicrobial use

• Herds that can manage the program
  (or the vet clinic can manage it for them)

Review

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Summary

- The dairy industry is under increasing pressure to demonstrate responsible drug stewardship
- SDCT represents a huge opportunity to significantly reduce antimicrobial use on farms without sacrificing udder health
- We have successful, cost-effective models for adopting SDCT and research is continuing
- We can do this!

Thank you!

Questions?