

European Innovation Partnership (EIP) Wales

Targeted approach for selective dry cow management decision making

Final report

April 2022

Introduction

Selective dry cow therapy (SDCT) aims to reduce broad spectrum antibiotic therapy by targeting only cows with an intra-mammary infection with antibiotics and those with a healthy udder with sealant only. This has, in the past, been reliant on monthly individual Somatic Cell Count (SCC) results from milk recordings, mastitis records, and using the California milk test (CMT) on the day of drying off. The CMT is subjective to interpretation and not always carried out to the specifications with accuracy and the individual SCC from monthly milk recording is an average of the four quarters and could be up to a month out of date by the time of dry off.

SDCT is something that most dairy farms are being asked to implement by their milk contracts and from government to help reduce antimicrobial resistance in livestock and humans. It is an easy way to reduce antibiotic use as most farms have in the past used blanket dry cow antibiotic therapy for all cows at drying off regardless of SCC results and mastitis cases.

The reliance on dry cow antibiotics to help clear any lasting infections in the dry cow period has been long proven and a key part of the mastitis five point plan. With the use of the five point plan, UK dairy farms have seen a major drop in UK herd level SCC and contagious mastitis, and alongside other improvements such as parlour flush systems, annual parlour tests, improved cluster liners, teat sealants use at dry off to reduce the risk of mastitis at and around calving and rewards for having herd low (bulk tank).

The Five-point mastitis control program was developed in the United Kingdom during the 1960s by the National Institute for Research into Dairying (NIRD) with the intention of reducing both clinical and subclinical mastitis through the control of contagious mastitis-causing organisms.

The Five points are:

1. Treat and record clinical cases
2. Post-milking teat disinfection
3. Dry cow therapy
4. Cull chronic mastitis cases
5. Perform regular milk machine maintenance

The Five-point plan is still important today and should be followed with the addition in point three of SDCT. It is important to emphasise that record keeping of individual mastitis cases and lactation SCC is essential for making SDCT decisions and to move away from blanket dry cow therapy.

It is important that as an Industry we look at ways to reduce antimicrobial resistance on dairy farms in the UK and we have already seen great improvements in the last few years. It is still a “work in progress” and needs the whole industry to work together for the right solutions for animal and human health and welfare, with the practicalities of on farm use being considered.

The following is an extract from the UN's Antimicrobial resistance (AMR) action plan which explains the wider context for this project;

Antimicrobial resistance (AMR) is a global problem that impacts all countries and all people, regardless of their wealth or status. The scale of the AMR threat, and the need

to contain and control it, is widely acknowledged by country governments, international agencies, researchers, and private companies alike. This document sets out the UK's 2019–2024 national action plan to tackle AMR within and beyond our own borders. Developed in consultation with a broad range of stakeholders across different sectors, it builds on the achievements of our last strategy (2013–2018) and is aligned with global plans and frameworks for action. The plan has ultimately been designed to ensure progress towards our 20-year vision on AMR, in which resistance is effectively contained and controlled.

It focuses on three keyways of tackling AMR:

- reducing need for, and unintentional exposure to, antimicrobials,*
- optimising use of antimicrobials; and*
- investing in innovation, supply, and access.*

We will build on our already considerable achievements in reducing antibiotic use in animals by working to improve animal health and address endemic disease issues, and we will improve our understanding of the routes of transmission of resistance including the impact of the environment and food.

(UN environmental programme)

The Project

SDCT aims to treat individual cows with antibiotics based on an assessment of the presence of an intra-mammary infection before drying off. In this 'Targeted approach for selective dry cow management decision making' EIP Wales project three dairy farmers from north east Wales went one step further by utilising new technology that can offer a more targeted approach to dry cow management that can work towards their goal of reducing antibiotic usage without compromising herd health and welfare.

They used the latest technology by carrying out milk leukocyte differential (MLD) testing using Q Scout Farm Lab. Q scout is a new and scientifically proven portable diagnostic machine that scans milk samples microscopically. It allows for the sampling and testing of each milking quarter prior to drying off to determine whether individual quarters require antibiotic therapy to combat an intra-mammary infection, or whether they could be dried off using an internal teat sealant in isolation. The test results are available in a very quick turnaround (sampling and results on the day before dry off), meaning that dairy managers have access to current udder health data allowing them to be confident in their decision making for every cow and every individual milking quarter.

Before this trial the farms would rely on monthly or bimonthly milk recording data showing individual SCC and look at the individual cow mastitis treatment record. The farms were using a base of SCC for that entire lactation for that cow to be below 100 or 150 and no clinical treatments for mastitis. It is important to remember the last milk recording data could have been 4-8 weeks ago. The only other tool they could use would be a CMT (California milk test) on the cows before drying off. There are limitations to this test including the fact it only shows SCC above 400 and can be interpreted differently from person to person. For this reason the farms were keen to use the new technology from the Q scout machine.

Q scout

Milk leukocyte differential (MLD) testing using Q Scout Farm Lab accurately identifies subclinical mastitis by analysing the ratios of white blood cell types that fight infection. By sampling and testing each milking quarter prior to dry off, the dairy manager is provided with information to determine whether individual quarters require antibiotic therapy to combat an intra-mammary infection, or whether they could be dried off using an internal teat sealant in isolation. Using an accurate, data driven, quarter level selective treatment approach offers potential for a reduction in the use of antibiotics beyond that previously seen in dry cow management. The speed of MLD testing through the Q scout is key to successful SDCT implementation, with test results available on the day of sampling, meaning that dairy managers have access to current udder health data.

Using the Q scout farm lab will help the dairy managers to be confident in their decision making for every cow and every individual milking quarter. This will mean that a quarter that is fighting in infection will be detected even though the total average SCC of all 4 quarters is low (under 100,000). If missed for treatment, this quarter could then develop into a clinical case of mastitis during the dry cow period. This will allow the inclusion or exclusion of antibiotic therapy at quarter level.

Milk Leukocyte Differential Testing (Q-Scout Farm Lab)

MLD testing on selected cows was undertaken 24 hours prior to dry off using Q Scout Farm Lab. The sampling was undertaken by the farmer and a sample from each milking quarter was analysed using fluorescent microscopy technology to count and differentiate immune cells in milk. This provided absolute values for each of the cell types below:

- a) Lymphocytes which scout for pathogens.
- b) Neutrophils which fight infection by engulfing bacteria and then releasing enzymes that kill the engulfed bacteria. The increased presence of neutrophils is a sign of subclinical mastitis.
- c) Macrophages which engulf and digest cellular debris and pathogens.

Q Scout MLD generated data showing the total leukocyte count and the percentage of each cell type present. This information was used in an index to generate a categorical quarter diagnosis of healthy versus infected. An example of this data is shown below in Image 1, where MLD testing revealed that this cow had a left front quarter that was infected with subclinical mastitis, indicated by the positive diagnosis. This diagnosis enables the left front quarter to be treated for subclinical mastitis during the lactation. Prior to the use of Q scout MLD a quarter such as this would have gone undiagnosed (as SCC through milk recording are an average of 4 quarters) and evolved into a more severe and costly case of mastitis.

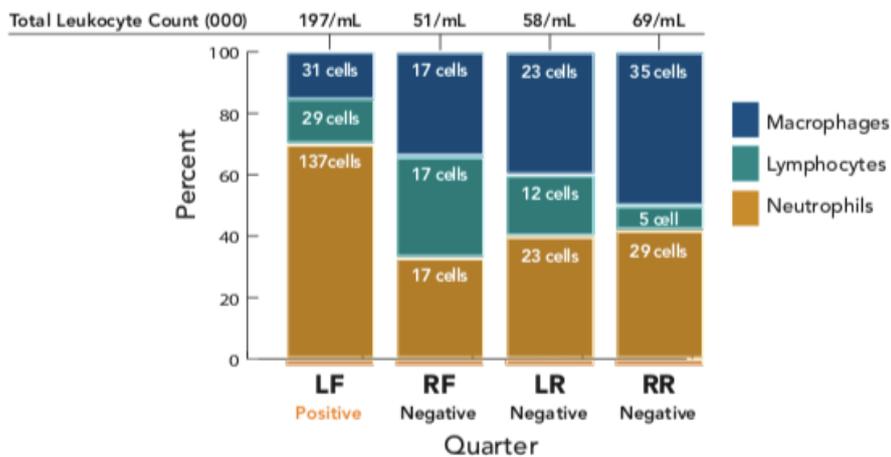


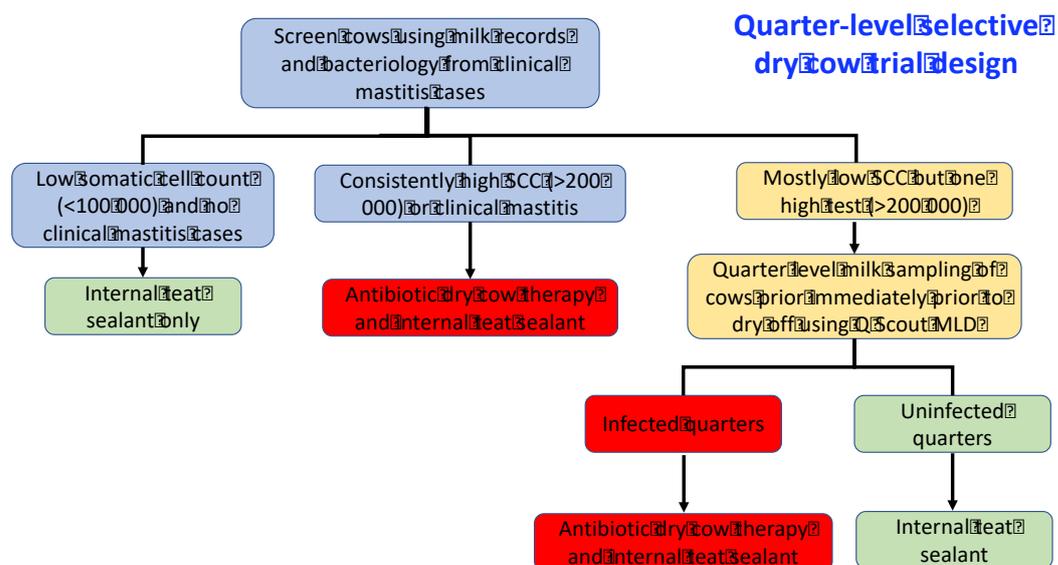
Image 1: An example Q Scout MLD generated data showing the total leukocyte count and the percentage of each cell type present.

Assigning Dry Cow Treatment

The resulting data from the Q Scout MLD testing was then used to assign a cow and her individual milking quarters to one of three treatment groups:

1. Antibiotic therapy and internal teat sealant. This will be termed the control group as this is the existing dry cow therapy programme used across all of the farms.
2. One quarter antibiotic therapy plus sealant – other three quarters sealant in isolation. (This was only for one farm)
3. Internal teat sealant in isolation.
4. Internal teat sealant in isolation.

Protocol for selection of cows suitable for sealant only and to be tested on the Q scout.



Project and Farms

The 'Targeted approach for selective dry cow management decision making' EIP Wales project started in December 2019 and ran until December 2021. The project idea came from three farmers after seeing a demonstration of the Q scout, and the results seen already at Neil Evan's farm - Holebrook Farm. Neil Evans and Tom Bletcher were keen to go to quarter level SDCT and Steve Massey wanted to start SDCT with confidence on his selection of individual cows for SDCT. The three dairy herds totalled approximately 800 Holstein Friesian lactating cows.

Unfortunately, Holderook Farm had to retire from the trial, and as a result Evan Jones from Hoseley Bank Farm joined the project. This increased the total cows to around 1,600.

All three farms:

- are located within a similar geographical region
- capture udder health data using milk recording services provided by external organisations
- have consistent application of mastitis control programmes based on the recommendations of their prescribing veterinary surgeons
- have routine veterinary visits as part of their dairy herd management
- have mastitis cases tested to make sure there is no level of contagious mastitis bacteria such as Staph Aureus in the herd before starting the trial as this would be detrimental to the project

1) Thomas Bletcher, Argoed Hall Farm, Mold, Flintshire

450 cow all year-round calving herd rearing their own herd replacements. 10,500 litre average /cow/year milked twice a day, 154 average bulk SCC/year. 5-7 cows are dried off each week depending on yield and calving date. Once dried off the cows go to a dry paddock in the grazing season or onto sand based dry cow cubicles away from the milking herd, then on to a transition straw yard 2-3 weeks before calving.

2) Stephen Massey, Pentre Isaf Farm, Rhos-y-madoc, Ruabon, Wrexham

300 cow all year-round calving herd rearing their own herd replacements. 8,500 litre average /cow/year milked twice a day, 176 average bulk SCC/ year. 5-7 cows are dried off each week depending on yield and calving date. Once dried off the cows either go to a dry paddock in grazing season or into dry cow cubicles away from the milking herd and then on to a transition straw yard 2-3 weeks before calving.

3) Evan Jones, Hoseley farms, Marford, Wrexham

1,000 cow all year-round calving herd rearing their own replacements. 11,400 litre average/cow/year. Milked three times a day 179 average bulk SCC/ year. 10-20+ cows dried off each week depending on yield and calving date. Once dried off the cows either go to a dry paddock in grazing season or onto sand dry cow cubicles away from the milking herd and then on to a transition straw yard 2-3 weeks before calving.

Somatic Cell Counts

Monthly milk individual SCC data is recorded by external organisations NMR or CIS using composite milk samples with preservative. All lactating cows in these herds were initially screened prior to dry off using the udder health data captured through this monthly milk recording and the on farm recording of clinical cases of mastitis.

Administering Dry Cow Treatments

The SDCT programme was implemented on farm by the farmer and their veterinary surgeons.

All SDCT treatments administered weekly by a veterinary technician to ensure strict hygiene and thorough compliance across all three farms. Due to COVID-19 restrictions at times the farm staff either completed SDCT on their own farms or reverted to blanket antibiotic and sealant administration, depending on their own circumstances.

Over the course of this project the veterinary advisers trained the farmers and their farm staff to undertake this task independently, to ensure a lasting legacy following the completion of the project.

Data Collection Following Dry Cow Treatment

Following their dry cow period, the cows were monitored throughout their subsequent lactation to gather data on udder health. The first month after calving is the most critical and likely to have infection coming from the dry cow period/calving environment.

Results

Argoed Hall Farm

Started December 2019.

711 cows in total dried off, 406 with antibiotics and sealant, 305 with sealant alone.

29 from the 406 cows had only one quarter treated with dry cow antibiotic (the other three sealant only). None of these cows calved down with mastitis and only one with a higher SCC than at dry off.

72.5% of the cows on antibiotic + sealant had a SCC lower or about the same SCC on the tests after calving.

88.1% of the cows that had sealant alone had a SCC lower or about the same SCC on the test after calving.

No mastitis issues with sealant only cows at dry off or at calving.

Antibiotic saving of £3,110 based on a tube costing £2.49 each

Pentre Isaf Farm

Dried off 517, 362 to antibiotic + sealant and 155 to sealant only.
September 2020 and August 2021 farm decision to dry off all cows with antibiotic and sealant due to weather and historic issues with mastitis in these conditions.

Difficult to have conclusive evidence on SCC as milk recorded every other month. But one cow that had sealant only did develop E. coli mastitis soon after drying off and was treated accordingly, no cows calved down with mastitis.

Antibiotic saving of £1,543.80 based on a tube costing £2.49 each

Hoseley Farm

1,084 cows dried off, 835 on antibiotic and sealant, 249 on sealant alone.

Hoseley Farm started very cautiously with selection, and two cows on sealant only had E. coli mastitis a couple of days after drying off, also one on dry cow antibiotic and sealant.

There were four periods where everything had antibiotic and sealant, two because of covid restrictions and no tech was allowed on farm, the other two times due to the weather at the time and a rise in mastitis in the milking herd (linked to parlour issues) during September to October 2020 and June to mid-September 2021.

Difficult to have conclusive evidence on SCC as milk recorded every other month, but results were 82% lower or around the same for sealant only and 76.2% lower or about the same of cows with DCT and sealant.

Antibiotic saving of £2,480 based on a tube costing £2.49 each.

Summary

Q scout did identify more cows to receive dry cow antibiotic therapy.

Between the three farms there were a number of cows who on SCC results and no clinical mastitis alone, would meet the criteria for sealant only treatment, but when tested through the Q scout had positive quarter results and so were given antibiotics. Although this resulted in greater antibiotic use for these cows at the time, the benefits would be seen the in following lactation, when the antibiotic use should be lower, as reduced chance of elevated SCCs and lower risk of mastitis.

Hoseley and Pentre Isaf's criteria for SDCT was for individual SCCs to be less than 150, ideally for the entire lactation or at least the last three milk recordings (both farms record bi monthly) and no history of clinical mastitis in that lactation.

Argoed Hall's criteria for SDCT was individual SCC had to be less than 100 ideally for the entire lactation or at least in the last three milk recordings (monthly) and no clinical mastitis in that lactation.

Each farm also had the final say in treatment for that individual cow. This may be because they were still producing a high daily milk yield, or had problems in previous lactations, the weather and cleanliness of the individual cow on the day would be considered.

Hoseley farm

In the trial 1084 cows in total were dried off. 608 of these on SCC history only could have received sealant only, but after a Q scout test and farm decision only 249 received sealant only (41%). Of the 359-testing positive on Q scout, 93 were positive in just one quarter (26%).

Pentre Isaf

In the trial 517 cows in total were dried off. 397 of these on SCC history only could have received sealant only, but after a Q scout test and farm decision only 155 received sealant only (39%). Of the 242 cows testing positive on Q scout, 45 were positive in just one quarter (18.6%).

Argoed Hall

In the trial 711 cows in total were dried off. 462 of these on SCC history only could have received sealant only, but after a Q scout test and farm decision 305 received sealant only (66%). Of the 157-testing positive on Q scout, 32 were positive in just one quarter (20.4%), 29 of these cows received antibiotic in one quarter and sealant and the other three cows had antibiotic and sealant in all quarters (they were already $\frac{3}{4}$ cows).

Hoseley and Pentre Isaf agreed farm and vet protocol was to treat any cows having a positive Q scout test, even if it was just one quarter with DC therapy. Therefore all quarters received antibiotic and sealant, the main reason being they were new to SDCT.

Argoed Hall had been doing SDCT with good success for a few years and wanted to use this trial to identify any cows that had just one positive quarter on the test, so their policy was to treat these cows with the one positive quarter with antibiotic and sealant, the other three quarters receiving sealant only.

Q scout machine - summary

Positives

- Easy on farm sample pot, clear definition of quarters
- Quick transfer to sample slides for interpretation
- Results for individual cows within one minute
- Clear results – green meaning negative and red meaning positive
- Can load up to 15 slides in machine at any one time, and the machine will work through them with no need to add one at a time. This is very time efficient, especially for big herds drying off large number of cows in one go.
- Could be used by a farmer group or vet practice.
- More specific and consistent results compared to CMT.

Negatives

- Expensive to buy and run with slides. There is currently no UK provider so slides need to be imported from the US at a cost of £4 / slide, with one slide used per cow (2021 price)
- No UK support if machine failed.
- Needs to be in an office, compared to the CMT which can be done in the parlour.

Further considerations before choosing SDCT

Discussion with vet on suitability for the herd, assessing in areas such as –

- The bulk SCC level.
- Individual milk recording – monthly/by monthly or in the case of block calving the last three months milk, SCC recording before drying off.
- Mastitis bacteriology.
- Mastitis farm records.
- Training of staff for administering sealants.
- Milk contracts.

Other considerations

- Housing/outside facilities for cows post dry off.
- Stocking rate.
- Weather.
- Cleanliness of parlour to dry cows off on sealant only and area waiting in.
- Time cows waiting from milking to be dried off.
- Procedure for cows after drying off – cleanliness of area going into, distance from parlour (to avoid milk stimulation) ideally no further interventions (such as foot trimming).
- Fly presence and treatment procedures.
- Milk yield of cow at dry off.
- Cleanliness of cow at dry off.
- Temperament of cow – if likely to kick, safer to tube with antibiotic and sealant as more risk of dirt going in when drying off.

Conclusion

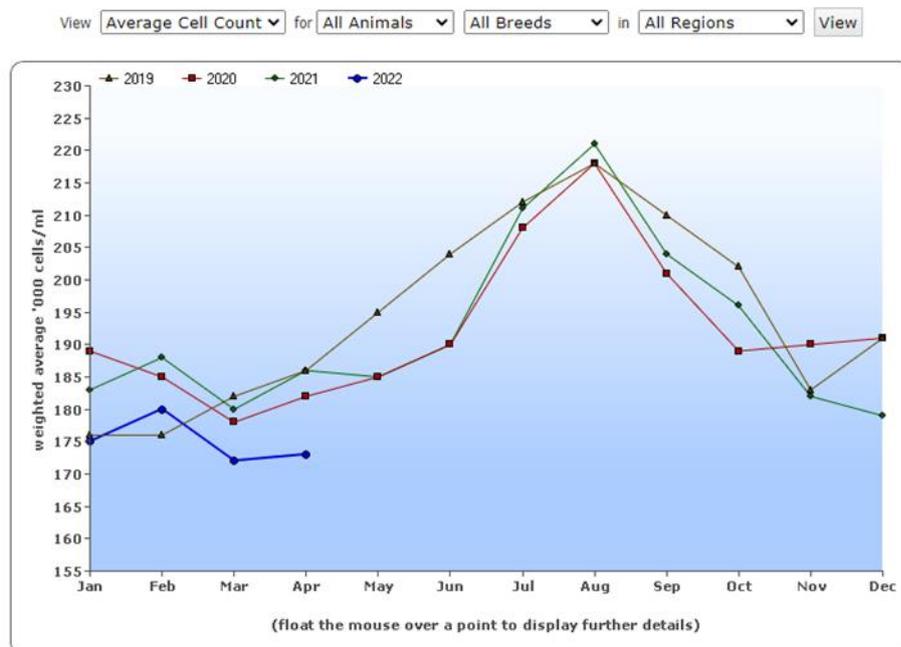
Q scout gave confidence to the farms that they were drying off their cows correctly.

Milk contracts and buyers should consider on an individual herd basis the threshold for SDCT; considering, housing, yield of cows etc., and work with the client and their vet to set realistic targets.

Weather conditions can have a big influence on stress and conditions for the cattle and looking at farm records to understand when there have been issues historically to reassess plans for SDCT.

Below is a graph from CIS of their recorded herds. The trends in SCC shows that there is a rise during the summer months for UK CIS producers which highlights the importance of proactive planning before issues arise.

Seasonal Trend Graph



Record keeping is paramount for selection. SDCT is not risk free but with correct training for clean administration, record keeping and using new technology, these risks can be reduced.

The dairy industry must do all that it can to reduce antibiotic use and vets, milk contractors and farmers need to work together to make improvements. Every farm is different and should work on their own individual plan with their vet to suit their system. There are both health and financial reasons to reduce antibiotic usage on farms.