

Clinical forum: selective dry cow therapy



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Responsible use of antibiotics is essential to reduce the risk of antimicrobial resistance developing. Routine whole-herd treatment with antibiotics cannot be justified any more unless the herd has a high bulk tank cell count, in which case whole herd treatment can be justified until the cell count has been reduced. Blanket antibiotic dry cow therapy formed part of the National Institute into Research of Dairying's Five Point Plan and, over the past 50 years, has helped to reduce mastitis due to contagious bacteria. The UK average cell count is below 190 000/ml indicating a low prevalence of contagious mastitis infections. Alongside other control measures, the use of dry cow antibiotics has changed mastitis epidemiology. The majority of clinical mastitis is caused by environmental bacteria which can enter the udder during lactation but also during the dry period. The use of internal teat sealants has been proven in many studies to reduce the rate of new infection during the dry periods. There is an average reduction in clinical mastitis of between 25–30% following their use. Whole herd treatment with teat sealants is justified. The majority of cows in herds with cell counts under 200 000/ml are free from subclinical infection at the end of lactation and therefore do not benefit from antibiotic treatment at drying off. Decisions in regard to dry cow therapy should be made on an individual cow basis, with antibiotics only being administered when there is evidence to support their use.

10.12968/live.2016.21.3.142

Selective dry cow therapy involves targeting the treatment of individual cows with antibiotic dry cow therapy based on their individual mastitis history. Using selective dry therapy is evidence based and is a crucial part of reducing overall antibiotic use in dairy cows. It also follows the BVA guidelines on responsible use of medicines which discourages the use of any blanket form of antibiotic treatment. Selective dry cow therapy is not no treatment, as cows that are free from infection should receive an internal teat sealant at drying off as many teats remain open for several weeks increasing the risk of dry period infections. It is important to minimise risk to cow health and welfare when moving to selective dry cow therapy.

All professions that prescribe antibiotics

are being encouraged to reduce their use. This is especially important for the veterinary profession in the UK which is allowed to dispense as well as prescribe. There are many EU countries where veterinarians are only allowed to prescribe and others where they have to administer every treatment. It could be argued that in the UK veterinarians favour blanket dry cow therapy because it increases income rather than because it improves outcomes; i.e. profits are more important than responsible use of antibiotics. Although veterinarians play a crucial role in increasing the use of selective dry therapy, farmers also play a role in encouraging its use.

Selective dry cow therapy is nothing new. In some of the Nordic countries, such as Denmark, blanket dry therapy has never been

allowed, while across the EU, organic dairy herds have been encouraged to only treat cows with dry cow antibiotics when they are known to be infected at dry off.

In order to fully understand selective dry cow therapy it is important to look at the history of dry cow therapy. Antibiotic dry cow therapy was first used in the 1940s and '50s to reduce the incidence of summer mastitis. It was not until the 1960s that the National Institute into Research of Dairying (NIRD) came up with the Five Point Plan which recommended that all cows should be dried off with antibiotic dry cow therapy. In the late 1960s the UK average bulk somatic cell count (SCC) was close to 600 000/ml and there was a high incidence of infection by *Staphylococcus aureus* and *Streptococcus agalactiae*. *S. aureus* alone accounted for 45 clinical cases per 100 cows per year at this time; and at this time the recommendation for blanket antibiotic dry cow therapy was justified.

In 1993, new EU legislation meant that milk had to have a SCC of under 400 000/ml; this, combined with financial incentives for low cell counts from the milk buyers, resulted in a significant reduction in cell counts in the UK. As of 2015 the average cell count on UK dairy farms was 190 000/ml (Figure 1) and the average incidence of mastitis has fallen to between 40 and 50 cases per 100 cows per year. The majority of clinical cases are caused by the environmental bacteria *Escherichia coli* and *Streptococcus uberis*. *S. aureus* now accounts for less than four clinical cases per 100 cows per year (Bradley, 2007). This significant change in the epidemiology of clinical and subclinical mastitis over the past 50 years means that now is a good time to review use of dry cow therapy.

Bradley and Green (2000) published research showing that 52.6% of all enterobacterial clinical mastitis in the first 100 days of lactation originated from dry period infections. The 642 study cows received a variety of antibiotic preparations at dry off. This demonstrated the importance of dry period infections and showed that antibiotic dry cow therapy does not prevent all cases of clinical mastitis originating in the dry period

Dingwell et al (2003) and Williamson et al (1995) showed that up to two thirds of teats from cows giving more than 21 litres at dry off had open teats a week after dry off (Figure 2). This reduced to 50% of open teats 6 weeks after dry off. The higher the yield at dry off

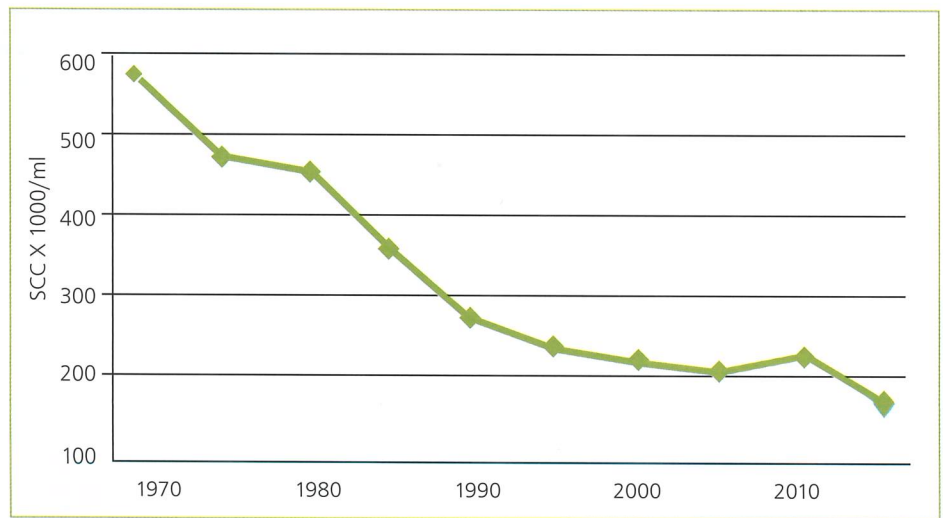


Figure 1. UK cell count is now under 190 000/ml (SCC = somatic cell count).

the greater the risk of open teats; open teats have a higher risk of dry period infections and thus mastitis.

From 2002 onwards there has been a plethora of published research demonstrating the benefits of internal teat sealants, with or without antibiotic dry cow therapy, in reducing the incidence of clinical mastitis in the subsequent lactation. There is probably more trial work done in this area than any other in mastitis. Veterinarians have seen reductions

in clinical mastitis following use of internal teat sealants. Raibee and Lean (2013) showed that there is a 29% reduction in clinical mastitis by using internal teat seals on their own at dry off.

Bradley et al (2010) showed there was no difference in mastitis rates between low cell count cows (defined as having the last three tests under 200 000/ml) that received an internal teat sealant with or without antibiotics and in low cell count cows. However, there

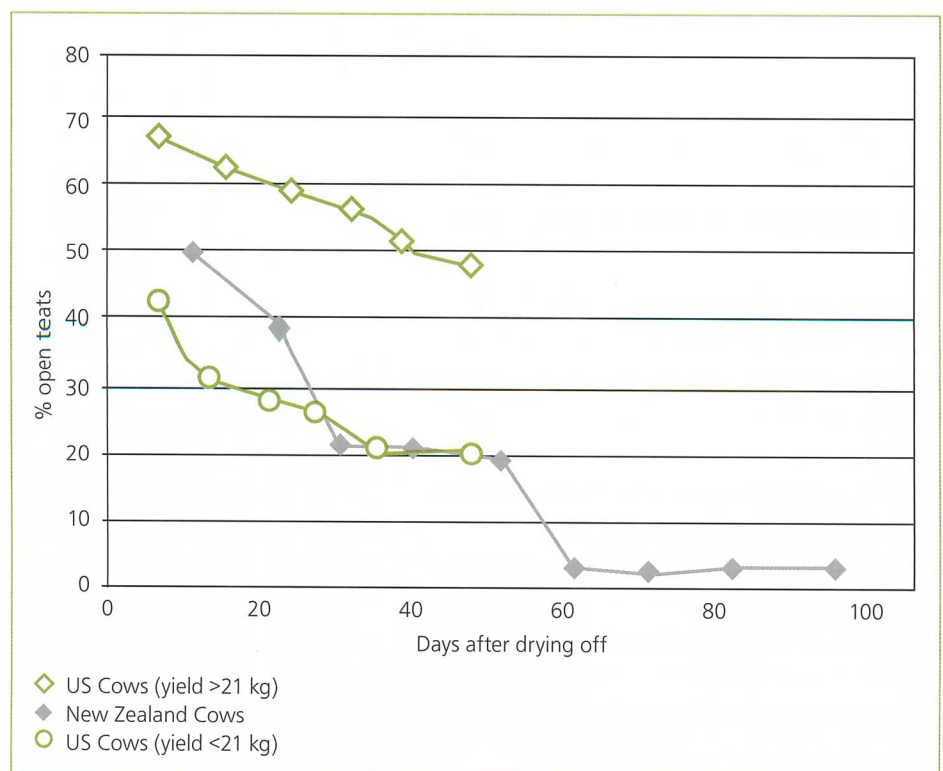


Figure 2. This shows that two thirds of cows giving over 21 litres at dry off have open teats 7 days after dry off



Farmers must be trained to dry off cows correctly

was an increased number of *E. coli* cases in these low cell count cows that received antibiotic as well as an internal teat sealant.

Recent National Milk Records data (personal communication) shows that in herds with a bulk cell count between 150 000/ml and 200 000/ml, 78% of cows have cell counts under 200 000/ml (Figure 3). This means that only 22% were infected. Even when the herd cell count was between 250 000/ml and 300 000/ml, the average proportion of infected cows was still only 30%.

When all the above factors are combined the justification for selective dry cow therapy is very compelling. The majority of cows in most herds are free from subclinical mastitis. However, a high proportion of cows have 'open' teats during the dry period, and this proportion increases as herd yields increase. This increases the risk of dry period infection. Such infections can cause clinical mastitis in the following lactation and can occur even in cows that receive antibiotic dry cow therapy. Indeed, in low cell count cows, there is an increased risk of *E. coli* mastitis if they are treated with antibiotics at drying off. The solution to dry period infection is not antibiotics but internal teat sealants which have been proven to be highly effective in reducing clinical mastitis caused by dry period infections.

It has been estimated that over 90% of all UK cows receive antibiotic dry cow therapy and just over 55% receive an internal teat sealant. The evidence above shows that this makes little sense as although the majority of

cows will benefit from an internal teat sealant, only the minority are infected and benefit from dry cow antibiotics.

There are 1.9 million milking cows in the UK and the culling rate is about 25%. This means that 1.4 million cows are going to be dried off annually. 45% of these do not currently get an internal teat sealant at dry off. If it is assumed that the average mastitis rate in the UK is 45 cases/100 cows per year (45%) and that an internal teat sealant reduces clinical mastitis incidence by 25%, then if all cows received a teat sealant at dry off the average mastitis rate would drop from 45 to 41%, re-

ducing the number of mastitis cases in the UK by over 70 000 annually.

There were some deaths following use of internal teat sealants when these were used alone in the mid 2000s. This was the result of poor hygiene at administration, which had previously been hidden by the use of antibiotics. These deaths have discouraged some farmers and veterinarians from using teat sealants on their own without antibiotics. However, clean, hygienic drying off avoids this problem; if teat sealants are going to be used on their own to treat cows at drying off, comprehensive training of farm staff in the correct dry off technique is essential.

Moving a herd to selective dry cow therapy is not a paper exercise. It is essential to review the herd mastitis status including analysis of cell counts, clinical mastitis records and bacteriology results. There will be many herds which can make the transition smoothly but there will be some farmers who will be resistant to change for fear of things going wrong.

Any herd can move to selective dry cow therapy but the risk of failure could be higher in high cell count herds that adopt incorrect thresholds for selecting cows to receive antibiotics and have not improved their mastitis management. Herds that have *S. agalactiae* infections need to eradicate this bacteria before moving to selective dry cow therapy. This is because *S. agalactiae* is highly contagious and can spread very rapidly throughout a herd. This is the one contagious mastitis bacteria that can be eradicated from a herd. *S. agalactiae* incidence is very low.

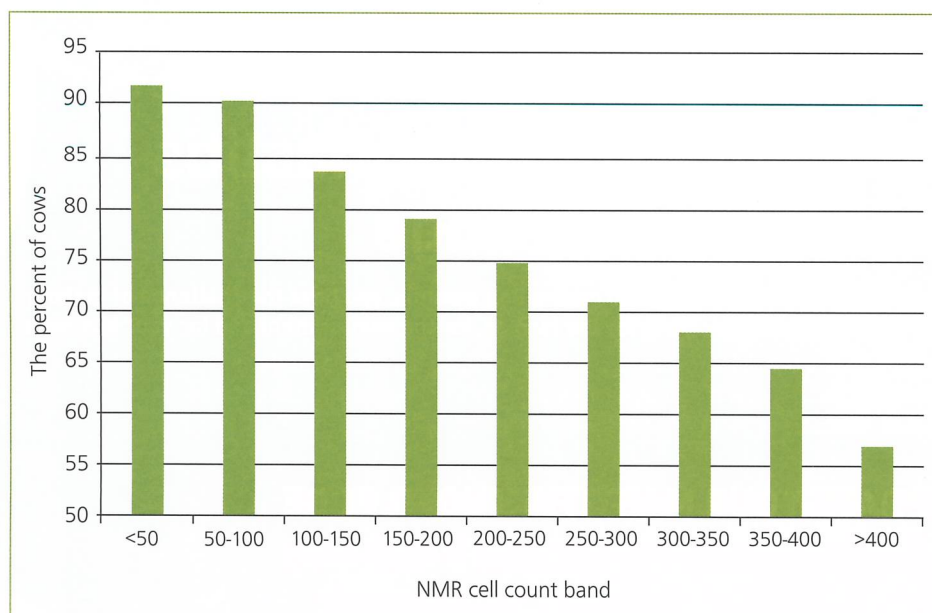


Figure 3. The percent of animals with a cell count of under 200 000/ml by NMR cell count band.

Cows that receive antibiotics at dry off are chosen on the basis of their cell count and clinical mastitis history. Cows that do not receive antibiotics must get an internal teat sealant. Ideally all cows should get an internal teat sealant at dry off. Virtually everyone agrees that a cow that had clinical mastitis should get antibiotics at dry off. The exception is where you can prove that there is no remaining infection in the udder. This decision could be made by a veterinarian based on history but it would be a difficult or unwise decision for a farmer to make. Farmers must be suitably trained in the dry off procedure and on farm training is best.

There is a variation in cell count thresholds with some individuals having a fixed threshold above which cows will receive antibiotics at dry off. Others use different thresholds according to the herd cell count where higher thresholds are chosen in low cell count herds where there is much higher margin of error compared with a high cell count herd, see Biggs (2016).

There are a significant number of benefits to farmers and the dairy companies from selective dry cow therapy. These include: an increase in use of internal teat sealants which will reduce clinical mastitis, a reduction in *E. coli* mastitis in low cell count cows that only get an internal teat sealant; less culling of mastitis cows in herds that start to use internal teat sealants; if cows calve early there is no additional milk withhold period beyond the statutory 4 days; the risk of bulk tank failures decrease; there is a reduced risk from introducing infections on the end of an intramammary tube when only one tube is being administered; less antibiotics will be fed to baby calves through residues in colostrum, helping protect market share by reducing antibiotic use; a cost saving from reducing dry cow therapy use. Herds that start to use internal teat sealants have the potential to make the greatest savings. There will be a saving from dry cow therapy, an increased cost of internal teat sealants and a significant saving from a reduced incidence of clinical mastitis over and above the additional cost of teat sealants.

Veterinarians need to be reassured that there is nothing to stop any farmer moving over to selective dry cow therapy provided that farmers are trained and that they follow the correct guidelines. It is important that vets monitor progress. **LS**

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How do you persuade farmers to move to using selective dry cow therapy?

James Breen replies:

The arguments around the use of selective dry cow therapy are many and encompass financial (reduced medicine use), responsible (prudent use of antimicrobials), legislative (government, e.g. Netherlands), milk buyer directive (e.g. Arlagården, Tesco Sustainable Dairy Group), argumentative (why are we administering antibiotic in uninfected cows anyway?) and evidence from research (use of antibiotic in low cell count cows is likely to increase the risk of coliform mastitis in the next lactation). My preferred arguments are usually the latter — as farmers really get the concept of making a cow-level decision and understanding what is best for the cow in the context of the herd situation, far more than trying to construct difficult arguments about reducing intramammary antibiotic use to reduce antimicrobial resistance concerns in human medicine. Ultimately, for many herds, the impact of putting antibiotics into low cell count cows (incorrectly classifying them as infected) is to shift the balance towards opportunistic infection with Gram-negative organisms during the dry period and this is a powerful clinical argument with farmers.

Alastair Hayton replies:

I discuss the scientific and economic implications, refer to equivalent local farmers/peers (e.g. organic farmers), who have been utilising

the practice successfully for a long time, and frequently suggest a slow process of adoption, starting on the lowest risk animals and building up the percentage of the herd dried off selectively as confidence in the outcomes are gained by the unit.

Andy Biggs replies:

This is not new — we along with many other practices have herds that have been using selective dry cow therapy for many years — the longest in our practice is 8 years. There is currently a focus on selective dry cow therapy for our clients supplying Arla as this will soon be a requirement to avoid a 'non-conformity' for their Arla Gaarden Assurance scheme.

For me the challenges vary depending on a number characteristics of the farm and I guess the farmer. Do they regularly routinely individual cow milk record (i.e. do they have SCC data)? See Q5.

Then it is about knowing what the farmer's attitude is to using antibiotics in general and what their likely drivers are for change.

For herds using blanket antibiotic dry cow therapy and internal teat seal on all cows the drivers can be an economic saving as well as the potential for reduced clinical mastitis in early lactation particularly by avoiding the use of antibiotic dry cow therapy in uninfected (low SCC) cows which is a risk for this. However I do not over emphasise the reduced clinical mastitis incidence early in the next lactation as it may not always be obvious in all farms but point out that the cost saving of reduced antibiotic dry cow therapy use is a given with selective dry cow therapy.

These herds already have experience using internal teat seal however in my experience there is a need to ensure training makes them competent to do it cleanly enough to use teat seal alone. In response to the Arla initiative we ran six farmer workshops in our practice to discuss the pros and cons of selective dry cow therapy and give some training on clean infusion technique.

For herds using just antibiotic dry cow therapy on all cows the challenges are much greater. As these herds have no experience (or sometimes a bad experience when teat seal was first launched almost certainly due to poor infusion technique) there is a need to train them in a clean teat seal infusion technique. In my opinion these farms are best to pass through a period of blanket teat seal and antibiotic dry cow therapy until they have

gained confidence in using teat seal before they attempt to use teat seal alone. Infusing teat seal or antibiotic dry cow therapy are very different techniques and the consequences of poor teat seal alone infusion can be catastrophic. This does of course mean antibiotic dry cow therapy only herds with my approach will have an approximate doubled cost initially and will still have an increased cost even when they reach the reduced antibiotic dry cow therapy with selective dry cow therapy albeit with a reduced dry period new infection rate and possible reduced early lactation clinical rate.

Theo Lam replies:

Our experience is that a mixture of approaches works best to change behaviour, also behaviour related to dry cow therapy. In the *Veterinary Communication Handbook* by Wessels et al (2014) this was summarised in the RESET model, which stands for Rules, Education, Social pressure, Economy and Tools. In the Netherlands we used all five. The first one seems the most important: blanket dry cow therapy has not been allowed since 2013. The interesting thing, however, is that most farmers are happy with it, and this is not usually an effect of rules (Scherpenzeel et al, 2016). Education about the importance of prudent antibiotic use (Speksnijder et al, 2014) lead to an increased social pressure. Additionally farmers were informed on the potential consequences of withholding dry cow antibiotics (Scherpenzeel et al, 2014) and about the importance of improving mastitis management in that situation. Of course economic consequences were calculated (Scherpenzeel et al, 2014) and tools were provided for veterinarians by the Royal Veterinary Association (www.kwaliteitdiergeenescunde.nl) on how to implement selective dry cow therapy.

What thresholds do you use to decide if a cow receives antibiotics at dry off?

James Breen replies:

This is a fundamental issue and an answer that cannot be made for all herds, i.e. one figure put in place and held up as 'right'. The reality is that setting SCC thresholds is a dynamic process that is likely to change over time as herd priorities change and therefore is something that should be under regular review (as should the prescription of dry cow therapies). That said, all the research published in this

area (both in the UK and abroad) uses the last three SCCs <200 000 cells/ml, with no clinical mastitis during that 3-month period to describe a cows that is likely to be uninfected, and for many herds this is a very good starting point. The only rationale to lower the threshold at which we consider antibiotic dry cow therapy would be for the high cell count herd (i.e. >200 000 cells/ml with more than 20% of the herd infected as measured by cell count — where CURE is the aim of dry cow therapy), and moving from 200 000 cells/ml down to say 100 000 cells/ml will result in an increase in test sensitivity from ~85% to ~95%. Importantly, for low cell count herds (where PREVENTION of new infection is the aim), vets should leave the threshold at 200 000 cells/ml or probably even increase the threshold to 250 000 cells/ml before we would prescribe antibiotic in that cow... this will increase test specificity up to ~96–99%, and mean we make the right decisions for uninfected cows and minimise the risk of coliform mastitis in the next lactation.

Importantly, we will ALWAYS make some wrong decisions...but for low SCC herds with good control of lactation-based new infections it does not matter if we miss the occasional Gram-positive major pathogen (contagious spread in these herds is low) — and we are making wrong decisions NOW by putting antibiotic in all cows, many of which are NOT infected!

Alastair Hayton replies:

There is no one size fits all answer to this and the parameters I use may vary even when the epidemiological picture is very similar between two units simply because one farmer may be starting out and wishes to be more cautious than an equivalent herd who has been using selective dry cow therapy for a long while. My base position, assuming the herd SCC and mastitis rate are well within agreed targets, would be to use selective dry cow therapy in an individual cow where no cases of clinical mastitis have been encountered in the current lactation and where the last 3 monthly individual SCCs have been below 200 000 cells/ml.

Andy Biggs replies:

For me it is all about starting conservatively so I would start with relatively low thresholds until confidence around selecting cows is gained. Dry cow cure rates are superior to

lactation therapy cure rates and so the one in a lactation chance of cure should not be missed.

Generically I would use 150 000 cells per ml for cows and possibly 100 000 cells per ml for heifers.

For herds with low prevalence of intramammary infections (low bulk SCC) I would tend to use higher thresholds. In high yielding herds I would sometimes use an 'override' and suggest antibiotic dry cow therapy in cow drying off with yields over 25 litres as this is known to increase new infection risks.

We use Interherd plus reports set up with a traffic light colour coding system on all our milk recorded herds. All cows receive internal teat seal and then only those that justify antibiotic get both antibiotic dry cow therapy and teat seal.

- 'Red' cows have one of the following in the 3 months just prior to drying off and justify antibiotic dry cow therapy: 1) a clinical case; 2) a SCC above the threshold or for herds not recording clinical cases well; 3) a missed milk recording as an indicator that the cow probably had a clinical case and was not milk recorded and could particularly with computer generated reports, fall into the category of no SCC over the threshold as a result.
- 'Orange' cows have one of the above events before the 3 months just prior to drying off and may justify antibiotic dry cow therapy in certain circumstances.
- 'Green' cows have none of the above events for their complete lactation and get teat seal by default.

Theo Lam replies:

This is a very difficult question. As Dr Edmondson mentions, several approaches have been described in the literature. The point here is how to diagnose an intramammary infection at drying off. Even if we would culture all quarters for several days before drying off, our diagnosis would not be perfect. It's a fact of life, diagnostics are not perfect and intramammary infections do have shedding patterns. Additionally, culturing all quarters at drying off is not very practical. Another approach is based on the individual SCC at drying off. Choosing SCC cut off levels has its effect on the consequences (Scherpenzeel et al, 2016). Including clinical mastitis history or earlier SCC results probably has added value in selecting the right cows.

How do you monitor a herd after they start using selective dry cow therapy?

James Breen replies:

Indices used to monitor herds should be the same as those already in place as part of our ongoing monitoring for mastitis herd health. Briefly, the use of bulk milk SCC is of very little value (an insensitive, 'blunt' tool that is easily manipulated by culling decisions and readily influenced by stage of lactation — and you could readily expect the bulk SCC to increase slightly anyway, as a consequence of missing some infections); instead the veterinary advisor must monitor the rate of NEW dry period origin infections as measured by SCC (i.e. <200 000 cells/ml at drying-off but >200 000 cells/ml at the first test-day in lactation; target <10%) AND the rate of new clinical cases of mastitis of likely dry period origin (i.e. more than 1 in 12 cows affected in the first 30 days of lactation). Importantly, increases in the rate of these do not mean the selective approach has 'failed' — more likely these reflect the overall challenge from the environment. However, increases in cell count over time may mean a re-evaluation of thresholds for antibiotic treatment at drying-off and a change of priority towards 'cure' rather than 'prevention'.

Alastair Hayton replies:

Principally formally via regular review of dry period performance (dry period new infection rate, percentage of cows calving in with SCC >200 etc) using TotalVet® and Interherd Plus® software though I would also routinely informally discuss how things are going at the routine to check no issues have been encountered.

Andy Biggs replies:

We would use Interherd plus to dynamically monitor dry period performance using a 200 000 cells/ml threshold and early lactation (dry period origin) clinical mastitis

- First infection rate. Target <10% of calvings cows with a first milk recording above threshold
- Failure of dry cow protection (L-H). Target <10% of cows below threshold at dry off
- Failure of dry cow cure H-H Target <20% of cows above threshold at dry off
- Index mastitis case rate. Target <8.5% index cases (first case in current lactation)

Theo Lam replies:

I would say that monitoring udder health is not any different from what you always should

monitor in herd health programmes, which is a combination of bulk milk SCC, individual SCC, and preferably data on the incidence of clinical mastitis, antibiotic usage and culling percentage for reasons of udder health (Santman-Berends et al, 2016). Specific attention though, could be given to the number of new infections during the dry period in older cows.

What opportunities are there for veterinarians from selective dry cow therapy?

James Breen replies:

In summary, the opportunity is huge as it allows vets greater involvement in terms of mastitis control on farm. By having conversations about current cell count and mastitis data initially relating to priorities regarding dry cow therapy, the veterinary surgeon is not only fulfilling prescribing requirements but is also in a position to review dry cow management as a whole, especially environment and nutrition which are likely to be far more important for most herds in determining a successful outcome. There are opportunities relating to herd health and advisory/consultancy roles, as well as more immediate work around aiding with administration of dry cow therapy (demonstration, quality control) and crucially the preparation of a monthly 'drying off list' alongside more established fertility visit lists. These drying-off lists can be tailored for the farm and be regularly reviewed, and include approaches for high cell count cows, low cell count cows and even 'uncertain' cows.

Alastair Hayton replies:

It provides a focus to analyse and discuss mastitis patterns on the farm and thereby hopefully increase engagement with the client on this area if this has been lacking as well as demonstrating a pro-active approach, desire to reduce drug costs and an overall antibiotic usage.

Andy Biggs replies:

This and other articles and the comments from the panel members show how complex and bespoke the process of delivering selective dry cow therapy is on individual farms and so there is a huge opportunity for veterinarians to be engaged, involved and make a meaningful contribution to reducing antibiotic usage in dry cows on their farms while ensuring udder health and production is not compromised by increased incidence and prevalence of intramammary infections over time.

Theo Lam replies:

There are several possibilities for veterinary practitioners to profit from selective dry cow therapy. The first one is to inform farmers on the importance of prudent antibiotic use. In The Netherlands many farmers indicated they 'have never ever heard anything about it' from their vet. Selective dry cow therapy, however, is only the first part of that. The second part is that along with taking away the preventive effect of prophylactic antibiotic use, mastitis management becomes more important. If you know what you are talking about in that field, and you have your communication skills up to standard, there is a business opportunity there. The third part is that, as a profession, cattle practitioners can work on their reputation as taking prudent antibiotic use seriously. In our country that is called 'one health'; the health of humans and animals are related to one another.

How do you decide if a herd is not suitable to use selective dry cow therapy and what steps do you take to resolve this?

James Breen replies:

The short answer is that there are NO unsuitable herds...but there may be unsuitable cows and there are certainly unsuitable approaches. It is important to realise that condemning herds to blanket antibiotic treatments based on the presence of *S. aureus* in the bulk tank (most herds if you look hard enough), high milk yields at drying off (a risk for new infection regardless) and other perceived 'no nos' are not barriers to selective dry cow therapy, rather they are opportunities to explain why selective dry cow therapy remains important alongside other areas of mastitis control. A word about herds which do not milk record — while these are more difficult to implement selective dry cow in, the lack of individual cell count data does not make them unsuitable, rather it just makes it harder to do a good job of doing it, as reliance on less reliable tests (e.g. California Mastitis Test) means that sensitivity (missing infected cows) AND specificity ('false-positives') are a big issue, particularly the latter. Another word about infusion technique — we cannot allow this to 'justify' antibiotic approaches, rather this is an opportunity to demonstrate correct infusion technique and challenge the status quo.

Alastair Hayton replies:

- Lack of suitable information to select cows (no milk recording data, poor clinical mastitis records).

- Likelihood of poor compliance to drying off procedures (though I don't think ultimately that this should be seen as an excuse).
- Poor quality dry cow housing, e.g. overstocked, poorly ventilated straw yards, especially in the transition cow and calving yard areas.
- High prevalence of especially chronic sub-clinical infections in the herd (greater than 20–25% of the herd chronically infected), particularly where there is a high prevalence of *S. aureus*.
- A combination of the above!

Obviously correction is by addressing the individual issues, e.g. encouraging the farmer to milk record, staff training etc.

Andy Biggs replies:

I am not sure any herds could not use selective dry cow therapy from an intramammary infection perspective however there are many herds in the UK that do not perform regular individual cow SCCs and currently we don't have a reliable way of determining which cows do or don't justify antibiotic dry cow therapy. Many of these herds have very good bulk milk SCC and clinical mastitis rates in fact that is probably part of their decision-making process

not to perform regular individual cow SCC recording. The California Milk Test (CMT) has an inappropriate threshold of around 350 to 400 000 cells/ml and culture while useful to indicate pathogen profiles, like PCR, is not really appropriate to use in all cows at drying off.

Equally I think the challenge of expecting herds not used to SCC recording to sample all cows for the 3 months prior to drying off is fraught with difficulties. Making sure the samples are taken from the correct cows and recorded in such a way that the data are available for decision making along with clinical data at the time of drying off would seem unlikely to happen.

In some low bulk SCC unrecorded herds heifers and some second calvers receive teat seal only however this is not really decision making at a cow level more on generic risk of the presence of an intramammary infection. So there is a challenge to come up with robust solutions to deliver selective dry cow therapy for herds that do not currently regularly individual cow cell count record

Theo Lam replies:

In The Netherlands that is not a relevant question, since selective dry cow therapy is

obligatory in all herds. As Dr Edmondson writes in his paper, any herd can move to selective dry cow therapy. When contagious mastitis (i.e. *Strep. agalactiae*) is found in a herd, temporary measures such as treating all infected cows, may be necessary. If udder health is suboptimal, if BMSCC is high, if there are many individual high SCC cows, infectious pressure likely is high, and cows will get infected more easily than in herds with good udder health. But I would say that in that situation decreasing infectious pressure ought to be the first priority. **LS**

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