



## \*\*\*\*\* Mastitis Review Spring 2010

This mastitis review uses the DairyCo Mastitis Control Plan (DMCP) template, the results of which are summarised in this document. I can happily supply you with the complete plan (all 381 questions and answers) or you can download it from [http://drop.io/\\*\\*\\*\\*\\*](http://drop.io/*****) . The plan uses data analysis in combination with measurements and observations made during the visit to obtain a 'diagnosis'. The observations are then ranked by importance to your diagnosis providing a 'hit list' of areas which stand to reap the largest rewards.

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## Data Review

### SCC data

The annual rolling lactation new infection rate is close to target but remains acceptable. The annual rolling dry period new infection rate is twice target, on the other hand the dry period cure rate is good at 74% suggesting that this is likely to be a new infection problem rather than a failure to cure.

Table 1 - Summary of SCC data

	22 Mar '10	22 Mar '09	Rolling 3 Rec	Rolling Annual
Lactation New Infection Rate	6.3	9.1	7.7	7.6
Dry Period New Infection Rate	11.1	27.3	16.7	15.3
Dry Period Cure Rate	75.0	80.0	73.2	74.0
Fresh Calver Infection Rate	15.4	23.1	20.4	18.4
% Herd Chronically Infected	11.3	11.5	11.8	12.6
% Herd > 200,000 cells/ml	18.5	18.2	19.3	20.1

The lactation new infection rate (Figure 1) shows the rate of new infection as determined by SCC for cows >31DIM and shows that the rate is consistently above the MAR (but not dramatically).

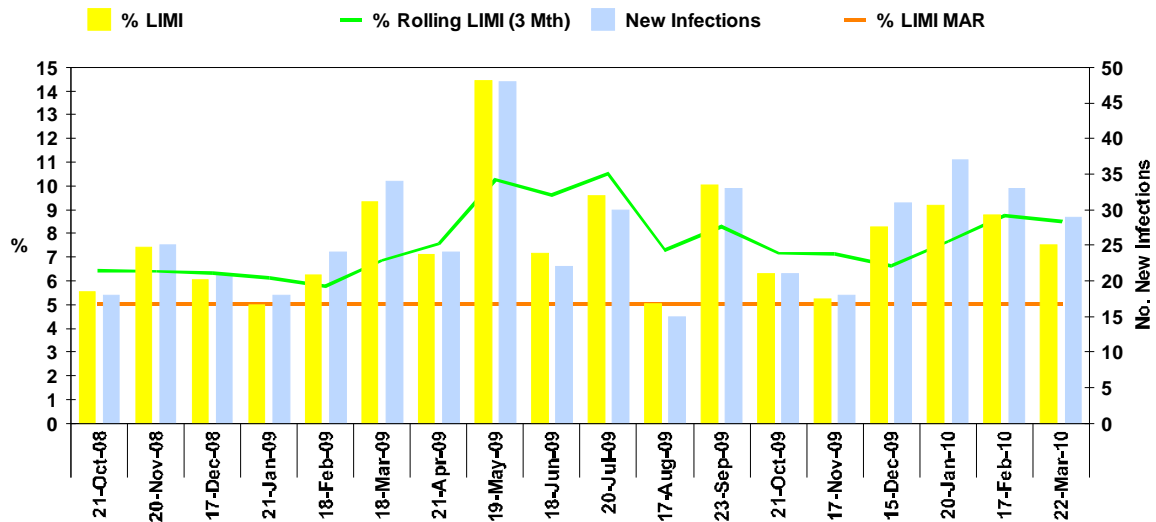


Figure 1 - Lactation new infection rate

The fresh calver new infection rate (Figure 2) measures infections present at calving (as determined by SCC) therefore includes both infections which have failed to cure over the dry period and newly acquired infections and is consistently twice the MAR. Again the 3mth rolling rate is consistently above the MAR and at times is more than twice as high.

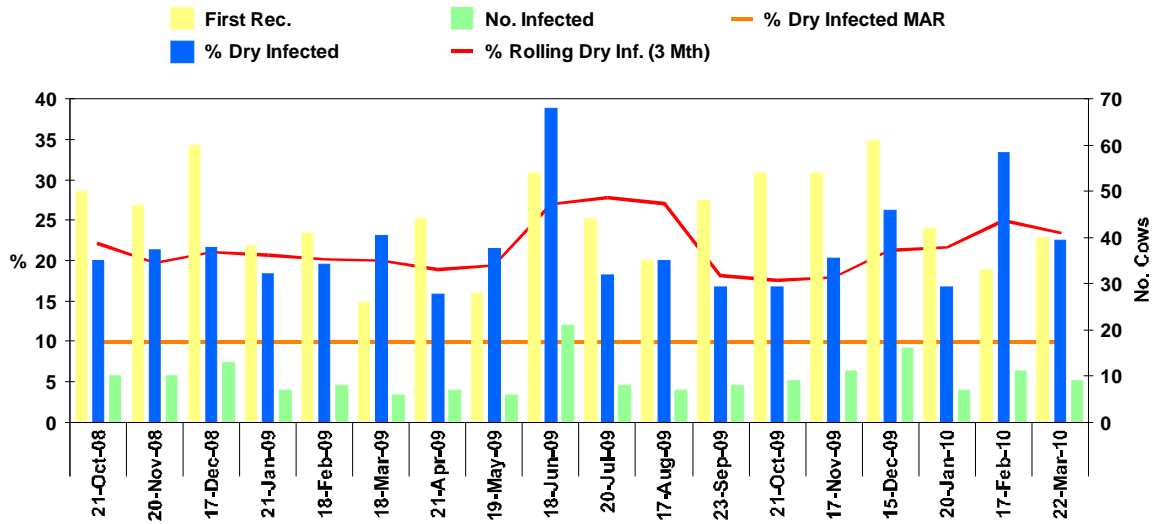


Figure 2 - Fresh calver new infection rate

The dry period new infection rate considers cows which dry off uninfected and calve in infected (as determined by SCC, Figure 3) and demonstrates a rise in the rate of dry period new infections. In some months (Dec, Jun) 25% of calving cows were infected!

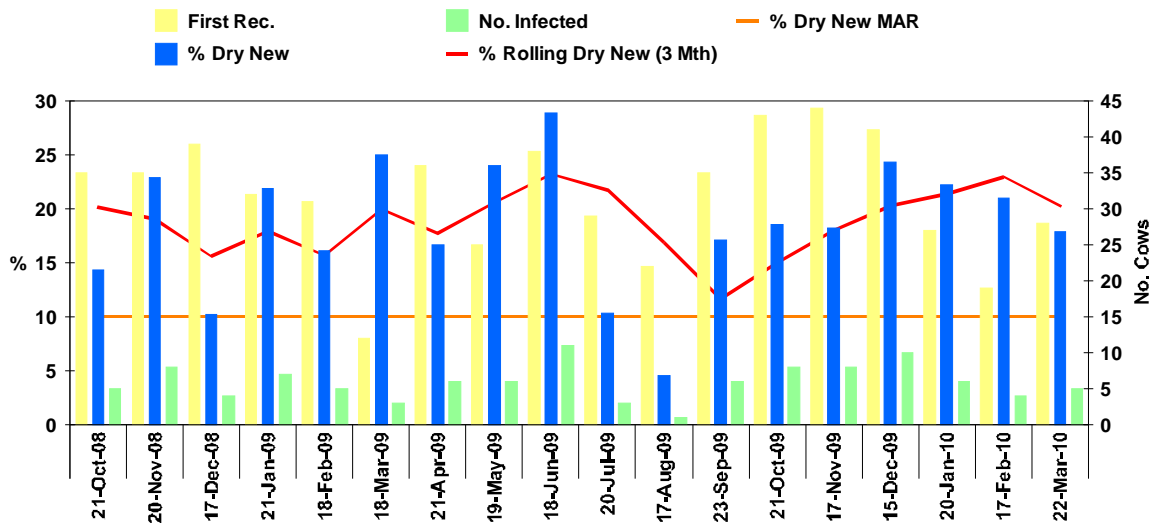


Figure 3 - Dry period new infection rate

**Summary of SCC data**

SCC data suggests that mastitis originating from the dry period is more significant than that originating from the lactation, and that the infections from the dry period are likely to be the result of new infections being acquired rather than infections which fail to clear.

## Clinical mastitis data

Figure 4 illustrates the number of cases each month and their origin (mastitis within the first 30 days of lactation is defined as dry period origin); there is a suggestion of seasonality to the cases with peaks occurring during housing and dropping off through the summer.

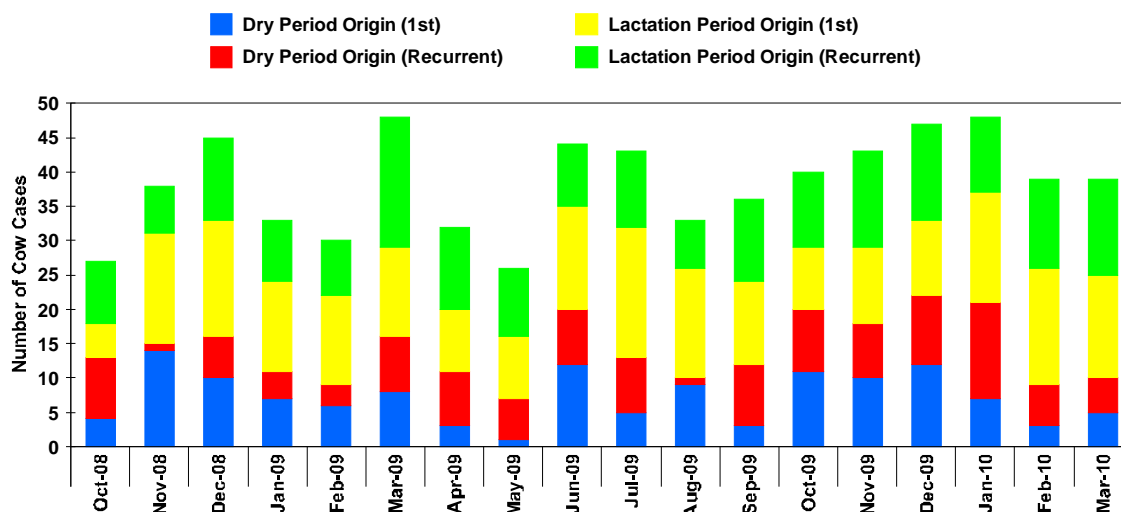


Figure 4 - Monthly cow cases and origins

Figure 5 summarises the origins for the preceding 12mths compared to the MAR (maximum acceptable rate, 40cases/100cows/yr), the blue section, which denominates infections which originate from the dry period are around the MAR as are those originating from lactation, whereas the repeats of both are above target.

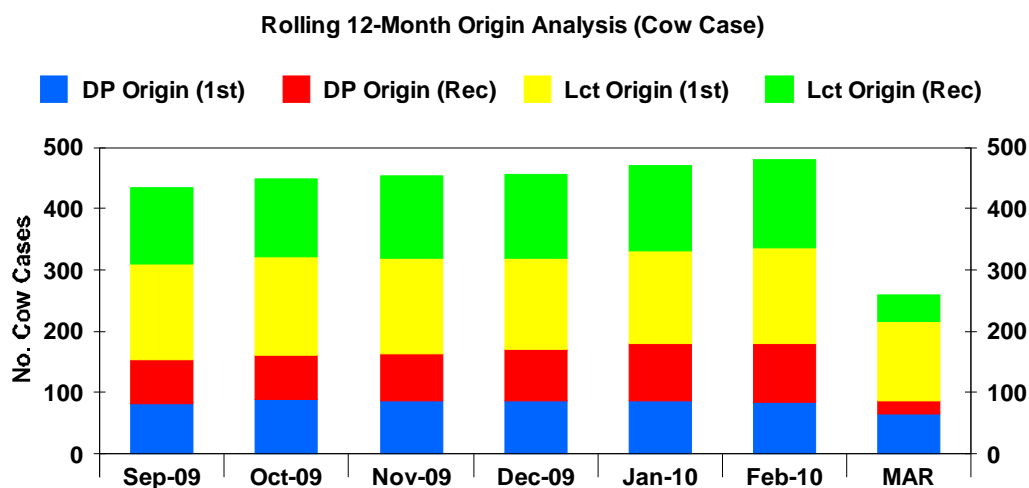


Figure 5 - Rolling 12mth origins

If the lactation and dry period origins for index cases only are examined in further detail (Figure 6 and Figure 7) we can see the suggestion of a seasonality to the lactation origin cases (winter and summer, Figure 6) whereas the dry period origins are much more variable without a seasonal overlay (Figure 7) – although in January 2010 when mastitis peaked, these were cases originating from both lactation and dry period. These graphs demonstrate that the index cases are not the problem, rather the repeats.

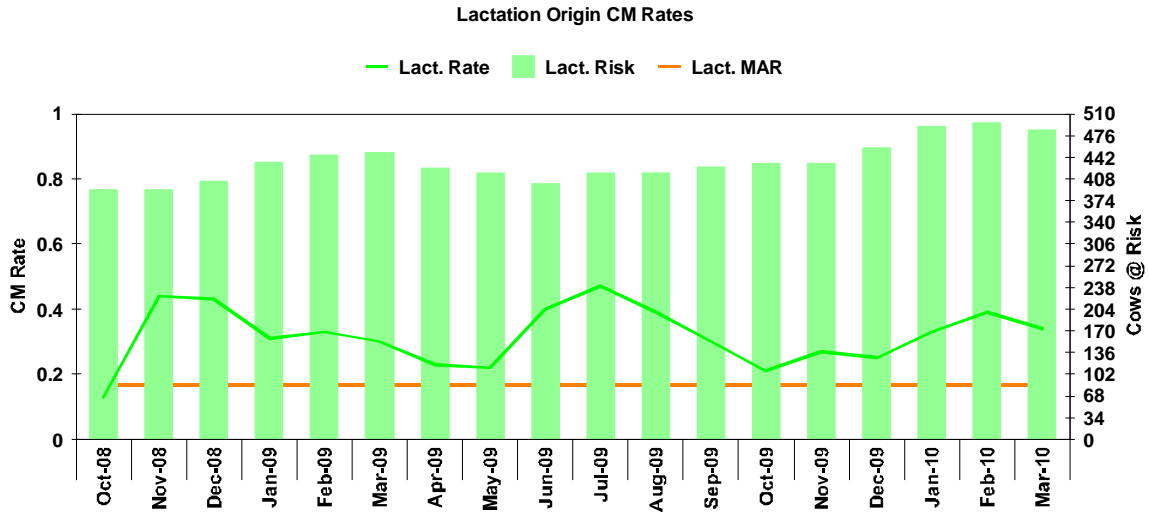


Figure 6 - Lactation origin

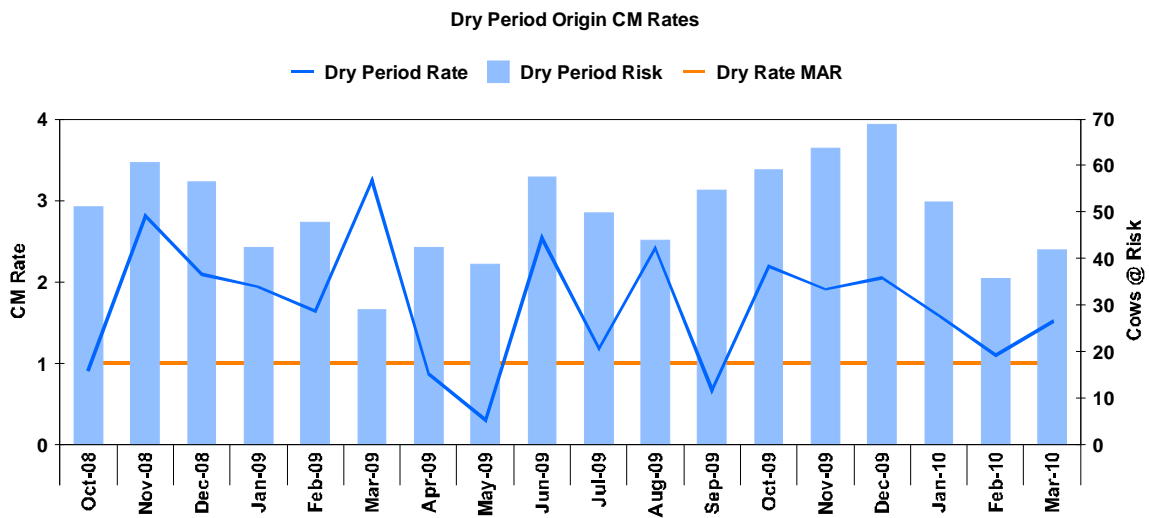


Figure 7 - Dry period origin

The incidence of clinical mastitis by occurrence begins to shed some light, Figure 8 shows that most cases are associated with a single bout (as would be expected in an environmental problem); however there are a number of cows (40 currently) who have suffered repeated cases (circled in Figure 8).

Total of 385 Animals with 853 Incidences (1009 Occurrences) out of 1705 Animals - 23%

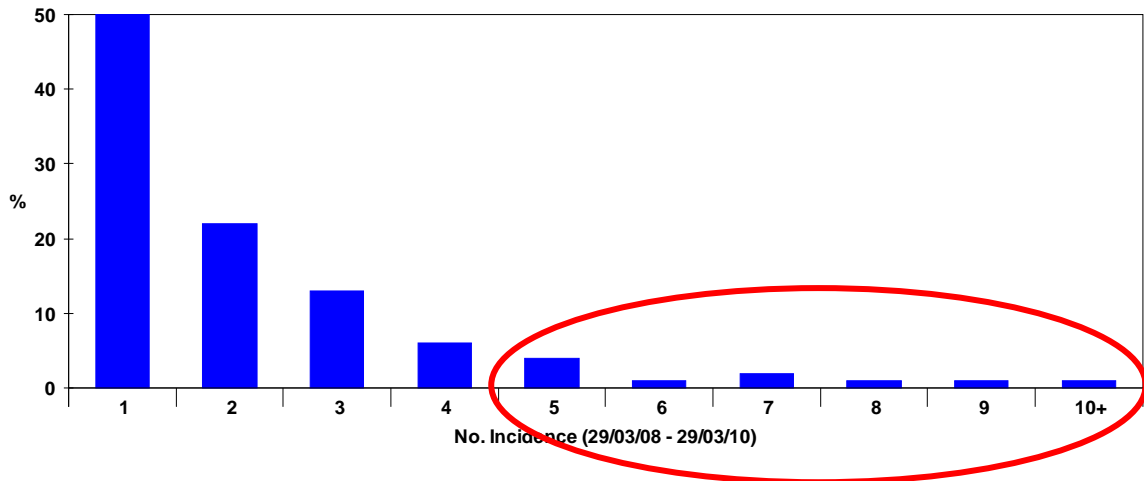


Figure 8 - Incidence by occurrence

If we examine the incidence of mastitis (Figure 9) we can see that there has been a steady rise, which dropped off over last summer, but has risen again this winter (which would agree with the feeling on the 'shop floor') and the mastitis incidence is consistently above the MAR (set at a stringent 25cases/100cows/yr).

However if we repeat the same graph with the cows circled in Figure 8 removed we see that mastitis is actually more reasonable - Figure 10 with the current winter being around the national average (47-65cases/100cows/yr as illustrated by the green box).

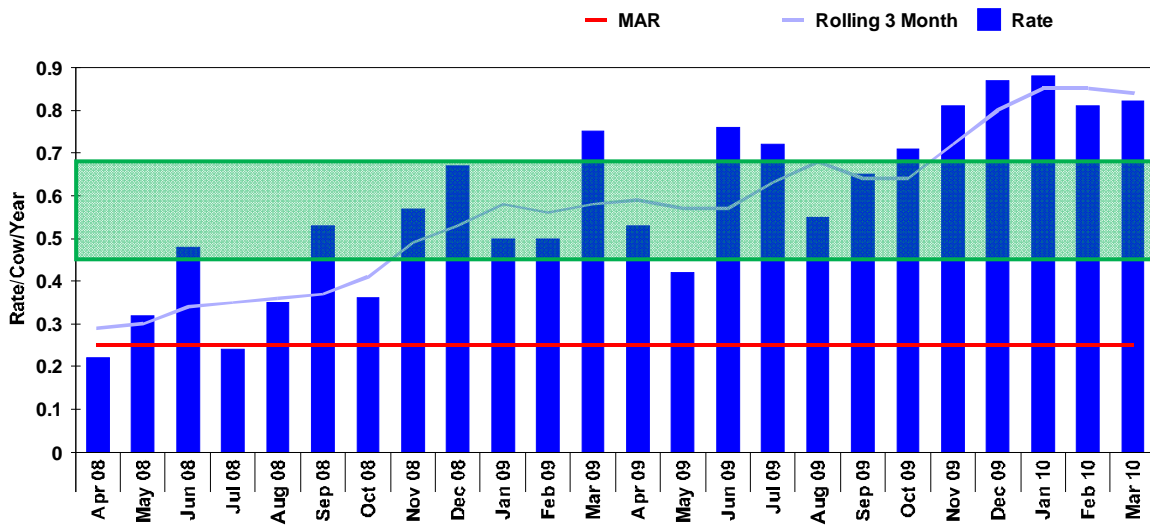


Figure 9 - Mastitis incidence

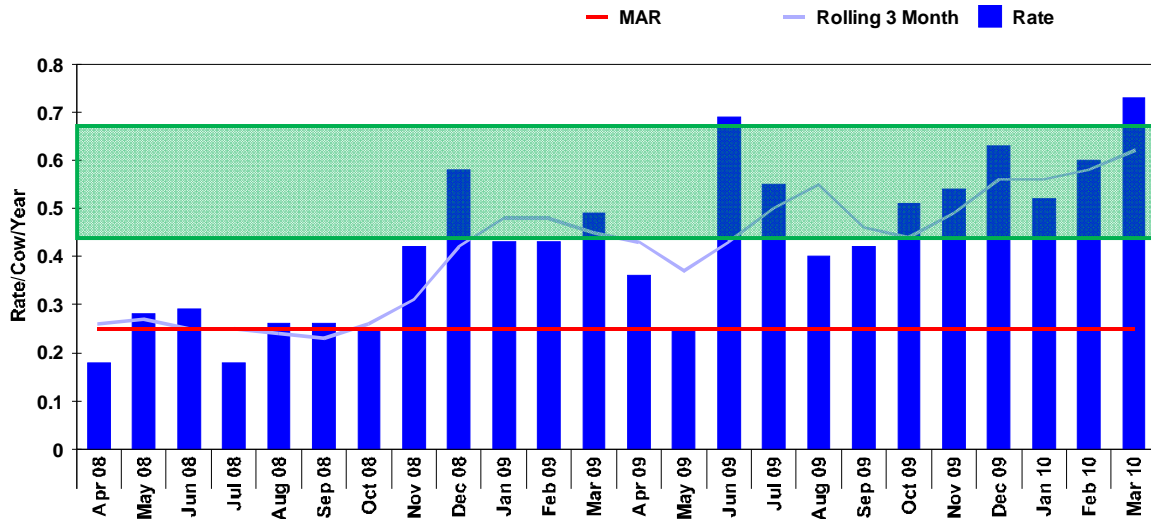


Figure 10 - Mastitis incidence with cows which have suffered 4+ cases of mastitis removed

**Summary of clinical mastitis data**

- Mastitis originating from both the lactation and dry period appears to be significant.
- Mastitis incidence is dominated by a core of cows which have suffered a large number of cases of mastitis and as a result skew the data. Once these cows are removed from the analysis mastitis incidence appears to be much better, and certainly for this winter has been around national average 46-65cases/100cows/yr.

**Heifer performance**

Due to the youth of the herd it is also worth considering the heifer mastitis performance. Figure 11 illustrates the mastitis in the first 30d of the heifers’ first lactation and is consistently above the MAR, suggesting that a large proportion (often greater than double) of heifers calve in with infections.

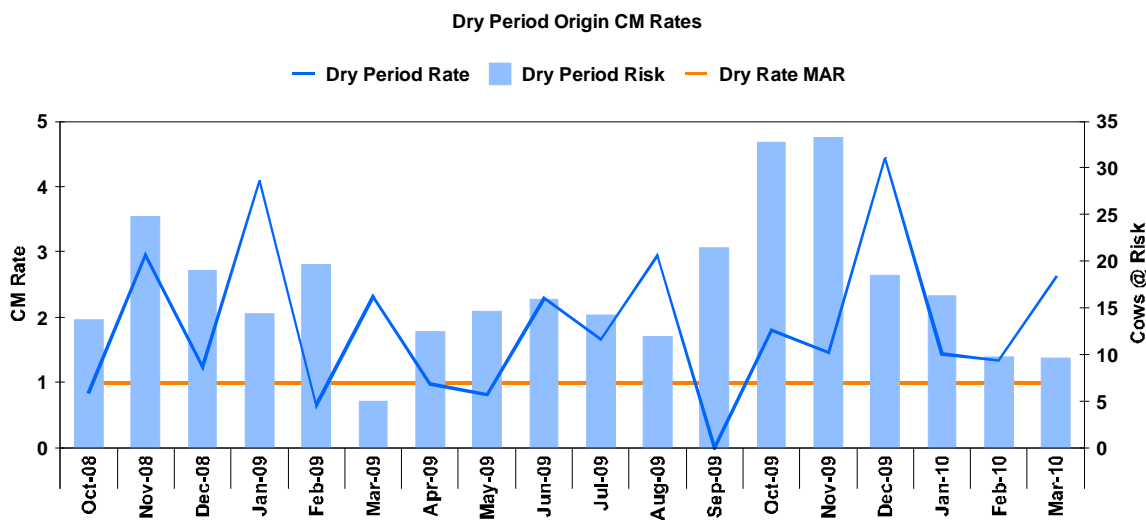


Figure 11 - Rate for mastitis originating pre-calving in heifers

Overall clinical mastitis rates for heifers are given in Figure 12, these are closer to the MAR suggesting that the lactation contribution is less significant than the infections heifers calve in with, however remains consistently above the MAR. These rates are perhaps better illustrated by Figure 13 where the 3mth rolling average can be clearly seen as rising.

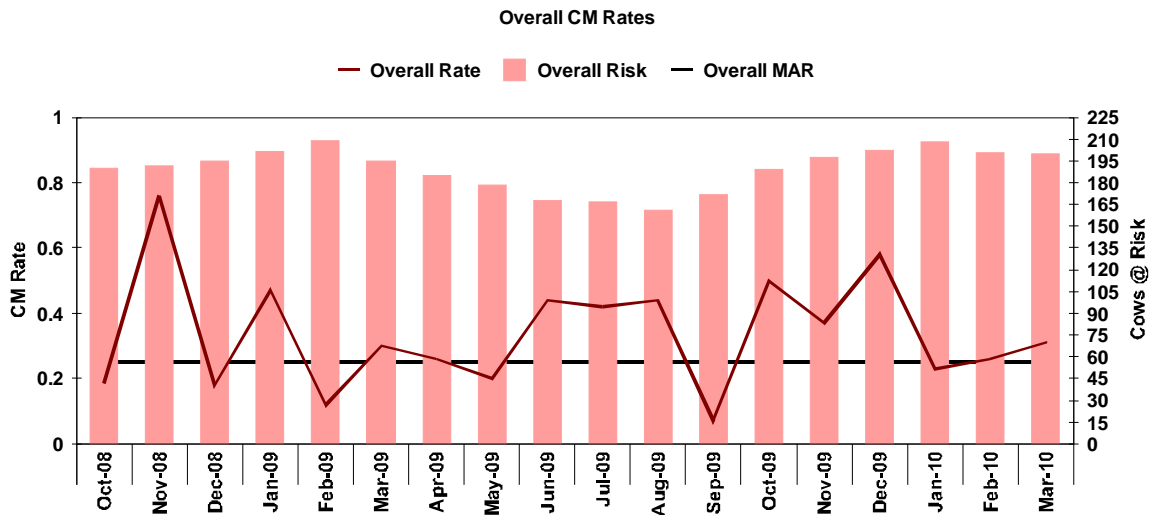


Figure 12 - Overall mastitis rate for heifers

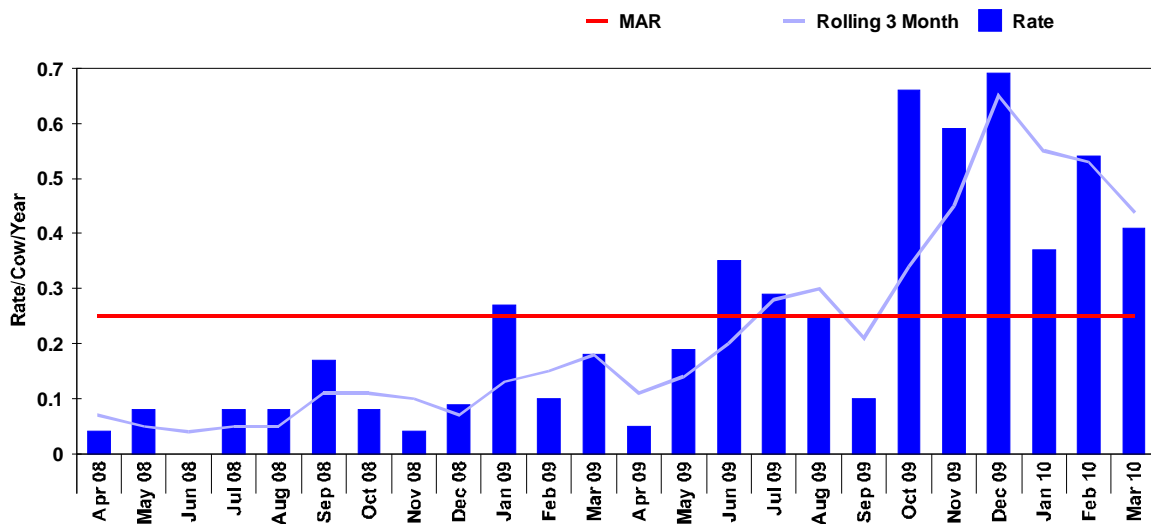


Figure 13 - Mastitis incidence for heifers

### Summary of heifer performance

We would hope that heifer performance (from a mastitis perspective) might be better than that of adult cows (less previous infection and consequently pathology which predisposes to recurrent infections), however the heifers appear to be performing as per the cows.

Ultimately this raises the question of whether the problems lies with the heifers themselves (blind quarters, warts etc) or with the management in the immediate pre-calving period (i.e. when they join the transition cows). It is likely that the problem will be a combination of both of these factors.

### Treatment protocol review

During the first review of mastitis we examined the clinical cure rates for the previous mastitis treatment protocols (three tubes of Ubro Yellow initially followed by three tubes + Tylan for recurrences) and decided to change the protocol to include an extended therapy (six tubes of Cobactan initially followed by six tubes of Ubro Yellow). The previous clinical case cure rates together with the most contemporary set are shown in Table 2.

The principle surrounding changing the protocol was to reduce the number of recurrences, i.e. increasing the 1<sup>st</sup> case cure rates. When the previous figures are compared to the current we can see that we successfully achieved the improvement (1<sup>st</sup> case clinical cure rates increased by ~25%).

Table 2 - Clinical cure rates

	May 2009	June 2009	July 2009	August 2009	Oct-09	Nov-09	Dec-09	Jan-10
All Mastitis Cure Rate (%)	38	37	36	33	37	36	34	33
Clinical 1st Case Cure Rate (%)	44	42	41	37	52	52	50	51
Dry Period Cure Rate (%)	74	70	72	71	70	69	71	72

However the really interesting question is whether the increased 1<sup>st</sup> case clinical cure rates are cost beneficial...

A very simple model for calculating this is given below:

- Total number of 1<sup>st</sup> clinical cases = 240cases/550cows/yr (taken from Figure 5):
  - An average 1<sup>st</sup> case clinical cure rate of 41% means that 98cases are cured during the first round of treatment.
  - An average 1<sup>st</sup> case clinical cure rate of 51% means that 122cases are cured during the first round of treatment.
- Savings (milk lost alone):
  - 24cases (=122-98) are saved from going onto receive second round of treatment.
    - Saved cost of second round (milk lost alone at 30l/day and 25ppl) of treatment (using Ubro Yellow)
      - $= (30 \times 0.25) \times 5.5 = \text{£}41.25/\text{case} = \text{£}990$  saved in total.
- Extra cost of treatment (lost milk alone):
  - Conventional treatment period = 1.5d, extended treatment = 3d, therefore 1.5d extra milk lost.
  - Conventional treatment
    - $= 240 \times ((30 \times 0.25) \times 1.5) = \text{£}2700$
  - Extended treatment
    - $= 240 \times ((30 \times 0.25) \times 3) = \text{£}5400$
  - Therefore extra cost of treatment =  $\text{£}5400 - 2700 = \text{£}2700$

So, when the simple economics are considered the extended treatment protocol has saved £990 in reduced second treatments, but cost an extra £2700 in milk which has to be thrown away. However as I mentioned at the start this is an extremely simplistic model and does not account for the following factors:

- Reducing the number of repeat cases reduces the infection risk that a proportion of these cases will pose (this risk is unquantifiable).
- Reducing the number of second cases reduces the chance of udders becoming further damaged (the more cases of mastitis in a quarter the more pathology and the higher the chance of becoming chronically infected).

## Findings from the DMCP

Based on the data analysis above the 'diagnosis' made was two-fold:

1. Mostly environmental pathogens with most new infections during lactation
2. Mostly environmental pathogens with most new infections arising from the dry period

In reality it may have been easier to single out one diagnosis (the most likely candidate would be dry period), but I thought it might be more interesting to use both (as well as actually being the truth). This does however mean that the plan has produced a large number of recommendations which are summarised below:

Level of requirement	Area of concern	Recommendation
MUST	Lactating cows	There MUST be a minimum of at least 2sq.m. of loafing space per cow.
MUST	Lactating cows	Cows with clinical mastitis and high SCC MUST be milked last to stop the spread of infection to other cows.
MUST	Lactating cows	20 to 30 seconds MUST elapse after application of pre-milking teat disinfection, before teats are dried.
MUST	Lactating cows	Liners MUST be changed at least every 2500 milkings or 6 monthly (whichever occurs first) - unless the manufacturer specifies otherwise.
MUST	Lactating cows	There MUST be access to ad lib water in the post milking yard.
MUST	Lactating cows	The cows MUST have an area of >2sq.m. of loafing space per cow in the post milking yard.
MUST	Dry cows	Cubicle partitions MUST not have a bottom rail below 0.4m.
MUST	Dry cows	There MUST be at least 2sq.m. of loafing space per cow.
MUST	Dry cows	Sometimes cows have to share calving pens or there are insufficient pens to allow them to be cleaned out between calvings.
MUST	Dry cows	Pens MUST be cleaned out between each cow calving.
MUST	Dry cows	There MUST be sufficient drainage to never allow pooling of liquid and to keep bedding dry on the surface.
MUST	Dry cows	There MUST be a minimum of 2sq.m. of loafing area per calving cow.
MUST	Dry cows	Calves MUST only be allowed to suckle their own mother to prevent the possible transfer of pathogens in milk between cows.
MUST	Treatment	The success of mastitis treatments MUST be monitored (in consultation with the attending veterinary surgeon) by monitoring cow SCC in the months after treatment.
MUST	Heifer replacement	You MUST ensure good fly control for all dry cows and heifers through the summer period when flies are expected or apparent.
MUST	Heifer replacement	You MUST avoid areas known to be associated with summer mastitis.
SHOULD	General	Herds SHOULD have one full time stockperson equivalent per ≤ 600,000 litres of milk production.
SHOULD	General	There are more than three milkers in total.
SHOULD	General	There SHOULD be a maximum of one relief milker.
SHOULD	Lactating cows	You SHOULD group cows with a high SCC and cows with clinical cases of mastitis separately to the main herd and milk them last at each milking.
SHOULD	Lactating cows	There SHOULD be water trough space of >10cm per cow for all cows at all stages of the production cycle, including availability in the yards before and after milking.
SHOULD	Lactating cows	Cows SHOULD always have access to water (not be denied access for more than 1 hour in a 24 hour period).
SHOULD	Lactating cows	Significant pooling of liquid in housing, feeding and/or loafing areas occurs.
SHOULD	Lactating cows	Cows SHOULD be housed away from the sight and sound of the milking plant.
SHOULD	Lactating cows	There SHOULD be a minimum cubicle size of greater than 2.43m long by 1.22m wide (8' by 4') for Holstein-Friesian cows.

Level of requirement	Area of concern	Recommendation
SHOULD	Lactating cows	Cubicle partitions SHOULD not have a bottom rail below 0.4m.
SHOULD	Lactating cows	Inorganic bedding materials SHOULD be used wherever possible.
SHOULD	Lactating cows	There SHOULD be at least 3sq.m. loafing space per cow.
SHOULD	Lactating cows	You SHOULD avoid returning cows to any one grazing, loafing or rest area for at least 4 weeks after it has been used by cattle.
SHOULD	Lactating cows	Cows sometimes have to wait more than one hour to be milked.
SHOULD	Lactating cows	All high SCC cows (as a guide >200,000 cells/ml for two of the last three months) SHOULD be clearly marked (using tail tape, leg bands, sprays etc), so that care can be taken to avoid their milk contaminating hands or other cows through splashes or aerosols.
SHOULD	Lactating cows	As a second best to the above, cows with clinical mastitis and high somatic cell counts SHOULD at least be milked with a separate cluster (this cluster should not be used to milk fresh calved cows or cows with milk out of the tank for reasons other than mastitis).
SHOULD	Lactating cows	After whole udder washes all wet areas MUST be dried with clean paper/laundered towel, with one clean/fresh part used per teat.
SHOULD	Lactating cows	Warm pre-milking teat disinfection solutions SHOULD be used to aid milk letdown.
SHOULD	Lactating cows	There MUST be complete coverage of all teats of all cows at every milking.
SHOULD	Lactating cows	The quantity of PMTD product used SHOULD be monitored on a weekly basis.
SHOULD	Lactating cows	The teat dip cup SHOULD have a non-return valve.
SHOULD	Lactating cows	All teats SHOULD be checked for PMTD coverage before cows exit.
SHOULD	Lactating cows	There SHOULD be less than 5% of cows with moderate/severe teat end damage (hyperkeratosis).
SHOULD	Lactating cows	There SHOULD be less than 2% of cows with other teat lesions.
SHOULD	Lactating cows	Fresh food SHOULD be provided after each milking to encourage the cows to stand for >30 minutes after milking and to prevent access to the lying area.
SHOULD	Lactating cows	The cows SHOULD have an area of > 3sq.m. loafing space per cow in the post milking yard.
SHOULD	Dry cows	Cubicles SHOULD be a minimum of 2.43m long by 1.22m wide (8' by 4') for Holstein-Friesians.
SHOULD	Dry cows	Cubicles SHOULD have flexible partitions (for example rope).
SHOULD	Dry cows	Inorganic bedding materials SHOULD be used wherever possible.
SHOULD	Dry cows	There SHOULD be a bedded lying area of 1.25sq.m. per 1000 litres of milk per cow (herd annual milk yield)
SHOULD	Dry cows	If limited space is available, priority SHOULD be given to the space allowances for transition cows and bedding frequency should be increased.
SHOULD	Dry cows	There SHOULD be at least 3sq.m. of loafing space per cow.
SHOULD	Dry cows	Cows are sometimes or always dried off during the milking process.
SHOULD	Dry cows	Cows SHOULD calve in individual pens rather than yards.
SHOULD	Dry cows	There SHOULD be 15sq.m. per cow, whether cows calve in pens or yards.
SHOULD	Dry cows	The calf SHOULD be removed from the cow within 24 hrs of birth after ensuring colostrum has been fed.
SHOULD	Dry cows	A CMT (California Mastitis Test) test SHOULD be carried out on all quarters of each cow within 7 days of calving.
SHOULD	Dry cows	Cows SHOULD be milked for the first time within 24 hours of calving.
SHOULD	Treatment	The parlour SHOULD have in-line filters.
SHOULD	Heifer replacement	Milk from cows under treatment for clinical mastitis is sometimes fed to calves.
SHOULD	Heifer replacement	Milk from cows with high SCC is sometimes fed to calves.
SHOULD	Heifer replacement	Mixing maiden heifers and dry cows SHOULD be avoided since this has been associated with an increased risk of mastitis after calving.

Level of requirement	Area of concern	Recommendation
COULD	Lactating cows	Cubicles COULD have flexible partitions (for example rope).

## Summary of DMCP

Due to the nature of the DMCP and my decision to select both lactating and dry period as diagnoses we have ended up with a rather long list!

However realistically there are aspects of the system we cannot change and having a full knowledge of perceived issues allows us to be better informed.

The points I would be keen to highlight are below:

1. Liner changes.  
Something appears to have gone astray here! We're well over the recommended liner change intervals despite being on a contract – is there a difference with the ADF liners which allows them to be used for longer?
2. Removal of calves.  
Currently calves are removed from their dams within 24hrs of calving (I believe), however these calves will present a significant as they potentially cross-suckle cows. Since we are stomach tubing them with colostrum is there any problem with removing them at that point?
3. Fly control  
Need I say more...
4. Running a separate mastitis/treatment/high SCC group?  
Is there any merit in creating a separate group by partitioning off some cubicles for cows under treatment or have high SCC, this way we could provide more space to our cows awaiting a clear Delvo-test and also for the lame etc.
5. Teat end damage.  
This was something I initially was very interested by – but having been away and reviewed the literature a bit more the significance of teat end lesions is questionable!  
The results of the teat scoring as part of the DMCP are summarised in Figure 14. The key to the lesions is extremely simple; N=Normal; S=Smooth ring (normal); R=Rough ring (beginning to be unacceptable); VR=Very rough (unacceptable).  
Studies vary according to the significance of teat lesions, although generally they all concur that significant teat lesions (VR) are associated with a higher incidence of mastitis and in the most recent study teats with significant lesions were 2.28 times more likely to suffer mastitis in the next 30d (Breen, Green et al. 2009), this study also demonstrated a prevalence of VR teats of 1%.  
Therefore in the \*\*\*\*\* herd teat ends are poorer than can be expected in the national herd and the very poor teat ends (VR) are likely to be associated with a higher incidence of clinical mastitis (interestingly this was commented on by Tim McKendrick in his report in April 2009 “Some hyperkeratosis noted” (p.5)).

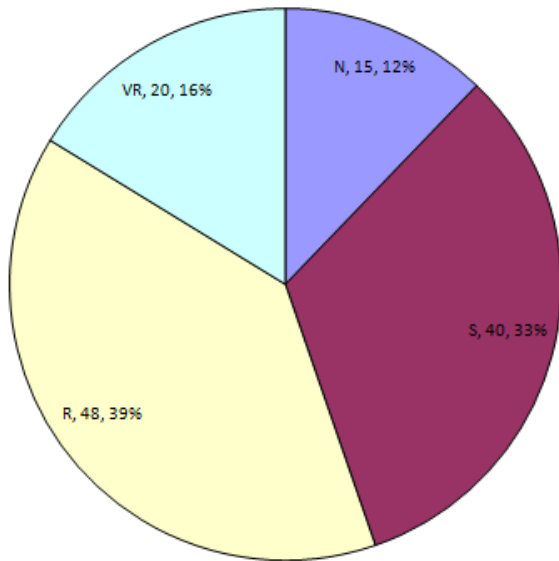


Figure 14 - Teat lesions distribution Feb 10

6. Waiting times.  
Some of the groups had to wait for 1hr45min in the collecting yard before milking, this isn't great from a number of aspects (without food, mastitis risk as teat ends open, without water, standing time with regard to feet etc).
7. CMT cows within 7d of calving.  
The principle is to detect subclinically infected cows before they have a chance to spread the infection or become chronically infected.
8. Feeding waste milk to calves.  
This is something we discussed with regard to Johne's risk, but never seemed to reach an action point on. The risk for Johne's is huge, but also potentially from passing mastitis to heifers.

## Summary

Both the SCC and the clinical mastitis data suggest that the dry period is a significant problem, this however is not a new finding and we have repeatedly discussed this. The dry period is likely to reflect new infections being acquired rather than infections which fail to cure (i.e. our cows do well provided we do not infect them again). Mastitis rate can be brought into line with the national average by better management of cows which suffer multiple cases of mastitis; in fact if we were to be better at managing cows which have had *three* cases of mastitis in the same quarter in the same lactation we could reduce the overall mastitis rate to the bottom end of the national average (~50cases/100cows/year).

Heifers have at times been a significant source of mastitis in the herd and certainly if we are calving in infected heifers we are likely to be making the job harder for ourselves in the long run!

It appears that despite improving the 1<sup>st</sup> case clinical cure rates the improvement is unlikely to be economically beneficial (on a purely lost milk perspective), this point requires discussion between the team but I perceive that changing to a more conventional 1<sup>st</sup> case treatment protocol (three tubes of Cobactan initially followed by extended second line) to be worth considering.

## Potential actions for consideration

1. Drying off procedure has to be constantly gold-standard; it should always be done as a separate job, in a clean parlour, wearing clean gloves, Orbeseal should always be used and the top of the teat pinched etc.
2. Further improvements need to be made to the transition cow management; ideally reduced stocking density, more straw adding, more frequent cleaning out, *consider moving to a sand yard*.
3. Ensure cows are CMT'd as soon as possible after calving.  
Earlier detection of mastitis means earlier treatment and hopefully improved cure rates.
4. Particular attention should be paid to heifers as they calve in with a CMT as soon as possible after calving and treatment as appropriate.
5. Remove calves from the transition yard as soon as possible after calving preferably <12hrs.
6. Improve the mastitis detection – more careful consideration to the foremilk
7. Be more aggressive with cows which have suffered multiple cases of mastitis. Consider culling (a cornerstone of the five-point mastitis plan from the 60's) or proactively drying off quarters (i.e. identify the forth case of mastitis in the same cow and quarter and dry it off), dry off the affected cows early.
8. Consider reverting the treatment protocol to three tubes of Cobactan for first cases and six tubes of Ubro Yellow/Multijet in combination with Tylan for repeat cases.

## References

Breen, J. E., M. J. Green, et al. (2009). "Quarter and cow risk factors associated with the occurrence of clinical mastitis in dairy cows in the United Kingdom." *J. Dairy Sci.* **92**(6): 2551-2561.