Dairy Cattle Practice: Literature Review

The journal article titled “Effect of Preoperative Erythromycin or Dexamethasone/Vitamin C on Postoperative Abomasal Emptying Rate in Dairy Cows Undergoing Surgical Correction of Abomasal Volvulus” and written by Dr Thomas Wittek, Katja Tischles, Imke Korner, Dr Tatjana Sattler, Dr Peter Constable, and Dr Manfred Furll may be relevant to practicing veterinarians in dairy practice. The paper concluded that preoperative erythromycin (10mg/kg) is effective in ameliorating postoperative abomasal hypomotility in cows which have undergone abomasal volvulus surgery. This is highly relevant to today’s dairy veterinarian as “the most frequent postoperative complication encountered with abomasal volvulus as a gastrointestinal dysfunction resembling vagal indigestion which occurs in 14% to 21% of cases” (Sattler et. al. 2000).

During my clinical experience I have been witness to veterinarians performing surgical correction of abomasal volvulus. The paper by Wittek et. al. (2008) complements to technique witnessed which involved preoperative antibiotics in the form of oxytetracycline, and postoperative ‘4 in 1’. Like Wittek et. al. the veterinarian was aware of the prognostic importance of the cow resuming normal gastrointestinal motility and thus administered the ‘4 in 1’ to ensure the smooth muscle’s requirement for calcium was met, promoting motility. Contradictory to the paper by Wittek et. al. the veterinarian did not use an antibiotic with prokinetic properties. The veterinarian selected oxytetracycline because of its spectrum of activity and indicated use in peritonitis. The paper by Wittek et. al. suggests that erythromycin would have been a superior option as it has both prokinetic properties which promote gastrointestinal motility, and also has a broad spectrum of activity.

Prior to drawing conclusions from a paper however it is important to assess the article and its methodology and interpretation of results to ascertain its validity and relevance to the field. In the case of the 2008 paper titled “Effect of Preoperative Erythromycin or Dexamethasone/Vitamin C on Postoperative Abomasal Emptying Rate in Dairy Cows Undergoing Surgical Correction of Abomasal Volvulus” by Wittek et. al. areas were identified which reduced the papers relevance to Australian dairy practice. Namely, the papers methodology did not mimic that seen in practice and thus the results found by Wittek et. al. may not be repeatable in the field. Wittek et. el. (2008) used metamizol sodium as a non steroidal anti-inflammatory drug in their treatment regime, which has been banned in Australia because of its association with the subsequent formation of agranulocytosis. Additionally, the study by Whittek et. al. (2008) administered ten litres of 0.9% sodium chloride containing 700g of glucose to all cows in the study one hour before surgery and every 12 hours post surgery which is impractical in the Australian field. Finally, the study only included cows which had rectal temperatures below 39.5°C, and had no diarrhoea, mastitis, retained placenta, or evidence of peritonitis. While this selection criteria minimises variables in the experiment and thus enhances its creditability, it does not provide results which are repeatable in the field as a different criteria were applied to the experiment compared to the cross section of animals presented for surgical correction of abomasal volvulus in the field.

Whilst the paper “Effect of Preoperative Erythromycin or Dexamethasone/Vitamin C on Postoperative Abomasal Emptying Rate in Dairy Cows Undergoing Surgical Correction of Abomasal Volvulus” by Whittek et. al. (2008) may not be immediately relevant to today’s practicing dairy
veterinarian it still holds scientific relevance for further development. The paper described a controlled experiment as all cows were in a similar disease status, the same surgeon did every abomasal volvulus correction, and treatment protocols were masked to the personnel who did the post surgery physical examinations. Additionally the statistical analysis of the results was extensive with a P<0.05 considered significant. Therefore the paper by Wittek et. al. does suggest with supportive evidence that preoperative treatment with erythromycin does have a positive effect in promoting postsurgical gastrointestinal motility which is of high prognostic importance, however the same results should not be expected in the field due to the variables which are likely to be presented.

References
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AN ALTERNATIVE TO THE USE OF PENETHAMATE HYDRIODIDE FOR THE TREATMENT OF CLINICAL MASTITIS IN DAIRY CATTLE

Clinical mastitis incurs significant economic losses related to the costs of diagnosis, treatment (drug costs, milk discard), ongoing production losses from damaged quarters, penalties associated with high somatic cell counts, increased probability of cow death, and increased risk of antibiotic residues in milk. Therefore, to minimise the losses associated with clinical mastitis, the therapeutic aim is to achieve long-lasting clinical and bacteriological cure, whilst minimising the amount of milk withheld (due to antibiotic residues) and minimising drug costs.

In Southern Victoria, the majority of clinical mastitis cases are detected in the first month of lactation. Gram-positive pathogens, particularly *Streptococcus uberis*, are the most frequently isolated pathogens from these cases. One treatment protocol for the control of Gram-positive mastitis pathogens involves a course of intra-mammary cloxacillin (Orbenin LC; Pfizer Animal Health). If treatment is unsuccessful, and a Gram-positive organism is still suspected, a second course of intra-mammary Orbenin LC is administered in conjunction with parenteral penethamate hydriodide (Mamyzin; Boehringer Ingelheim). Cure rates with Mamyzin are higher than Orbenin alone, however the cost of Mamyzin may be prohibitively expensive to use as a first-choice treatment. Aside from increased cure rates, parenteral therapy has other clinical advantages when multiple quarters are infected, when swelling of the mammary quarter is present and diffusion of antibiotics delivered by the intramammary route may be compromised, or when animal behaviour increases the risk to operators trying to infuse antibiotics.

McDougall, Agnew, Cursons, Hou, & Compton (2007) performed a bioequivalency study to compare the efficacy of parenteral penethamate hydriodide (Mamyzin) and tylosin base (Tylan 200; Elanco Animal Health) as sole agents in the treatment of *Streptococcal* mastitis. Both drugs were administered at the same dose rate and frequency (i.e. 5 grams at 24 hour intervals for 3 days). Duplicate milk samples were collected before treatment and again 14 and 21 days later. The study found that the number of cows with clinical failure did not differ between treatments, and that there was no difference in bacteriological cure between treatments (79.8% for Mamyzin vs. 82.0% for Tylan 200). There was no difference between treatments in SCC or milk production.

The experimental design and results of the study by McDougall et al. (2007) appeared valid. The sample size (n=659) was sufficient to test the hypothesis and produce statistically significant results with 95% confidence and 80% power with a <10% difference in the proportion of cure between treatment groups. In the discussion section of the article, the potential biases were adequately addressed and they were thought to not have had a major effect on the outcome of the results.
The practical implication of the findings by McDougall et al. (2007) is that tylosin could pose a more cost effective solution to mastitis control in early lactation since the cost of Tylan 200 is approximately $38/course in comparison to $50/course of Mamyzin. Because milk withholding is 72 hours for both drugs, there is no difference in the cost associated with discarded milk. The saving of $12 in drug costs may enable tylosin to be used as a first-choice treatment for mastitis cases in early lactation.

One potential problem with using tylosin as an alternative to penethamate hydriodide is that drug interactions may occur when combining a parenteral macrolide with intramammary β-lactam preparations. First-principles of antibiotic pharmacology would warn against combining a bacteriostatic and bactericidal antibiotic, however a review of the literature found that in some cases there is synergy (Allen & Epp, 1978; Deshpande & Jones, 2003) or no negative interaction (Lin, Stanek, & Mufson, 2003) between macrolides and β-lactam antibiotics when controlling Gram-positive organisms.

REFERENCES:


Direct effects of induced parturition on subsequent reproductive performance of dairy cows

Introduction

Calving induction is a common practice on many seasonal calving herds to achieve a tighter calving pattern and fit herd feed requirements to pasture growth curves (Blackwood, 2007). This article will review the direct effects, which are assessed by comparing the differences in reproductive performance between similar induced and non-induced cows that calve at the same time (Morton & Bulter, 1995). The review will compare the results published with the reproductive performance of Riverside #2, which is a dairy herd in the same region the study was undertaken.

Induction protocol

The induction protocol at Riverside #2 was similar to the protocol used in the article. All cows to be induced were given an intramuscular injection of 25 to 35 mg of synthetic glucocorticoid, dexamethasone, in the trimethyl acetate formulation (first treatment). Cows which had not calved in 14 days but are ‘fully bagged up’ are given 500µg of the synthetic prostaglandin F\(_{2\alpha}\) (cloprostenool or like) (Blackwood, 2007) (Morton & Bulter, 1995). In the case that the cows were not lactating, did not have significant udder enlargement and had not calved within 14-21 of calving they received another injection of dexamethasone. In the study by Morton & Bulter (1995) an identical dose was given to the first, but the protocol at Warrnambool Veterinary Clinic employs a dose half of the original (12.5-17.5mg).

Results

<table>
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<th>Variable</th>
<th>Reported (Morton &amp; Bulter, 1995)</th>
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<tr>
<td></td>
<td>Untreated</td>
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<td>21 Week Empty Rate</td>
<td>7.2</td>
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<tr>
<td>Unknown Pregnancy Status @ 21 weeks after MSD*</td>
<td>7.9</td>
<td>11.5</td>
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<tr>
<td>Induced to calve in following calving period</td>
<td>12.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Calving to conception (days)</td>
<td>75</td>
<td>73</td>
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* Morton & Bulter (1995) classified pregnancy status as unknown for those cows that had not been observed in estrus since the previous mating where pregnancy diagnosis was not performed. At Riverside #2 all cows were pregnancy tested and therefore no cows had an unknown pregnancy status.
Discussion

The results achieved at Riverside #2 were comparable with the results reported by Morton & Bulter, (1995). The results of the study by Morton & Bulter, (1995) indicated that the percentage of cows not pregnant at the end of the period after induction, and of the cows whose calving was induced in the following calving period did not differ significantly between induced and untreated groups. The result at Riverside #2 is not consistent with the findings by Morton & Bulter, (1995) as around double the amount of cows that were induced in the previous calving period were induced in the subsequent calving period compared with non-induced cows. This however, does not mean that induction directly affects subsequent fertility as there may be other factors such as a late calving date in the induction cows which influenced the subsequent joining date of this group and therefore resulted in induction in the subsequent year.

The most relevant statistic to the effect on subsequent fertility is the mean calving to conception time. Although differing by around 20 days between Riverside #2 and the study by Morton & Bulter, (1995), there was no significant difference between groups of induced and non-induced cows in the study. Therefore it could be concluded that the results from Riverside #2 concur with Morton & Bulter, (1995) that induction does not directly affect subsequent fertility in dairy cows.

Validity of article’s methodology, results and conclusions

This study was conducted with a large study group. There were 49 herds enrolled in the controlled study. The controls were selected on the criteria that they had the same calving date, were the same age and were not induced for the previous calving. This is an appropriate method of selection of controls.

The induction protocol was also appropriate to compare the results of Riverside #2 and the trial as they were almost identical. However, management around the induction period is crucial in preventing related diseases (Blackwood, 2007) and this was not discussed in the study by Morton & Bulter, (1995).

The cows of unknown pregnancy status may have negatively impacted on the validity of results. If most of the cows of unknown status were not pregnant, the effect of induction on the percentage of cows that were not pregnant at the end of mating would have been underestimated. If this study were to be repeated, the herds should all be pregnancy tested at the end of the joining period.
References
