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Herd health management practices and parasite control on Irish beef farms

Key external stakeholders:

Beef extension workers and farmers; livestock industry; veterinarians and herd health professionals; research organizations.

Practical implications for stakeholders:

- Deficiencies in herd health practices identified on farms participating in the Teagasc/Farmers Journal BETTER farm programme included dystocia, calf pneumonia and calf diarrhoea.
- On these farms, twenty per cent of calves that were born experiencing minimal calving assistance and which suckled their dams unassisted had failure of passive transfer (FPT).
- On 12 of the BETTER farms, the overall animal-level (herd-level) prevalence of liver fluke and rumen fluke infection in these herds was 40.5% (100%) and 20.8% (75%), respectively.
- A study was conducted at two research farms to determine the efficacy of levamisole, fenbendazole and ivermectin in dairy calves. Resistance to ivermectin was detected with *Cooperia* identified as being the resistant nematode genus based on post-treatment cultures.
- The merits of targeted selective treatment (TST) for suckler beef calves over their first two grazing seasons was examined. Apart from a pre-housing anthelmintic treatment, no TST calves required anthelmintic treatment while at pasture. The heifers were followed over the second grazing season, with all animals requiring anthelmintic treatment in early September.
- A TST approach controlling for both gastrointestinal nematodes (GIN) and lung worms (*Dictyocaulus viviparous*) in dairy calves showed that *D. viviparous* is potentially the most important nematode to consider under the grazing conditions prevailing in Ireland

Main results:

The overall objective of this project was to identify how herd health in Irish suckler beef farms could be more effectively managed. Herd health management practices on Irish suckler beef farms participating in the Teagasc/Farmers Journal Business, Environment and Technology through Training, Extension and Research (BETTER) farm beef technology transfer programme was assessed with dystocia and issues of poor neonatal health the main concerns. High levels of exposure to Bovine Viral Diarrhoea (BVD) virus and to gastrointestinal and hepatic helminths were also found. The efficacy of anthelmintics currently available in Ireland using a faecal egg count reduction test (FECRT) was investigated and is the first report of anthelmintic resistance (AR) in cattle in Ireland. A targeted selective treatment (TST) approach to nematode control as an alternative approach to nematode control in first grazing season (FGS) and second grazing season (SGS) beef cattle highlighted that live weight gain is not suitable as a TST measure in FGS suckler beef cattle and that spring-born suckler beef calves are susceptible to nematode challenge in the SGS. A further finding was that future TST-based approaches to nematode control in dairy calves under Irish pasture-based conditions must consider the potential threat of challenge due to *D. viviparous*.

Opportunity / Benefit:

Deficiencies in herd health management practices and a high level of exposure to pathogens that may affect farm output were found on a sample of suckler beef farms. These are likely to result in reductions in farm profitability. Furthermore, the presence of persistently infected (PI) BVD animals has the potential to substantially increase herd health costs. AR in cattle was found and thus, good practice in relation to the use of anthelmintics is critical. A research farm study showed that spring-born suckler beef calves under Irish conditions experience minimal exposure to GIN challenge however, clinical disease may occur in the SGS. *D. viviparous* is potentially the most important nematode for dairy calves under temperate conditions

Collaborating Institutions:

UCD, AHI, DAFM

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1. Project background:

With low profitability a concern for beef farms, factors that affect efficiency of production such as genetics, nutrition, management, reproductive performance and herd health are of interest. Herd health problems affect farm profitability through reduced animal live weight performance, cost of treatment, cost of prevention and opportunity cost of labour. At the outset of this project, there was no published information on the herd health management practices on Irish suckler beef farms. Furthermore, there was no published information on the parasite control practices of Irish beef farmers, on the levels of exposure in suckler beef herds to gastrointestinal nematodes (GIN) over their first and second grazing seasons or on the efficacy of currently available anthelmintics. There is also concern over the long term sustainability of current parasite control programmes with reported cases of AR. In this respect, there is a need to identify new approaches to parasite control in grazed ruminants under these conditions. An example of an alternative approach is the use of a TST approach, whereby the individual animal is treated instead of the entire group.

2. Questions addressed by the project:

The objectives of this project were to;

1) Document herd health status and management practices on Irish suckler beef farms that were participating in the BETTER farm programme.
2) Determine on these farms; 1) the prevalence of BVD virus-positive cattle, 2) the colostrum management practices and their effects on the rate of adequate passive transfer in calves, and 3) the prevalence of GIN and hepatic helminth-infected cattle.
3) Determine the efficacy of currently available anthelmintics on the Irish market using a faecal egg count reduction test (FECRT).
4) Determine the effects of a TST-based approach to nematode control in suckler beef calves over their first two grazing seasons.
5) Determine the minimum number of anthelmintic treatments required to control challenges due to D. viviparus and O. ostertagi in FGS spring-born dairy-to-beef calves.

3. The experimental studies:

For objectives 1 and 2, sixteen Irish suckler beef farmer participants in phase 1 of the Teagasc/Farmers Journal BETTER beef technology transfer programme were used. A farmer questionnaire was used to collect information on herd health management practices employed on these farms, coupled with identifying any herd health problems. Farms were visited to complete questionnaires. A veterinary questionnaire was also completed describing: 1) extent of animal health management advice, and 2) the veterinarian's opinion on perceived herd health issues on the farm over the study period. Varying numbers of farmer participants agreed to additional herd screening for; the presence of BVD virus using RT-PCR technology performed on ear biopsies (n = 14 farmers), colostrum feeding practices and neonatal immunity (n = 13 farmers) and, liver fluke, rumen fluke and GIN in female breeding stock (n = 12 farmers).

For objective 3, animal based experimental studies were conducted at Teagasc, Johnstown Castle, Co. Wexford, and Teagasc, Grange, Dunsany, Co. Meath. At both sites Holstein-Friesian male calves were randomised using the recorded age, live weight and FEC assigned to treatment groups incorporating alternative anthelmintic control products. Calves were individually faecal sampled to determine their FEC prior to and following dosing. Individual calf FECs in both studies were determined using the McMaster method with a sensitivity of 50 EPG.

For objectives 4 and 5, animal based experimental studies were carried out at Teagasc, Grange, Dunsany, Co. Meath. Study animals were either suckler bred of late maturing breed types bred from a research herd at the study site (objective 4) or artificially reared dairy calves sourced from commercial dairy farms (objective 5). In both studies, calves were randomised by breed, age and weight and assigned to one of two treatments; control and TST. Calves in the control groups were treated subcutaneously with ivermectin on days 0, 42 and 84. Individual calves in the TST groups were treated at pasture with the same product at the

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same dosage rate if any one of the following criteria were met; 1) positive for *D. viviparus* larvae using the modified Baermann technique or 2) positive/negative for *D. viviparus* larvae using the modified Baermann technique with plasma pepsinogen (PP) ≥ 2 Utyr and FEC ≥ 200 EPG.

4. Main results:

Study 1

Dystocia, calf pneumonia and calf diarrhoea were identified as the primary herd health problems affecting the 16 BETTER farm herds. The high incidence of dystocia was attributed to the extensive use of continental beef breed sires such as Belgian Blue. The calving pen hygiene, the length of time calves resided in calving pens and colostrum management practices on some farms are all likely to have influenced the incidence of these conditions.

A finding of particular concern was the high frequency of anthelmintic treatment of calves. Twelve farmers reported that they treated their calves a minimum of three times in the FGS, with the four remaining farmers treating their calves twice. An additional finding was that the majority of farmers had similar parasite control practices for calves, irrespective of whether they were spring- or autumn-born. Considering that suckler beef calves born in the spring or summer, unlike their autumn- or winter-born counterparts, may experience minimal exposure to GIN highlights the deficiencies in the parasite control practices on these farms.

Study 2

The overall prevalence of BVD virus-positive cattle was 0.98% (range 0-3% per herd, range 0.6-3.0% per positive herd). On one farm with ten BVD virus-positive animals identified during screening, which were subsequently confirmed as PI, a comparison was made between the 12 month period when these animals were present on the farm until slaughter and the corresponding period twelve months later when no PI animals were present, in terms of expenditure on antibiotics. There was a 47% overall reduction in antibiotic expenditure on the farm when no PI animals were present compared to the same period 12 months earlier when ten PI animals were present.

Eighteen of the 82 calves (22%) sampled had ZST values less than 20 units (herd mean range 17.0 – 38.5 units) indicating a failure of passive transfer. Furthermore, approximately 20% of calves that were born experiencing minimal dystocia and suckling their dams unassisted had FPT. Therefore, it is advisable that all suckler beef calves are encouraged to suckle their dams shortly after birth irrespective of the nature of the delivery. The overall animal-level (herd-level) prevalence of liver fluke and rumen fluke infection in these herds was 40.5% (100%) and 20.8% (75%), respectively.

Study 3

For the Johnstown Castle study, treatment resulted in mean FEC reductions (95% confidence interval) of 49% (16-70%), 99% (94-100%) and 100% for ivermectin, fenbendazole and levamisole treated groups, respectively. For the Grange study, treatment resulted in a mean FEC reduction (95% confidence interval) of 37% (0-69%) for ivermectin-treated calves. The presence of *Cooperia* in post-treatment cultures on day 14 in ivermectin-treated calves in both studies indicates resistance to this genus. This was the first report of AR in cattle in Ireland. A larger multi-site study is needed to determine if the study findings are an isolated incident or if AR is common on Irish cattle farms.

Study 4

No TST calves were treated with anthelmintics as they did not reach pre-determined treatment thresholds. The average daily gain (± standard error of the mean (s.e.m.)) for control and TST group calves was 0.89 (± 0.02) kg day^{-1} and 0.94 (± 0.02) kg day^{-1}, respectively (P=0.17). In the SGS, all heifers, in both groups, were treated on day 431 due to clinical signs of respiratory disease. Up to that date, only two TST heifers exceeded the treatment thresholds in the SGS. The average daily gain for control and TST heifers from turnout on day 321 to anthelmintic treatment on day 431 was 0.90 (± 0.04) and 0.80 (± 0.04) kg day^{-1}, respectively (P=0.035). It was concluded that spring-born suckler beef calves require minimal anthelmintic treatment to maintain performance. In contrast, performance may be impaired in the SGS unless appropriate anthelmintic treatment is provided.

Study 5

There was an effect of TST treatment and time on FEC [treatment (P=0.023), time (P<0.001)] and on PP [treatment (P=0.002) and time (P<0.001)] with both measures higher in TST calves. There was a 50% reduction in anthelmintic use in TST calves compared to control calves. Clinical signs of *D. viviparus* infection, confirmed by the modified Baermann technique, were evident in TST calves on days 62 and 63 of the study. The average daily gain for control and TST calves was 0.50 (0.02) kg day^{-1} and 0.47 (0.03) kg day^{-1}, respectively (P=0.41). Thus, performance in dairy calves can potentially be maintained with fewer anthelmintic treatments but farmers need to be vigilant of the challenge posed by *D. viviparus*. Any future

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approach into the use of TST in FGS calves must take into consideration the relative importance of *D. viviparus* as a pathogen.

5. Opportunity/Benefit:

The findings from this project have highlighted a number of areas that warrant further investigation.

- There is a need for farm-specific herd health planning in order to improve the health and subsequent performance of suckler beef farms. Future research should examine the adoption, implementation and effect of such herd health plans on Irish suckler beef herd performance.
- It is recommended that a larger, multi-site study be conducted in order to determine the extent of AR on Irish cattle farms.
- Under Irish grazing conditions, this study suggests that spring-born suckler beef calves experience minimal exposure to GIN challenge. However, as these studies were conducted on one farm, they may not be representative of the wider farming population in Ireland. Therefore, it is recommended that a larger, wider study be conducted to determine the level of exposure to GIN on Irish suckler beef farms. The determination of PP concentrations in these calves at housing in winter would be a suitable monitoring tool. Farmers could also be interviewed so that their parasite control practices could be identified. This would also help identify whether overuse of anthelmintics is occurring on Irish beef farms.
- Any future studies on the use of a TST approach to nematode control in FGS dairy calves under these conditions must consider challenge due to *D. viviparus*. A study examining the use of live weight gain as a TST measure in calves vaccinated against *dictyocaulosis* should be considered.
- The use of composite FEC would allow farmers to monitor nematode burdens in groups of animals over the course of a grazing season such that groups could be targeted for anthelmintic treatment when the composite FEC value exceeds a particular threshold. At present, there is a lack of published information in the literature on the use of such an approach in cattle. This warrants further investigation.

6. Dissemination:

Peer reviewed journal publications

- O'Shaughnessy J, Mee JF, Doherty ML, Crosson P, Barrett D, O'Grady L, Earley B: Herd health status and management practices on 16 Irish suckler beef farms. Irish Veterinary Journal 2013, 66(1):21.
- O'Shaughnessy J, Earley B, Mee JF, Doherty ML, Crosson P, Barrett D, Prendiville R, Macrelli M, de Waal T: Detection of anthelmintic resistance on two Irish beef research farms. Veterinary Record 2014, 175(5):120.
- O'Shaughnessy J, Earley B, Mee JF, Doherty ML, Crosson P, Barrett D, Macrelli M, de Waal T: Nematode control in spring-born suckler beef calves using targeted selective anthelmintic treatments. Veterinary Parasitology 2014, 205(1–2):150-157.

Conference proceedings

- O'Shaughnessy J, Mee JF, Earley B, Doherty ML, Crosson P, Barrett D, de Waal T: The control of nematodes in dairy calves using targeted selective treatment (TST). In: BCVA Congress: October 16th-18th 2014; Leicestershire, UK: Cattle Practice; 2014: 287.
- O'Shaughnessy J, Mee JF, Earley B, Doherty ML, Crosson P, McGee M, O'Riordan EG, Barrett D, de Waal T: Are veterinarians recommending too many anthelmintic treatments for beef calves? - we test an alternative approach. In: XXVII World Buiatrics Congress: 2014; Cairns, Australia; 2014: 229.
- O'Shaughnessy J, Earley B, Mee JF, Doherty ML, Crosson P, Barrett D, de Waal T: The detection of ivermectin-resistant nematodes in Irish cattle. In: European Veterinary Parasitology Conference: 2014; Dublin, Ireland; 2014: 38.

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