



Nematode control in spring-born suckler beef calves using targeted selective anthelmintic treatments



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ABSTRACT

As anthelmintic resistance is increasingly being reported in cattle worldwide, there is a need to explore alternative approaches to gastrointestinal nematode control in cattle. A novel approach is the use of targeted selective treatments (TST) where only individual animals are treated instead of the entire group. The study objective was to determine if anthelmintic usage could be reduced using a TST-based approach in rotationally grazed first-grazing season suckler beef calves without affecting calf performance. Eighty-eight spring-born suckler beef calves, naïve to anthelmintics, with an initial mean (s.d.) age and live weight of 159 (22.4) days and 221 (42.4) kg, respectively, were used. All calves were vaccinated at pasture against dictyocaulosis at 8 and 12 weeks old. On August 9th 2013 (Week 0), when the trial began, calves were randomised by age, weight, sex, dam breed and sire breed to one of two treatments: (1) standard treatment (positive control) ($n = 44$) and (2) TST ($n = 44$). Samples collected one week prior to the start of the study were used as baseline covariates. Each treatment group was replicated once. All calves in the control groups were treated subcutaneously with levamisole on Week 0 and on Week 6. Individual calves in the TST groups were only eligible for treatment at pasture with the same product if predetermined thresholds were reached [plasma pepsinogen ≥ 2.0 international units of tyrosine/litre and faecal egg count ≥ 200 eggs per gram of faeces]. The trial concluded at housing on Week 13. Data were analysed using repeated measures mixed models ANOVA (PROC MIXED) (SAS 9.3). No calves in the TST groups were treated for gastrointestinal nematodes during the study period as they did not reach pre-determined treatment thresholds. Mean (sem) calf daily live weight gain for control and TST groups was 0.90 (± 0.04) and 0.92 (± 0.03) kg, respectively ($P = 0.68$). Using an ELISA to detect antibodies to *Dictyocaulus viviparus* at Week 11, 81% of calves were seropositive. Gastrointestinal nematode challenge

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in spring-born suckler beef calves under these conditions can potentially be controlled with minimal anthelmintic treatments whilst not significantly impairing calf performance, provided appropriate control measures are taken to prevent dictyocaulosis from occurring.
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1. Introduction

In Ireland, suckler beef calf production is predominantly a grass-based system (Drennan and McGee, 2009), where the majority of calves are spring-born (DAFM, 2012) and are grazed at pasture with their dams until weaning at approximately 7–9 months of age in the autumn. In such a system, calves are potentially exposed to long periods of gastrointestinal nematode (GIN) challenge throughout their first year at pasture. In contrast to other European countries, Bennema et al. (2010) reported that cattle in an Irish pasture-based production system may encounter higher levels of GIN challenge as a result of greater time spent at pasture, coupled with a climate conducive to parasite development and transmission.

Despite the nematode challenge encountered, studies on GIN in spring-born suckler beef calves internationally observed that clinical disease in this category of suckler calf was unlikely to occur (Agneessens et al., 1997; Couvillion et al., 1996; Michel et al., 1972; Owen et al., 1989). Although clinical parasitic disease may occur post weaning (Sargison et al., 2010), parasitic gastroenteritis mostly occurs subclinically in spring-born suckler beef calves, with the effects of parasitic challenge being manifested through impaired live weight gain (Forbes et al., 2002).

At present, there is no information on the optimal management of, or of the challenge due to GIN in first-grazing season (FGS) suckler beef calves at pasture, or on the relative importance of *Dictyocaulus viviparus* as a pathogen, under Irish conditions. In a first study of herd health management practices in Irish suckler beef herds, we reported that the majority of farmers treated calves 3 or more times in their FGS for GIN and had similar parasite control practices for autumn- and spring-born calves (O'Shaughnessy et al., 2013). This frequency of anthelmintic treatment of FGS calves was considerably higher than that reported in the UK (Barton et al., 2006) where less than 25% of beef calves were treated 3 or more times in their first grazing season.

Subclinical nematode infections in suckler beef calves may significantly affect calf performance (Forbes et al., 2002; Stuedemann et al., 1989) and strategic anthelmintic treatments can significantly improve performance (Hersom et al., 2011; Stromberg et al., 1997). However, as anthelmintic resistance (AR) is increasingly being reported in cattle worldwide (Sutherland and Leathwick, 2011), there is a need to explore alternative approaches to GIN control in cattle. A novel approach is the use of targeted selective treatments (TST) (van Wyk et al., 2006) where only individual animals are treated with anthelmintics as opposed to treatment of an entire group. The aim of the TST approach is to reduce the use of anthelmintics and thus minimise the selection of resistance nematode alleles, thus increasing the effective lifespan of anthelmintics.

At present, there is little published information on the use of TST-based approaches to GIN control in cattle, with the only studies published using performance-based indicators in dairy-bred cattle (Greer et al., 2010; Höglund et al., 2013a). There is a need to examine TST-based approaches to GIN control in suckler beef calves under Irish conditions given the high frequency of anthelmintic usage here (O'Shaughnessy et al., 2013).

The present study reports the findings of a TST-based approach to GIN control in rotationally grazed FGS suckler beef calves in Ireland. The aim of the study was to establish (1) the GIN challenge experienced by suckler calves under Irish grazing conditions and (2) the number of anthelmintic interventions required to prevent clinical parasitic disease and maintain calf performance using a TST-based approach to GIN control. The study hypothesis was that spring-born suckler beef calves using a TST-based approach to GIN control would require minimal anthelmintic treatments in their FGS and would achieve similar levels of live weight gain to calves receiving two anthelmintic treatments, provided calves were vaccinated to prevent *D. viviparus* infection from occurring.

2. Materials and methods

All animal procedures performed in this study were conducted under experimental licence (B100/2869) from the Irish Department of Health and Children in accordance with the Cruelty to Animals Act 1876 and the European Communities (Amendment of Cruelty to Animals Act 1876) Regulation 2002 and 2005.

2.1. Study location and experimental design

The study was conducted on a 70 ha farmlet at the Animal & Grassland Research and Innovation Centre, Teagasc, Grange, Dunsany, Co. Meath, Ireland (longitude 6° 40' W; latitude 53° 30' N; elevation 92 m above sea level).

Study animals consisted of 69 Charolais and 19 Blonde d'Aquitaine-sired spring-born calves and their dams. There were 40 female and 48 male calves. Dams were of predominantly Limousin ($n=43$), Charolais ($n=42$), Simmental ($n=2$) and Aberdeen Angus ($n=1$) genotypes.

The trial began on August 9th 2013 (Week 0), when calves, naïve to anthelmintics, were randomised by age, weight, sex, dam breed and sire breed and then allocated to one of two treatments: (1) standard treatment (positive control) ($n=44$) ((males $n=24$; females $n=20$)) and (2), TST ($n=44$) ((males $n=24$; females $n=20$)). Each treatment group was replicated once. Mean (s.d.) calf age and live weight on Week 0 was 159 (22.4) days and 221 (42.4) kg, respectively. All calves in the control groups were

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