Veterinary Parasitology 204 (2014) 352–363

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Parasite control practices on pasture-based dairy farms in the Republic of Ireland

Yris Bloemhoff[a], Martin Danaher[b], Andrew Forbes[c], Eric Morgan[d], Grace Mulcahy[e], Clare Power[f], Ríona Sayers[a,*]

[a] Animal and Bioscience Research Department, Animal & Grassland Research and Innovation Centre, Teagasc, Moorepark, Fermoy, Co. Cork, Ireland
[b] Food Safety Department, Teagasc Food Research Centre, Dublin 15, Ashtown, Ireland
[c] School of Veterinary Medicine, Glasgow University, G61 1QH, United Kingdom
[d] School of Biological Sciences, University of Bristol, Woodland Road, Bristol BS8 1UG, United Kingdom
[e] School of Veterinary Medicine, University College Dublin, Dublin 4, Belfield, Ireland
[f] Food Safety Department, Teagasc Food Research Centre, Co. Cork, Ireland

ARTICLE INFO

Article history:
Received 14 August 2013
Received in revised form 6 May 2014
Accepted 10 May 2014

Keywords:
Parasite control
Anthelmintic
Endectocides
Survey
Dairy herds
Ireland

ABSTRACT

Dictyocaulus viviparus, *Ostertagia ostertagi* (nematode parasites), and *Fasciola hepatica* (trematode parasite) result in productivity losses on dairy farms and impact on animal health through clinical and sub-clinical disease. Parasite control in livestock systems is largely based on the use of chemoprophylactic agents (anthelmintics), grazing management, or a combination of both. The objective of this study was to document current parasite control measures employed by Irish dairy farmers in a predominantly pasture-based livestock system. A questionnaire survey of 312 geographically representative farmers was completed in 2009 with a follow up survey completed in 2011. Statistical analysis highlighted significant differences in chemoprophylactic usage between 2009 and 2011. In particular, an increase in the use of albendazole for both trematode (19% in 2009 to 36% in 2011) and nematode (30% in 2009 to 58% in 2011) control was observed. This was most likely due to flukicide restrictions introduced in the Republic of Ireland in 2010 for dairy animals. Logistic regression highlighted regional differences in chemoprophylactic use. Farmers in southern parts of Ireland, an area with good quality soil, less rainfall, and a higher density of dairy farms than other regions, were approximately half as likely to dose for *F. hepatica* and were more likely (OR > 2.0) to use albendazole for both nematode and fluke control. Approximately 30% of respondents who used a chemoprophylactic treatment for nematodes, used a product which was 'unsuitable for purpose' (e.g. ivermectin for the treatment of *F. hepatica*), highlighting the need for increased awareness, continuing research, and regionally targeted education tools regarding optimal parasite control.

1. Introduction

Nematode and trematode parasites infect domestic livestock, impacting on their health and welfare (Piedrafita et al., 2010; Stear et al., 2007). In temperate climates, the most prominent parasites affecting dairy herds are the nematodes *Dictyocaulus viviparus* (Duncan et al., 1979;

* Corresponding author. Tel.: +353 25 42 215.
E-mail addresses: yris.bloemhoff@teagasc.ie, yris_b@hotmail.com (Y. Bloemhoff), riona.sayers@teagasc.ie (R. Sayers).

http://dx.doi.org/10.1016/j.vetpar.2014.05.029
0304-4017/

Johnson et al., 2003; Ploeger, 2011), *Ostertagia ostertagi* (Charlier et al., 2011; Williams and Bilkovich, 1971) and the trematode *Fasciola hepatica* (Borgsteede, 2011; Fairweather and Boray, 1999; Hope-Cawdery, 1984). These parasites can result in significant economic losses in livestock systems (Bennema et al., 2009; Holzhauer et al., 2011; Schweizer et al., 2005). Losses due to these parasites can be associated with clinical symptoms, predominantly in young stock, while infections in adult cattle are typically, though not exclusively, sub-clinical (Bennema et al., 2009; Michel et al., 1982; Ploeger, 2002; Vercruysse and Claerebout, 2001).

In the Republic of Ireland (from here on referred to as Ireland), outdoor grazing of grass contributes significantly to the diets of dairy herds, in contrast to many other dairy producing nations in the northern hemisphere (Bennema et al., 2010; Dillon et al., 1995). The rearing of replacement stock in Ireland relies largely on extensive grazing of grass from an early age (Gleeson, 1971) to reach sufficient weight for breeding. Dairy farmers in Ireland design their production systems around the grass growing season (Supplement 1), with farmers in the south of Ireland turning cows out to grass from as early as February and cows remaining at pasture until early December when conditions allow (Drennan et al., 2005). The majority of Irish dairy cows calve in spring (February to April) to align peak milk production with the peak in grass growth (Dillon et al., 1995; Drennan et al., 2005; Kennedy et al., 2003). The combination of seasonal grazing, a high proportion of grass in the diet, and a mild climate during the grazing season has the potential to lead to very high levels of parasite exposure (O'Farrell et al., 1986). Limited existing Irish data shows that *F. hepatica* is present in over 60% of livers from culled beef and dairy cows (Murphy et al., 2006). The same study showed a prevalence of *D. viviparus* of 14% and found *O. ostertagi* in 57% and 10% of slaughtered dairy and beef cows (Murphy et al., 2006). In 2009, the regional veterinary laboratories (RVL) in Ireland reported the highest proportion of *F. hepatica* eggs in faeces in May (34%). The RVL also found that 5.8% of bovine faecal samples submitted tested positive for *D. viviparus*. While extensive research programmes to increase the efficiency of grazed grass utilised in the diet in Irish dairy systems (McCarthy et al., 2007; Shalloo et al., 2004) have evolved, parallel studies relating to the impact on parasite exposure and parasite control systems are limited (Bennema et al., 2010; Murphy et al., 2006).

Parasite control in livestock systems worldwide is predominantly achieved through the use of anthelmintics, grazing management, or a combination of both (Barger, 1997). Since the 1960s several classes of anthelmintics against *O. ostertagi*, *D. viviparus* and *F. hepatica* have been developed (Harder, 2002a,b) each having different ranges of activity. A list of chemoprophylactic agents licensed in 2009 for nematode (wormers) and trematode (flukicides) control in dairy herds in Ireland is shown in Supplement 2. In 2010, however, several flukicides were restricted for use in dairy cows, and in-calf heifers intended to produce milk for human consumption, due to lack of maximum residue limits (MRL) for their active ingredients in milk (Supplement 2) (O'Brien et al., 2010). Chemoprophylactic usage and application of different grazing management practices across various management/age groups (cows, heifer, calves) on Irish dairy farms are currently undocumented with only limited information available on historical parasite management practices (Downey et al., 1983; Murphy et al., 2006; Parr and Gray, 2000). The objective of this study, therefore, was to document current grazing management procedures and chemoprophylaxis use for the treatment and prevention of nematodes (*D. viviparus* and *O. ostertagi*), and *F. hepatica* on Irish dairy farms. Key influences on parasite management and control procedures were also investigated.

2. Materials and methods

2.1. Study population

The population in this study included dairy farmers participating in a larger disease prevalence study. Selection of farmers has previously been described by O' Doherty et al. (2013). Briefly, 312 study farms were randomly selected from the Irish Cattle Breeding Federation (ICBF) database, all members of HerdPlus®, a management decision support tool for dairy farms administered by the ICBF. Participation in the study was entirely voluntary and non-incentivised. Geographical location was available for all farms allowing mapping of study farms.

2.2. Questionnaire

The questionnaire survey (SURVEY 2009) used for this study was an expanded version of that by Charlier et al. (2005) and Forbes et al. (2008). Supplementary questions specific to this study related to pasture management and *F. hepatica* chemoprophylactic treatments in cows, in-calf heifers (animals greater than 12 months of age but not yet calved), and calves (animals younger than 12 months of age). The questionnaire was piloted by seven Teagasc research-farm managers (Irish Agriculture and Food Development Authority). Following minor amendments, the questionnaire was circulated to the 312 participating farmers. The final questionnaire consisted of 54 questions, sectioned into three separate areas, (i) farm demographics, (ii) grazing management, and (iii) parasite control measures implemented on farm from the 1st of October 2008 to 30th of September 2009. The questionnaire consisted of 27 multiple choice, 12 binary closed-ended (yes or no) and 15 open-ended questions. The survey was conducted as a postal survey with hard copies returned between December 2009 and February 2010.

A second survey, focusing specifically on anthelmintic use in cows, was undertaken at the Teagasc National Dairy Conference on the 15th (Cork) and 16th (Athlone) of November 2011 (SURVEY 2011). This survey consisted of 19 questions and was administered to investigate the impact of 2010 flukicide licensing changes. County of origin of each respondent was recorded in order to regionalise responses, to assess possible differences between regions.