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A survey of the exposure to *Ostertagia ostertagi* in dairy cow herds in Europe through the measurement of antibodies in milk samples from the bulk tank

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Abstract

Measurement of antibodies to *Ostertagia ostertagi* in bulk tank milk (BTM) has value as a diagnostic indicator for potential production losses and anthelmintic treatment responses in dairy herds. Most of the recent data on *O. ostertagi* antibodies in milk have been generated in Belgium and Canada; the purpose of this study was to determine the range of *O. ostertagi* antibody levels in several European countries. BTM samples were collected during the autumn of 2005 and 2006 from a total of 1185 dairy herds from dairy farming regions in Denmark, Germany, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom. Antibody titres to *O. ostertagi* were determined by indirect ELISA and expressed as optical density ratios (ODR). In addition, relationships between ODR and management practices were investigated. For each country the mean ODR and the 25th–75th percentile values were determined. Mean BTM ODR values in herds with access to yards, paddocks and pastures ranged from 0.3 in Italy to 0.6 in Portugal and the UK/Ireland. The BTM ODR values obtained in this study were generally lower than those described in the literature for Belgium, but comparable with those in Canada. Variations between different European countries appeared to reflect different husbandry practices, particularly those related to access to pasture. The association analyses showed correlations between the BTM *O. ostertagi* ODR, outside access and grazing management, consistent with the publications from Belgium and Canada. When diagnostic values appropriate for different production situations and environments have been further validated, the test will provide an objective, quantitative assessment of the *O. ostertagi* status of a dairy herd and the possible impact this may have on performance and potential responses to anthelmintic treatment. This represents a significant step forward in evidence-based medicine for dairy veterinarians, advisors and farmers.

Keywords: *Ostertagia ostertagi*; ELISA; Bulk milk; Diagnosis; Eprinomectin

1. Introduction

Although there is evidence of a significant negative impact of nematode infections on milk production (Gross et al., 1999; Sanchez et al., 2004a), treatment responses to anthelmintics can vary amongst different studies and herds (Kloosterman et al., 1996; Michel et al., 1982; O'Farrell et al., 1986; Ploeger et al., 1990; Ploeger et al., 1989). One possible explanation for the variability in the responses to anthelmintic treatment is that, not only do individual cows in a herd carry worm burdens of different magnitudes, but also that dairy

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herds could be grazing pastures with different levels of exposure to, and hence challenge from, infective larvae of *Ostertagia ostertagi* (Eysker et al., 2002; Fox et al., 2007).

Neither faecal egg counts nor plasma pepsinogen values have been shown to provide quantitative measures of worm burdens, or their impact, in adult cattle (Eysker and Ploeger, 2000; Vercruysse and Claerebout, 2001). On the other hand, antibodies against crude extracts of *O. ostertagi* antigens, measured by ELISA in serum (Ploeger et al., 1989) and milk (Kloosterman et al., 1993), have been shown to vary quantitatively both amongst individual cows and between herds, raising the possibility of discriminating different levels of infection and exposure to parasites. *O. ostertagi* antibody levels, whether measured in individual sera, milk or bulk milk, were also found to negatively correlate with milk yield (Kloosterman et al., 1993). Subsequent studies confirmed the negative relationship between bulk tank milk (BTM) antibody levels and herd milk yield (Charlier et al., 2005b; Guitian et al., 2000; Sanchez and Dohoo, 2002; Sanchez et al., 2004b).

The potential for the mean herd level of *O. ostertagi* serum antibodies to be used as a predictor of a milk yield response to anthelmintic treatment in adult dairy cows was first described in the Netherlands in cows that were treated with ivermectin in the dry period during housing (Ploeger et al., 1989). The mean herd milk production response to treatment correlated positively ($P < 0.05$) with the mean herd *O. ostertagi* antibody titre measured in the September prior to housing. Another study in the Netherlands, but using bulk milk rather than serum as the substrate for testing, demonstrated an association between the herd titre for *O. ostertagi* antibodies in the bulk milk tank and the treatment response to ivermectin administered in the dry period >28 days before calving (Kloosterman et al., 1996). The associations were not significant, possibly because of the relatively small sample size (34 farms) and because the animals were not treated during lactation. Subsequent studies using eprinomectin, which was generally administered during lactation (some animals in the study of Charlier et al., 2007b were in late pregnancy), indicated that the magnitude of the increase in milk yield subsequent to treatment was positively related to *O. ostertagi* antibody levels in both individual cows (Sanchez et al., 2005; Sanchez et al., 2002a) and in BTM (Charlier et al., 2007b; Sithole et al., 2005).

All the studies cited have been conducted in a relatively narrow geographic range in Europe (Belgium and the Netherlands) or in Canada, so it was considered important that BTM *O. ostertagi* antibody levels should be surveyed throughout a number of European countries to determine if the values were comparable to those found in these three countries. If the ranges in BTM *O. ostertagi* antibody values and the associations with various management factors were similar, then extrapolations from the original studies might be reasonably considered.

The objective of this survey was to investigate the *O. ostertagi* status of dairy cow herds in different European countries through measurement of antibody concentration in the bulk milk tank and to compare these results with those already published for Belgium and Canada. Additionally, management and performance data were collected where possible in order to determine if relationships between BTM *O. ostertagi* antibody levels and various management practices and performance indicators were similar.

2. Materials and methods

2.1. Sampling procedure

BTM samples were collected in the autumn of 2005 and 2006 in eight different European countries: Denmark, Germany, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom. Autumn was chosen in order to limit any differences that might result from seasonal variations (Charlier et al., 2007a) and to determine antibody levels at the end of the grazing season after exposure outside to infection with *O. ostertagi*. Sampling was carried out mainly by practising veterinarians, animal health organisations or through milk recording agencies. The farms were selected by convenience: no specific criteria were imposed for inclusion in the survey, other than that farms should have good records so that management data could be readily collected. In addition, in each country, it was requested that some permanently housed herds with no access to pasture be included in order to establish some base-line data. The target was to obtain BTM samples from a minimum of 100 herds within a country or region.

Samples were collected in a container with a preservative, which was dated and labelled. After collection, samples were initially refrigerated at 4 °C and then stored at −20 °C pending transport to the laboratory. When all the samples from one region had been collected, they were sent with cooling blocks in insulated packaging to arrive within 48 h at the laboratory of parasitology in Ghent, where all the *O. ostertagi* antibody measurements were conducted.