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Short communication

Prevalence of production disease related indicators in organic dairy herds in four European countries

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ABSTRACT

The aim of this study was to assess the prevalence of production disease related indicators on 192 organic dairy farms in Germany, Spain, France and Sweden. The following indicators were used: raised somatic cell count (> 100,000 cells/ml, subclinical mastitis), high fat/protein ratio (risk of ketosis), low milk fat (risk of acidosis), prolonged calving interval, clinical lameness, and mortalities of calves and cows. Prevalence of the assessed indicators varied widely between farms and countries. The median prevalence (interquartile range) were 51.3% (15.4) for subclinical mastitis, 10% (7.7) for risk of ketosis, 3.2% (4.7) for risk of acidosis, 42% (20.7) for prolonged calving interval, and 14.2% (20.4) for clinical lameness. The incidence risk of calves dying between 1 and 90 days of age was 0.002 (0.043) per month of risk. Cow mortality was 0.026 (0.048) per year at risk. The assessment has shown that a comprehensive set of indicators can be calculated from readily available data, sparing the need to establish new and costly procedures. Future research should focus on strategies for using the information most effectively to reduce the level of production diseases in organic dairy farms.

1. Introduction

Organic farming aims at achieving good animal health and consumers directly associate organic products to enhanced animal welfare (Harper and Makatouni, 2002; McEachern and Willock, 2004). Whereas the compliance with the production rules is inspected on a yearly basis in all organic certified operations in Europe, there is no common monitoring of disease levels (Sundrum, 2014). The purpose of this study was to provide updated information about the prevalence of production disease related indicators in European organic dairy farms.

2. Material and methods

2.1. Sample

The study enrolled 200 certified organic farms in France, Germany, Spain and Sweden. Farm recruitment is described in detail by van Soest et al. (2015). Since the farms were either selected because of their accessibility or self-selected by willingness to participate, the sample must be considered convenient.

2.2. Data collection and analysis

All farms were visited once between March and August 2013. General characteristics were assessed through a specifically designed on-farm protocol. A sample of the lactating cows on each farm was scored for lameness according to the guidelines of the Welfare Quality® protocol (Welfare Quality, 2009) by six trained observers. Inter-observer agreement was determined based on video scorings and found to be moderate with a weighted kappa of 0.48 (Dohoo et al., 2009). Lameness prevalence was calculated by summing up the shares of moderately and severely lame animals. All countries had access to data from the official milk recording schemes, breeding companies and animal movement databases. Common procedures for calculations were written as scripts in R (r-project.org), and applied by all countries for the period from January until December 2013, to arrive at similar data sets with information on herd-level indicators. All descriptive statistics and production disease related indicators were reported using the median (m) as measure of central tendency, due to non-homogeneity of variance and non-normal distribution of some data. The interquartile range (IQR) was used as measure of spread. Mood's

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Median Test was employed to assess country differences in production disease related indicators, with results considered significant if $p < 0.05$.

2.3. Indicators

Herd size was calculated as cow-years, i.e. dividing the sum of all days cows were present during the study period by 365. Milk yield was defined as the cumulative milk yield produced by the cows present during the period of interest divided by number of cow-years. The milk production per cow was estimated using the test interval method described by the International Committee of Animal Recording (ICAR, http://www.icar.org/). For comparative purposes, individual test-day milk yield was converted into energy-corrected milk (ECM). Replacement rate was computed for all herds, defined as the number of primiparous calvings per herd size. Prevalence of subclinical mastitis was defined as the proportion of all test-days, during the period of interest, with an SCC >100,000 cells/ml (Hamann, 2005). Milk composition was used for indicating metabolic disorders. For each indicator the percentage of test-day observations beyond predefined thresholds was calculated. Fat percentage below 3.0 at test-days, except for the first 30 days in milk, was used to indicate animals at risk of subacute ruminal acidosis (Allen, 1997; Enemark, 2009). A fat/protein ratio above 1.5 at test-days during the first 100 days in milk indicates an imbalanced energy supply with risk of ketosis (Buttchereit et al., 2010; Heuer et al., 1999) and was thus included. Prolonged calving interval, as a proxy indicator associated with reproductive disease and poor fertility (Pryce et al., 2004), was calculated. Calving intervals of more than 400 days were defined as prolonged (Dubuc et al., 2010; LeBlanc et al., 2002). On-farm mortality was determined for calves and cows separately. The mortality rate for calves was calculated as the number of calves that died between 1 and 90 days of life using calf-month at risk within the studied period as the denominator. The total number of days contributed by each animal was divided by 30.4 (average days/month) to give the number of months at risk. Calf mortality was not calculated for farms in Spain since recording of calf births in the Spanish animal movement database was substantially incomplete. Cow mortality was calculated as the number of cows that died or were euthanized on farm divided by the sum of cow-years at risk. Sold animals were censored at the day of leaving the herd.

3. Results

Descriptive data are presented in Table 1. On animal-level, the predominant breeds were Holstein (53%), Normande (16%) and Montbéliarde (16%) in France, Holstein (41%) and Simmental (31%) in Germany, Holstein (100% including crosses) in Spain, and Holstein (41%) and Swedish Red and White Cattle (39%) in Sweden.

Distributions of production disease related indicators for the four countries and the overall sample are presented in Table 2. Prevalence was highest for subclinical mastitis. Largest variations were found for prolonged calving interval and clinical lameness.

Mood's Median Test revealed significant differences between countries for the prevalence of subclinical mastitis, clinical lameness, risk of subacute ruminal acidosis, prolonged calving interval, and calf mortality.

4. Discussion

The aim of this study was to assess the current prevalence of production disease related indicators in organic dairy farms in France, Germany, Spain and Sweden. The four countries were chosen to cover different geographical and climatic conditions but are not representative of the whole of Europe. Within countries, the studied farms were selected by convenient sampling and may thus differ from a randomly selected sample in various aspects. The variation within our sample in terms of herd size, milk performance, breed, housing system, and management, however, corresponds to the variation found in European organic dairy systems (EC, 2014; Häring, 2003). Therefore, external validity may be high enough to allow for some careful generalisation.

It was shown that a comprehensive set of indicators can be calculated from readily and continuously available data, sparing the need to establish new and costly procedures. Although the value of the used milk parameters has been confirmed in previous studies (Bramley et al., 2008; Heuer et al., 2000), some of them are also being discussed, e.g. SCC thresholds for the detection of subclinical mastitis (Ruegg and Pantoja, 2013) and fat/protein ratio as a measure of energy balance (Madouasse et al., 2010a). Therefore, the prevalences that are provided cannot be considered as perfect measures of production diseases but are merely useful proxies. The lack of information on locomotion disorders was compensated by lameness scoring, which is time-consuming and error-prone. A database with recorded observations done at routine claw trimming, as implemented in e.g. Sweden (Nielsen et al., 2013), would be a much more reliable basis for lameness monitoring if established in other countries as well. Since data structures are quite variable between countries and most data are not freely available to use for all actors that work with animal health in the field, actions are needed to ensure access to harmonized and relevant data to those that are authorised, e.g. by farmers or by law.

Prevalences of production diseases varied immensely between farms and countries. In agreement with our study, Ivemeyer et al. (2012) identified significant differences between countries in terms of subclinical mastitis, subacute ruminal acidosis and calving interval, and none for risk of ketosis. The prevalence that we found for most of the indicators is in the range of data reported in the literature. To our knowledge, prevalence of subclinical mastitis as defined in this study has not been published for dairy herds in France, Spain and Sweden. In two German studies on conventional herds prevalence of raised SCC was much lower than the overall prevalence we found and distinctly lower than the country results with the exception of Sweden (43% in Barth and Brinkmann, 2010; 40% in Härle and Sundrum, 2013a). Lower values were also reported for Austrian farms (31% in Tremetsberger et al., 2015) and farms in the UK (45% in Madouasse et al., 2010b). Lameness prevalence in Spain and Sweden were similar to those found in conventional farms (4% in Manske et al., 2002; 14% in Pérez-Cabal and Alenda, 2014), whereas frequencies were lower in the German sample (compared to 24% in Dippel et al., 2009) and higher in France (compared to 15% in Coignard et al., 2013). In relation to the Bavarian herds, the risk of acidosis in our sample was substantially lower (compared to 20–40% in Härle and Sundrum, 2013b) whereas the risk of ketosis was more or less similar (2–20%). Prolonged calving interval was used as an indirect measure of fertility, although it may be caused by non-observation of heat or management decisions for the voluntary waiting period as well as by health issues other than reproductive disorders (Pryce et al., 2000). Löf et al. (2007) found a median calving interval of 400 days in Swedish dairy herds that were mainly conventional, which means 50% of the herds had an average calving interval longer than 400 days. Although not directly comparable, these results seem to be slightly higher than the results in our study. Incidence rates in Swedish calves dying between 1 and 90 days of age were studied by Svensson et al. (2006), who assessed a rate of 0.009. This rate is lower than the calf mortality in our study countries, including the Swedish sample. Incidence density of cow mortality was lower than mortality rates reported in the literature (Compton et al., 2016; Raboisson et al., 2011). As opposed to calf mortality, cow mortality was highest in Sweden, followed by France, Spain, and Germany. This is in accordance with a study by Alvasen et al. (2012) who report high mortality rates for Sweden compared to other countries. Mood's Median Test revealed significant differences between countries for most of the investigated indicators. Swedish farms, in comparison with the other countries, were characterised by low levels of subclinical mastitis and lameness as well as high