



# Clinical lameness and risk factors in a Spanish Holstein population

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## ARTICLE INFO

### Article history:

Received 20 June 2013

Received in revised form

10 March 2014

Accepted 14 March 2014

### Keywords:

Lameness

Management

Parity

Risk

## ABSTRACT

Given the economical importance of lameness in dairy milk production, the presence or absence of clinical lameness and the associated risk factors were studied in a Spanish Holstein population. Lameness was diagnosed by veterinarians or farmers as visually abnormal gait. Up to 6 cases per lactation were considered in 6568 lactations of 3459 different cows with first calving between January 2005 and October 2011. Geographical area (region where herd is located) and parity number (primiparous and multiparous) were studied as risk factors, along with the following herd facilities: housing type, flooring, access to soil surface, presence or absence of a footbath, and periodical trimming. Seasonality of lameness was determined as season when first lameness event was diagnosed and lactation period (first 120 days or later) when first event occurred. Also milk, fat, and protein yield production were analyzed as risk factors. The association analyses were estimated using multivariate generalized linear models with a log link function. Lameness was diagnosed in 13.8% of cows and 8.7% of lactations, with multiparous cows being more prone than primiparous cows (odds ratio (OR)=1.50). Solid concrete was more beneficial than grooved concrete for primiparous cows (OR=0.67) as were freestalls as compared to cubicles, while no differences relating to housing system or flooring type were found for multiparous cows. Changes in walking surfaces led to the highest risk of lameness only for cows with two or more lactations (OR=1.33), where it was found to be more beneficial either always or never having soil surface available. Presence of footbaths was associated with reducing lameness occurrence in multiparous cows while periodical trimming was a useful preventive treatment for primiparous cows. Winter was the season of diagnosis of a first event with less probability of being recurrent for multiparous cows. No association with production traits were found either for primiparous or multiparous cows. Herd factor risks were therefore different for primiparous and multiparous. Young cows were less prone to lameness in herds with solid concrete floors and periodical trimming. However, walking on the same kind of surface throughout the lactation and the availability of a footbath prevented the occurrence of lameness in multiparous cows.

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## 1. Introduction

Lameness is one of the most important welfare problems in dairy cows not only because it is painful for the animal (Rushen et al., 2007). An animal with locomotion

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problems will avoid moving to access feeding and milking parlor and, therefore, milk production will be affected (Green et al., 2002). Also, Booth et al. (2004) reported that lameness was associated with increased culling and it has been proven that it also contributes to other causes of removal, such as poor fertility (Sattler, 2002; Hultgren et al., 2004). The U.S. Animal and Plant Health Inspection Service (APHIS, 2007) reported a 16% culling rate due to lameness, which was found to be the third most common reason for involuntary culling. When treatment costs are also considered (Kossaibati et al., 1999; Sattler, 2002), lameness leads to reduce profitability.

Lameness is a multifactorial condition that can be caused by infections, laminitis, conformation, trauma, and other claw lesions. It is affected by housing system, herd management, nutrition, and animal characteristics (Clarkson et al., 1993). Risk factors affecting foot and leg problems have been studied for different outcome variables. There are studies in the literature on risk factors for specific claw lesions, such as digital dermatitis, thin sole and white line disease (e.g., Somers et al., 2003, 2005a; Sanders et al., 2009) and for lameness as a general disorder (e.g., Barker et al., 2007, 2010). A broad range of lameness prevalence has been reported depending on country (mainly due to the production system) and lesion considered, but approximately 20% of intensively managed dairy cows worldwide are lame at least once in a lifetime (Cook and Nordlund, 2009).

The most important risk factors for lameness have been proposed to be flooring and housing. Equilibrium in claw horn wear and growth (van der Tol et al., 2005) depends on an optimal balance between smoothness and abrasiveness of the floor. Several authors found no difference in locomotion problems when comparing concrete flooring and straw yard (Fregonesi and Leaver, 2000; Somers et al., 2005b) but other studies (e.g., Somers et al., 2003) reported that cows in straw yards had the lowest number of claw disorders and that long exposure to concrete flooring has a negative effect on claw health. Freestall barns (Cook, 2003) and zero-grazing (Haskell et al., 2006) potentially increase claw disorders. Season also seems to be a critical factor. Studies in United Kingdom (Rutherford et al., 2009) and Southeastern United States (Sanders et al., 2009), show spring and summer to be the periods with the higher risk of claw lesions, because of heat and humidity. Preventive treatments, such as trimming and footbaths have been shown to help reducing lameness (Manske et al., 2002; Amory et al., 2006; Espejo and Endres, 2007).

Claw health problems are not always recorded or readily available, however. Because lameness can be diagnosed as abnormal gait caused by pain or mechanical disturbances (Dyer et al., 2007; Rushen et al., 2007), some countries and experimental researchers have used locomotion score to evaluate lameness (Sprecher et al., 1997), such as United Kingdom (Rutherford et al., 2009), Sweden (Manske et al., 2002), and United States (Dyer et al., 2007). In Spain, lameness was not routinely recorded on commercial farms up to 2013, but a program was initiated in 2005 to begin on-farm collection of health problems records, such as lameness and clinical mastitis. To our knowledge, there is no previous literature regarding

lameness in Spanish Holstein populations. Therefore, the aim was to describe the incidence of lameness in a Spanish Holstein population and to study the risk factors associated with lameness.

## 2. Materials and methods

### 2.1. Data collection

Clinical lameness has been recorded since April 2005 in a number of Spanish herds from three regions (the Basque Autonomous Region, Navarra, and Girona). With the assistance of the regional associations, herds were chosen to include farms with a variety of herd facilities. The requirements were to have proven reliability in recording data (based on experience from previous programs) and submission of a filled-out questionnaire on basic farm management and facilities. From an initial pool of 40 herds, only 23 with continuous lameness recording throughout the entire period of study (2005–2011) were ultimately chosen.

Although etiology can be diverse, in this study clinical lameness (LAM) was diagnosed as visually detected locomotion disorders, regardless of etiology (lesion, trauma, etc.). Therefore the only criterion used to diagnose LAM was abnormal gait. Either the farmer or the veterinarian recorded diagnosed lameness (like records for clinical mastitis, as described in Pérez-Cabal et al. (2009)). The data recorded included: herd, cow identification, feet affected, date of diagnosis, date of beginning and end of medication (if necessary), treatment(s) applied (trimming, shoeing, bandaging, and/or medication), and remarks regarding lameness. For the same cow, two events of lameness were considered as different when the dates of diagnosis did not match, dates differed by at least one week, and treatment periods did not overlap regardless of feet affected (front or rear). When different treatments were applied, for example trimming and medication, the same event was recorded twice with a different code for each treatment. Lameness was considered as the number of cases on a lactation basis. Each lactation of a cow was recorded as healthy or sound if zero events occurred or as lame if from 1 to 6 events were diagnosed. The final data set included 6568 lactations of 3459 lactating cows with first calving between January 2005 and October 2011.

### 2.2. Risk factors

Geographical location of herd (by region) and parity number (primiparous or multiparous) were included as risk factors. Factors were grouped into three types: herd facilities, production traits, and seasonality of LAM. The herd facilities studied were housing type (freestalls with deep straw bedding, cubicles with straw bed, and cubicles with latex mat); floor type (flat concrete, grooved concrete) all with straw bedding; access to soil surface (always, only during dry period, and never); presence or absence of footbath (yes or no); and periodical hoof trimming (yes or no). Periodical trimming “yes” was considered regardless the frequency, from one to four times a year, once a week, once a month, while periodical

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