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Dynamics of culling for Jersey, Holstein, and Jersey × Holstein crossbred cows in large multibreed dairy herds

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ABSTRACT

The objective of this observational study was to describe and compare the dynamics of reason-specific culling risk for the genetic groups Jerseys (JE), Holsteins (HO), and Jersey × Holstein crossbreds (JH), considering parity, stage of lactation, and milk yield, among other variables, in large multibreed dairy herds in Texas. The secondary objective was to analyze the association between survival and management factors, such as breeding and replacement policies, type of facilities, and use of cooling systems. After edits, available data included 202,384 lactations in 16 herds, ranging from 407 to 8,773 cows calving per year during the study period from 2007 to 2011. The distribution of lactation records by genetic group was 58, 36, and 6% for HO, JE, and JH crosses, respectively. Overall culling rates across breeds were 30.1, 32.1, and 35.0% for JH, JE, and HO, respectively. The dynamics of reason-specific culling were dependent on genetic group, parity, stage of lactation, milk yield, and herd characteristics. Early lactation was a critical period for "died" and "injury-sick" culling. The risk increased with days after calving for "breeding" and, in the case of HO, "low production" culling. Open cows had a 3.5 to 4.6 times greater risk for overall culling compared with pregnant cows. The odds of culling with reason "died" within the first 60 d in milk (DIM) were not significantly associated with genetic group. However, both JE and JH crosses had lower odds of live culling within the first 60 DIM compared with HO cows (OR = 0.72 and 0.82, respectively). Other cow variables significantly associated with the risk of dying within the first 60 DIM were cow relative 305-d mature equivalent (305ME) milk yield, parity, and season of calving. Significant herd-related variables for death included herd size and origin of replacements. In addition to genetic group, the risk of live culling within 60 DIM was associated with cow-relative 305ME milk yield, parity, and season of calving. Significant herd-related variables for live culling included herd-relative 305ME milk yield, herd size, type of facility, origin of replacement, and type of maternity. Overall, reason-specific culling followed similar patterns across DIM in the 3 genetic groups.
Key words: culling, death, Jersey, Holstein

INTRODUCTION

Culling is defined as the departure of cows from the herd because of sale, slaughter, salvage, or death (Fetrow et al., 2006). Both premature culling and mortality inflict financial losses to the dairy industry and are relevant animal welfare issues (Thomsen and Houe, 2006). In recent years, dairy cows have shown a trend for lower survival rates (Hare et al., 2006; Miller et al., 2008) and high involuntary culling rates are a concern on dairy farms (Weigel et al., 2003). Extra-farm factors significantly affecting decisions on culling include cost of replacements and milk and beef price (Hadley et al., 2006). At the farm level, culling is affected by management style, reproductive policy, type of facilities, level of production, herd size, and cattle breed, among other factors (Hadley et al., 2006; Hare et al., 2006; McConnel et al., 2008).

Several studies have analyzed the survival ability of different dairy breeds. Hare et al. (2006) reported that the survival rate to parity 2 for Holsteins (**HO**) first calving in 2000 was 74.3%. Survival rates to parity 2 for other breeds were 71.8% for Ayrshires, 68.8% for Brown Swiss, 66.3% for Guernseys, and 76.2% for Jerseys (**JE**). Survival rate to parity 6 was 9.8% for HO and 15.6% for Jersey × Holstein (**JH**) with first calving in 1996. Similarly, culling rates of 31.9 and 27.2% were estimated for HO and JE herds, respectively (Hadley et al., 2006). When survival to subsequent calving was compared between JH crossbred cows and HO, an advantage of 8.6 and 14.4% for a second and third calving in crossbred cows, respectively, was observed (Heins et al., 2012).

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Herds using a single breed are more representative of the US dairy industry. Multibreed herds are less common, but provide the opportunity for comparison of breed performance and survival, as individuals are under a common environment and management (Garcia-Peniche et al., 2006). The dairy industry in the Texas panhandle has exhibited sustained growth in the last decades, favoring large herds with cows housed in freestall barns and dry-lots. In some areas, the proximity to cheese-processing plants has stimulated the introduction of JE cattle, resulting in several herds where HO, JE, and their crosses are managed under the same systems.

Previous studies have investigated the dynamics of culling by different causes in dairy herds (Bascom and Young, 1998; Smith et al., 2000; Hadley et al., 2006; Pinedo et al., 2010). However, recent studies describing the risk for reason-specific culling in different types of cattle in multibreed commercial herds are scarce. It is presumable that the risk of reason-specific culling will vary depending on each particular breed and may be associated differently by multiple factors, such as stage of lactation, parity, pregnancy, season, herd characteristics, and other concurrent conditions affecting individual cows. Nevertheless, the potential effect of these and other factors on the risk of culling for specific reasons in JE, HO, and their crosses, managed under the same conditions in large commercial herds in Texas, has not been quantified. Consequently, the main objective of this observational study was to describe and compare the dynamics of reason-specific culling risk for JE, HO, and their crosses, considering parity, stage of lactation, milk yield, and herd characteristics in large multibreed dairy herds in Texas. The secondary objective was to analyze the association between management factors, such as type of facility (dry-lot vs. freestall), breeding (heat detection or synchronization of ovulation programs), and replacement policies and survival.

MATERIALS AND METHODS

Study Population

The current study explored risk factors for culling through analysis of lactation records from large multibreed herds in Texas and was restricted to JE, HO, and JH crossbred cows. A convenience sample of herds was selected based on the authors' contacts with farms, the presence of at least 2 of the genetic groups (JE, HO, and JH crossbreds), and the willingness of farmers to provide farm information. A total of 202,384 lactation records of cows calving between January 2007 and June 2011 were available for the analyses and consisted of 58, 36, and 6% HO, JE, and JH records, respectively. Data were provided by 16 herds, ranging from 400 to 8,500 cows; 11 located in the High Plains region and 5 in north central Texas. Information was extracted from on-farm software and consisted of calving date, parity, date of dry-off, 305-d mature equivalent (**305ME**) milk yield, herd code, breeding data, and recorded culling reason and date. Only 1 out of 8 possible disposal (culling) codes per culled cow was reported. Culling was considered removal from the herd with any disposal code other than "dairy purposes." Live culling included all 6 disposal reasons except "died." Consequently, in the estimation of annualized culling rates, the reason "died" was considered separately. Data regarding herd-related variables were obtained through a survey given to the farm owners or the farm veterinarians.

Data Edits

Lactation records missing parity number, calving date, or breed were removed from the data set. Records for subsequent lactations in the same cow reporting a different breed were also removed. The culling date was the last known recorded status date with the status code for culling. The number of cow-days was calculated for each individual as the number of days between the calving date and culling or death date, the subsequent calving date, or the last known event date, whichever was earlier. Cow-days for open cows were calculated as the number of days between calving and conception that resulted in a pregnancy or last known event date, whichever was earlier. Cow-days for pregnant cows were calculated as the number of days between conception and calving or last known event date, whichever was earlier.

Herd parameters were estimated from the edited lactation records. Herd milk yield (305ME) and herd size per season and year were calculated. Annualized live culling and death rates were calculated as the number of cows that were live culled or died/number of cow-days at risk $\times$ 365.

Events of Interest and Independent Variables

Event of interest was reason-specific culling for 8 reasons: "low productivity," "dairy purposes," "any sickness," "breeding," "injury or sick," "mastitis," "abort," and "died." Lactation records missing a culling reason (or with an undefined character recorded) were classified under "reason not reported." Considering that a significant proportion of live culling and death occurs during early lactation (Dechow and Goodling, 2008; Dechow et al., 2012), the variables for live culling and death by 60 DIM were created for categorical analysis.