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Early lactation production, health, and welfare characteristics of cows selected for extended lactation

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ABSTRACT

Some cows are able to achieve relatively high milk yields during extended lactations beyond 305 d in milk, and farmers may be able to use this potential by selecting the most suitable cows for an extended lactation. However, the decision to postpone insemination has to rely on information available in early lactation. The main objectives of this study were, therefore, to assess the association between the information available in early lactation and the relative milk production of cows on extended lactation, and to investigate if this information can be used to differentiate time of first insemination between cows. Data came from 4 Danish private herds practicing extended lactation in which some cows are selected to have a delayed time of planned first insemination. Average herd size varied from 93 to 157 cows, and milk yield varied from 7,842 to 12,315 kg of energy-corrected milk (ECM) per cow per year across herds. The analysis was based on 422 completed extended lactations (427 ± 87 d), and each lactation was assigned to 1 of 3 (low, medium, and high) milk performance groups (MPG) within parity group within herd based on a standardized lactation yield. For cows in the high MPG, peak ECM yield, and ECM yield at dry off were significantly greater, the relative reduction in milk yield between 60 and 305 d in milk was significantly smaller, and a smaller proportion had a body condition score (scale: 1–5) at dry off of 3.5 or greater compared with cows in low MPG. Previous lactation days in milk at peak ECM yield and ECM yield at dry off were higher, the relative reduction in milk yield between 60 and 305 d in milk was smaller, and the number of inseminations per conception was higher for multiparous cows in high MPG compared with low. Current lactation ECM yield at second and third milk recording were greater for cows in high MPG compared with low. A principal component analysis indicated that variables related to fertility, diseases, and milk yield explained most of the total variation between primiparous cows, whereas variables related to milk yield, fertility, and days in milk at peak yield were the most dominating for multiparous cows. Our study indicated that milk yields in previous lactation and at second and third milk recording correlate well with milk production potential, and therefore, may be promising indicators when selecting the most suitable cows for extended lactation.

Key words: extended lactation, dairy cow, milk production, indicator

INTRODUCTION

Dairy farmers make management decisions on a daily basis related to different areas including culling, feeding, disease treatments, and reproduction. Available software solutions aimed at supporting the farmer with these decisions range from simple spreadsheet models to more complex and advanced systems. A common trait for these software solutions is that they rely on potentially a large amount of data including cow-specific characteristics that are processed to support the farmer in evaluating the expected outcome of a decision. Typically, decisions are evaluated in relation to their effect on cow economic performance.

One important driver for the expected economic performance of a cow is the milk production level and profile during lactation, which are directly affected by feeding and indirectly by a range of factors. These factors include general management practices (Albarrán-Portillo and Pollott, 2011), breed and parity (Nielsen et al., 2003), age at first calving in relation to first parity performance (Ettema and Santos, 2004), and previous days dry (Funk et al., 1987; Steeneveld et al., 2013). Also, reproduction, lameness (Green et al., 2002, Onyiro et al., 2008), calving difficulty (Thompson et al., 1983; Barrier and Haskell, 2011), some diseases in early lactation (Fourichon et al., 1999; Rajala-Schultz et al., 1999), and BCS at calving (Roche et al., 2009) are known to affect milk production. Furthermore, BCS at calving may interact with reproduction, health, and welfare of the cow (Roche et al., 2009).

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In industrialized dairy farming systems, much information concerning these factors is available from compulsory and voluntary herd and cow recording schemes, which, in combination with personal experience, may be used in everyday decision-making. These decisions could involve differentiating time of first insemination after calving between individual cows and thereby select all or some cows to have insemination delayed. In turn, this would manage these cows for an extended lactation beyond 305 DIM.

Intuitively, managing cows for extended lactations increases herd average DIM, and this could reduce average milk production if cows follow the general curvature of a standard lactation curve. However, studies indicate that cows completing an extended lactation can produce equal amounts of milk per feeding day (lactating plus dry days) as cows completing a lactation of traditional length (Arbel et al., 2001; Österman and Bertilsson, 2003; Lehmann et al., 2016). Furthermore, these studies indicated the presence of a large variation between cows in individual milk production per feeding day, and it is, therefore, possible that some of the cows with the lowest milk production potential should have been inseminated earlier.

Milk production per feeding day extends to milk production per annual cow, which again extends to herd milk production. The difference between the individual cow and herd average milk production per feeding day, therefore, reflects the contribution of the individual cow toward herd milk production. We hypothesize that differentiating time of first insemination between cows can be a part of an optimization strategy where the milk production potential is used during an extended lactation. However, farmers have to do this differentiation in early lactation based on the available information on individual cow characteristics, which could include factors such as previous milk yield, disease, and reproduction that may affect milk production performance for the remaining part of the lactation.

The main objectives of this study were, therefore, to assess the association between the information available in early lactation and relative milk production of cows on extended lactation, and to investigate if this information can be used to differentiate time of first insemination between cows.

MATERIALS AND METHODS

Herds

Four farmers actively managing selected cows for extended lactation participated in the project from January 2013 to December 2015. Each farmer had their own definition of the length of both a planned short and a planned long lactation, and they managed this by altering time of first insemination relative to calving. The 4 farms differed in size, breed, replacement rate, and milk production level (Table 1), and across herds, the average calving interval ranged from 425 to 541 d for primiparous and from 423 to 519 d for multiparous cows. Mean parity of multiparous cows was 2.7 (SD = 1.1) with 59% in second parity, 25% in third parity, and 16% in greater parities. All 4 herds were managed in a confinement system and fed a TMR.

Table 1. Annual herd characteristics

	Herd			
Item	1	2	3	4
Annual cows[1]	157	93	154	132
Breed	Holstein	Holstein	Crosses[2]	Jersey
System[3]	Conventional	Organic	Organic	Organic
Milking system	Parlor	Robot	Parlor	Robot
Barn type	Cubicles	Cubicles	Deep litter	Deep litter
Milk per annual cow, kg	12,358	10,479	7,083	6,151
Mean fat, %	4.05	3.83	4.74	5.82
Mean protein, %	3.29	3.34	3.62	4.11
Milk per annual cow, kg of ECM	12,315	10,209	7,842	7,849
Replacement rate, %	52.0	32.4	38.8	29.4
Age at first calving, mo. (SD)	24.9 (2)	25.3 (2.4)	25.8 (1.2)	26.9 (3.3)
Calving interval primiparous, d (SD)	425 (59)	511 (77)	474 (45)	541 (111)
Calving interval multiparous, d (SD)	422 (51)	503 (108)	483 (45)	519 (115)
Planned short lactation length, mo. (d)	13 (395)	14 (426)	15 (456)	13 (395)
Planned long lactation length, mo. (d)	16 (487)	17 (517)	18 (548)	16 (487)

[1]One annual cow is an average cow fed for 365 d.

[2]Crosses of Holstein, Red Danish, and Jersey.

[3]Organic certification according to Danish standards.