

Assessment of Fertility Performance and Interrelationships with Production in German Dairy Herds

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Introduction

The perceived negative relationship between milk production and herd reproductive performance often drives management decisions in reproductive management. Study objectives were to characterize productive and reproductive performance of German dairy herds from different regions and evaluate relationships between herd lactational performance and various measures of herd fertility.

Materials and Methods

Raw milk production and reproductive events data ($n = 40,000$ lactations) were collected from German Breeding Test Organizations over a three year period (2004 to 2006). These data represented 138 herds from three geographic regions (north, $n = 16$; east, $n = 10$; south, $n = 116$) of Germany. Herd size ranged from 56 to 1,450 cows. Individual cow and herd fertility was characterized by calculated parameters of time to first service (TFS), services per conception (SPC), days open (DO), calving interval (CI), and conception risk (CR). Heat detection rate (HDR) and pregnancy rate (PR) were calculated for herds. Lactation performance parameters included milk per day (MPD), lactation yield (MY), milk fat (MF), milk protein (MP) and calculated milk fat-to-protein ratio (FPR). Milk parameters were summarized by days in milk groups of ≤ 40 (MPD40, MF40, FPR40), 41-to-80 (MPD80, MF80, FPR80) and >105 (MPD105, MF105, FPR105). Herds were categorized into quartiles for production and reproductive performance to determine if significant interactions were present. Interrelationships between production and reproductive parameters were analyzed using ANOVA and logistic regression models.

Results

Means (\pm SD, range) for TFS, DO and CI across all herds were 73.3 (\pm 17.9, 49-145), 102.4 (\pm 19.1, 73-194) and 388.7 (\pm 18.6, 361-477) days, respectively. Mean (\pm SD, range) proportions for CR, HDR and PR across herds were 0.37 (\pm 0.10, 0.22-0.81), 0.53 (\pm 0.18, 0.13-0.99) and 0.19 (\pm 0.05, 0.06-0.32), respectively. Region influenced TFS, SPC, DO, CI, CR ($P < 0.0001$) and HDR

($P = 0.0047$). Small (< 61 cows) and medium (61-150 cows) sized herds showed similar overall reproductive performance, though medium sized herds had shorter TFS, DO and higher PR compared to other herd sizes. Larger herds (> 150 cows) had the lowest reproductive performance and highest culling rate compared to other herds. Lactational performance (milk per day and rolling herd average) influenced TFS ($P = 0.02$), SPC ($P < 0.0001$) and CR ($P = 0.004$) and tended ($P = 0.07$) to influence DO and CI. Top 25% milk production (.19,900 lb; $>9,040$ kg) herds had greater ($P < 0.05$) TFS (81 d), SPC (1.99), DO (116 d) and CI (400 d) and lower ($P < 0.05$) CR (0.36) compared to lower production herds (71 d, 1.8, 98 d, 384 d, 0.37), respectively. Lowest 25% producing herds (.17,000 lb; $< 7,750$ kg) had greater ($P < 0.05$) DO and CI compared to the middle 50% production herds. Lowest CR (< 0.31) quartile had the highest milk per cow (53.2 lb; 24.2 kg/d) compared to all other quartiles. For every 4.4 lb (2 kg)/d increase in herd milk per cow, CR was decreased one percentage unit. Higher milk yield, irrespective of lactation stage, resulted in longer ($P < 0.001$) DO and CI compared to other milk production quartiles. Across MPD40 quartiles there was a linear increase ($P = 0.001$) in SPC and decline ($P = 0.01$) in CR. Cows with low (70 lb; < 31.8 g/kg) MF40 had longer TFS ($P = 0.0003$), DO ($P < 0.0001$) and CI ($P < 0.0001$). Cows with high FPR40 (> 1.44) or FPR80 (1.30) had longer DO ($P < 0.0001$, 0.001) and CI ($P = 0.0004$, 0.03), respectively. The higher FPR105 quartile (> 1.21) showed shorter ($P < 0.0001$) DO and CI, less ($P = 0.01$) SPC and greater ($P = 0.03$) CR compared to other quartiles.

Significance

The current study shows German dairy herds have similar challenges in herd reproductive performance. Observed regional and herd size differences reflect management decisions as well as physiologic challenges in achieving high milk production with good reproductive performance. Although data from the current study suggests a negative effect of high milk production on reproductive performance, there is also evidence that good reproductive performance can be achieved with high milk production.