Anna Bieber, María Lozano-Jaramillo, Michael Walkenhorst, Rennie C. Eppenstein
Research Institute of Organic Agriculture, Ackerstrasse 113, 5070 Frick, Switzerland

Fertility and health traits of dairy cows on farms with short versus long productive lifespan profiles

Introduction

- Milk yield increase in dairy cows was accompanied by decrease of productive lifespan in many dairy producing countries (Dallago *et al.* 2021)
- Publications at herd level on risk factors for culling are limited and the effects of farm characteristics and management practices on longevity in dairy cows are not yet fully established (Owusu-Seyere *et al.* 2023).
- We aimed at comparing fertility traits, and health indicators of Swiss dairy farms characterized by short versus long productive lifespans (SPL: 3.1 ± 0.4 vs. LPL: 5.3 ± 0.8 lactations)

Methods

- Data: herd book data from 2015-2020 of 142 farms which were selected to be representative for Swiss dairy production (Graphic 1) but contrasted by productive lifespan, of which 67 answered a questionnaire regarding farm practices and management routines in May 2021, 64 provided their veterinary treatment data for the period 1.1.2019-31.12.2020, and 30 were additionally visited during May to July 2021 to evaluate animal health traits
- Statistics: Wilcoxon-Mann-Whitney tests (continuous or Chi –square tests (for continuous or categorical variables) in R (R Core Team, 2020, Wickham et al., 2019)

Graphic 1. Division of Switzerland into 15 study regions with the characteristics assigned to each region in terms of production region (valley/hill or mountain), production system (organic= BioSuisse or conventional) and predominant breed

Results

- LPL farms showed lower number of inseminations per heifer (-0.24, P=0.0304), less days open (- 6 d, P=0.0256) and a shorter calving interval (-8 d, P=0.048), while number of insemination in cows did not differ by productive lifespan profile . Consistently, LPL farms had by tendency a lower proportion of antibiotic veterinary treatments due to fertility problems.
- LPL farms had a significantly higher average somatic cell score, and a significantly higher proportions of test day records with elevated somatic cell count (Table 1). However, this increase was smaller than what could be expected due to the age difference between contrasting productive lifespan profiles and was not associated with higher treatment incidences for clinical mastitis.
- Proportion of cows with abnormal locomotion (SPL: 15.7 ± 15.4 % vs. LPL: 15.4 ± 7.9 % , P = 0.395) and proportion of lame cows (SLP: 5.3 ± 5.2 % vs. LPL: 6.7 ± 5.0 % , P = 0.337) did not significantly differ between farms with contrasting productive lifespan profile
- Cow health management routines (e.g. regular advise by a veterinarian on fertility management, milking order based on udder health, routinely use of teat sealers, number of claw trimming events) did not differ significantly between farms of contrasting productive lifespans, apart from a slightly higher proportion of farms with LPL practicing abrupt drying off

Table 1. Comparison of mean values (± standard deviation) of udder health-related traits between Swiss dairy farms with short and long productive lifespan based on herd book data (2015 to 2020)

Trait[1]	Productive lifespan profile		P-value[2]
	Short (n=70)	Long (n=72)	
SCS	2.2 ± 0.5	2.5 ± 0.5	0.000186***
SCC100 (%)	30.2 ± 10.3	37.6 ± 11.9	0.000101***
SCC350 (%)	7.0 ± 3.8	9.1 ± 4.6	0.00509**

[1] SCS = average somatic cell score at lactation level, SCC100 = proportion of test day records above the threshold of 100.000 cells /ml milk, SCC350 = proportion of test day records above the threshold of 350.000 cells /ml milk
[2] P-values derived from the Wilcoxon- Mann- Whitney test, *P < 0.05, ** P < 0.01, ***P < 0.001

Conclusions

- a longer productive lifespan is not at the expense of health, even if the somatic cell count level increased with age
- a focus on fertility, udder and claw health is crucial when aiming at a long productive lifespan in dairy cows

References
Dallago, GM et al. (2021) Keeping dairy cows for longer: a critical literature review on dairy cow longevity in high milk-producing countries. Animals 11, 808.
Owusu-Sekyere, E et al. (2023) Dairy cow longevity: Impact of animal health and farmers' investment decisions. Journal of Dairy Science 106, 3509-3524, https://doi.org/10.3168/jds.2022-22808.
R Core Team (2020) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria, https://www.R-project.org/
Wickham, H et al. (2019) Welcome to the tidyverse. Journal of Open Source Software,4(43), 1686. doi:10.21105/joss.01686.

Acknowledgments
We thankfully acknowledge financial support by the Federal Office for Agriculture (OFAG, contract number: 627001582, Switzerland, main founder), the Association of Swiss Cattle Breeders (ASR, Zollikofen, Switzerland), Bio Suisse (Basel, Switzerland), Fondation Sur-la-Croix (Basel, Switzerland), IP-Suisse (Zollikofen, Switzerland), Migros (Zürich, Switzerland), and Schweizer Milchproduzenten Swissmilk (SMP, Berne, Switzerland). We also thank Braunvieh Schweiz (Zug, Switzerland), Swissherdbook (Zollikofen, Switzerland), Holstein Switzerland (Posieux, Switzerland), the Federal Food Safety and Veterinary Office (FSVO, Berne, Switzerland), Rindergesundheit Schweiz (RGS, Zurich, Switzerland), Schweizer Tierschutz (STS, Basel, Switzerland), Schweizerische Vereinigung für Wiederkäuergesundheit (SVW, Berne, Switzerland), and Agroscope (Switzerland) for their support during workshops and following discussions in defining the final dataset. We thank Qualitas AG (Zug, Switzerland) for preparing and providing herd book data. We warmly thank all farmers participating in this study.