Abstract Submission Form

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Preferred presentation   Oral

Preferred session   Session 10: New approaches in the field of functional traits for management and breeding

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Title of your paper   Calculating resilience indicators in US Holstein cows using pen-level data

Insert ABSTRACT text

Resilience is defined as an animal's capacity to bounce back to normal functioning after a perturbation or maintain specific functions in the face of change or stress. US dairy herds typically group cows into pens based on factors such as parity, lactation stage, reproductive status and milk production. By coupling daily milk yield data with day-to-day pen location information, we can more precisely model management conditions and environmental stressors affecting individual cows for each day of the lactation. It also allows us to detect management and environmental perturbations that may occur each day at the pen level and subsequently measure the responses of individual cows to these stressors. Our dataset included daily milk weights and pen locations of 4,183 primiparous cows in 10 US herds from 2018 to 2023. Individual lactation curves were fitted using polynomial quantile regression with a 0.5 quantile to derive expected lactation curves. Our resilience phenotype was defined as the percentage change in daily milk production for a cow on a given day relative to her preceding 7-day average. Perturbed days were identified based on residuals between expected and observed daily milk yields and such days had 70% or more negative residuals for at least 5 consecutive days in a given pen. The statistical model included age at first calving and herd-pen-milking-date as fixed effects and additive genetic and permanent environmental as random effects. Estimated heritability of relative change in milk production

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on perturbed days was 0.08 (0.02), while estimated repeatability was 0.41 (0.01). Our findings suggest that animals differ in their response to perturbations at the pen level, and this measure of resilience in daily milk yield is heritable and repeatable. Identifying perturbations at the pen level on specific days can more effectively capture the management and environmental conditions affecting an individual cow at a given time, and resilience can be measured by comparing how her response differs from that of her contemporaries, which enables producers to make more informed decisions through selection and management strategies.

Enter keywords   resilience, pen-level perturbations, daily milk weights

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