Selection for feed efficiency and its consequences on fertility and health in Austrian Fleckvieh

A. Köck[1], M. Ledinek[2], L. Gruber[3], F. Steininger[1], B. Fuerst-Waltl[2] and C. Egger-Danner[1]
[1]ZuchtData EDV-Dienstleistungen GmbH, Dresdner Str. 89, 1200 Vienna, Austria, [2]University of Natural Resources and Life Sciences, Dep. Sustainable Agricultural Systems, Div. of Livestock Sciences, Gregor-Mendel-Str. 33, 1180 Vienna, Austria, [3]Agricultural Research and Education Centre Raumberg-Gumpenstein, Raumberg 38, 8952 Irdning, Austria; astridkoeck@gmx.net

This study is part of a larger project, the overall objective of which is to evaluate the possibilities for genetic improvement of efficiency in Austrian dairy cattle. In 2014 a one-year data collection was carried out. Data of approximately 5,400 cows (3,100 Fleckvieh (dual purpose Simmental); 1,300 Brown Swiss; and 1000 Holstein) kept on 167 farms were recorded. In addition to routinely recorded data (e.g. milk yield), data on new traits like body weight, body condition score, lameness, claw health, subclinical ketosis and data about feed quality and feed intake were collected. The specific objective of this study was to estimate genetic parameters for efficiency traits and to investigate their relationships with fertility and health in Fleckvieh cows. The following feed efficiency traits were considered: ratio of milk output to metabolic body weight ($ECM/BW^{0.75}$), ratio of milk output to dry matter intake (ECM/DMI) and ratio of milk output to total energy intake (ECM/INEL). Heritabilities of feed efficiency traits were moderate and ranged from 0.11 for ECM/INEL to 0.18 for ECM/DMI. More efficient cows were found to have a higher milk yield, lower body weight, slightly higher dry matter intake and lower body condition score. Cows with a higher efficiency had a longer calving interval and higher frequency of fertility disorders. Higher efficiency was, however, associated with a slightly better claw health due to the lower body weight of the cows and lower culling rate. Overall, cows with a medium efficiency combine both a high milk yield with good fertility and health.

Dairy cow robustness in fluctuating environments via trade-off analysis of life functions

L. Barreto Mendes, J. Rouel, B. Dumont, B. Martin, A. Ferlay and F. Blanc
INRA 1213 UMRH – VetAgro Sup, Centre de Recherche de Auvergne-Rhone-Alpes, 63122, Saint-Genès-Champanelle, France; luciano.mendes@inra.fr

With climate change and its implications on livestock systems, dairy herds reared based on natural grasslands are especially susceptible. Grassland-based systems are exposed to highly unpredictable fluctuations in terms of diet quality and quantity as well as to other environmental challenges such as thermal stress. In this context, we consider that a livestock system transition towards robustness is crucial. We assume that animal robustness is a function of genotype (breed), management and interactions between genotype and environment that generate individual variability. In this study, we describe a process that allows assessing the life functions trade-offs of individuals facing fluctuating environment, and we calculate an overall individual animal robustness factor (R). The proposed methodology was applied to a database comprising 435 dairy cows of three breeds (160 Prim'Holstein, 200 Montbeliarde and 75 Tarentaise), and a total of 1,174 lactations. The database included variables representative of life functions related to animal productivity (milk yield, fat and protein content, dry period duration), health status (body weight & condition, mastitis and lameness) and reproductive performance (success of insemination, calving interval). The statistical algorithm for calculation of overall robustness (R) consisted in the following steps: (1) linear mixed modeling procedures to model life functions with significant variables; (2) scenario analyses, where models are then used to predict deviations in life functions under nutritional or environmental changes as compared to average conditions; (3) trade-off analysis and (4) determination of the appropriate formula to estimate of R. First results indicate that milk yield is the function most negatively affected by nutritional variability, whatever the breed. Conversely, body weight remained stable across lactation cycles for all breeds, except for Tarentaise, which presented a slight increase in body weight when moving to extreme nutritional conditions. Future research will use the R indicator for identifying animal profiles and system-management practices that are the more resilient to various types of perturbations.