22. **Prediction equations for feed intake of lactating dairy cows** (Schätzgleichungen zur Vorhersage der Futteraufnahme von Milchkühen). L. Gruber*, F.J. Schwarz, D. Erdin, B. Fischer, H. Spiekers, H. Steingaß, U. Meyer, A. Chassot, T. Jilg, A. Obermaier and T. Guggenberger – Irdning / Freising / Zürich / Iden / Bonn / Stuttgart / Braunschweig / Posieux / Aulendorf / Poing

Feeding dairy cows according to their nutrient requirements is of great physiological, economical and ecological importance. Therefore, in order to design rations which meet those requirements, an accurate estimate of the animals' feed intake is a prerequisite.

Materials and methods: A database was assembled from feeding experiments carried out at 10 research institutes and universities in Germany, Austria and Switzerland (n=31,865 from 2,151 different cows). The data is characterised by a wide variation in both animal parameters as well as nutritional factors.

Animal factors: 3 breeds (<u>Si</u>mmental, <u>B</u>rown <u>S</u>wiss, <u>H</u>olstein <u>F</u>riesian), parity (2.7 ± 1.7, $1 - 12$), days of lactation (138 ± 78, $2 - 459$), live weight [LW] (634 ± 75, $398 - 999$ kg), milk yield (24.3 ± 8.1, $2.2 - 60.6$ kg), IT_{forage} (13.0 ± 3.1, $3.6 - 31.3$ kg DM), IT_{total} (18.5 ± 3.5, $5.4 - 31.6$ kg DM).

Nutritional factors: energy concentration of forage (5.9 ± 0.5, $4.1 - 7.4$ MJ NEL), proportion of hay in forage ration (23 ± 27, $0 - 100$ %), proportion of grass silage in forage ration (35 ± 28, $0 - 100$ %), proportion of maize silage in forage ration (31 ± 27, $0 - 100$ %), proportion of fresh grass in forage ration proportion (10 ± 25, $0 - 100$ %), concentrate level [ITc] (5.5 ± 3.7, $0.0 - 16.4$ kg DM).

Calculations and statistics: The data of long-term trials were divided into periods of 2 weeks to allow for influence of stage of lactation. The statistical analysis was carried out using procedure GLM of SAS (1999). The prediction equations were validated following the principles of Bibby & Toutenburg (1977), i.e. partitioning the variance into bias, regression and disturbance, based on 20 % of the data.

Results and conclusions:

IT_{total} = ((−0.557 + [COUNTRY · BREED] + PARITY + LACTATION
+ b_{LW} · LW + b_{MILK} · MILK + b_{ITc} · IT_c + 0.983 · NEL_f
+ 0.01154 · Hay% + 0.00699 · Maizesilage% + 0.00558 · Freshgrass%
+ 0.2053 · (XP/NEL) − 0.002266 · (XP/NEL)²) · 0.932) + 0.38

R^2 = 87.0, RSD = 1.30 kg DM (7.0 %) [ESTIMATION]; R^2 = 74.0, RSD = 1.77 kg DM (9.6 %) [VALIDATION]

[COUNTRY · BREED]= −2.570, −2.006, −2.604, −1.573
for breed = SI, BS, HFm, HFh in Germany and Austria, respectively
HFm and HFh = medium and high management level for HF farms
[COUNTRY · BREED]= −0.371, −0.959, 0.000 for breed = SI, BS, HF in Switzerland, respectively
PARITY = −0.767, +0.261, 0.000 for parity = 1, 2+3, ≥4, respectively
LACTATION = −4.224 + 4.088 · (1 − exp(−0.01583 · day of lactation))

b_{LW} = 0.0142 − 0.0000431 · day of lactation + 0.0000000763 · (day of lactation)²
b_{MILK} = 0.0723 + 0.0008151 · day of lactation − 0.000001065 · (day of lactation)²
b_{ITc} = 0.6856 − 0.0021353 · day of lactation + 0.0000038023 · (day of lactation)²

Using a mixed linear model (fixed effects of [country · breed], parity, month of lactation together with individual regression variables like live weight, milk yield, concentrate intake within month of lactation as well as NEL content of forage, forage composition and XP/NEL-ratio) resulted in R^2 = 87.0 % and RSD = 1.30 kg DM. The value of the regression coefficients changes during lactation due to the change of importance of physical and physiological feed intake regulation.
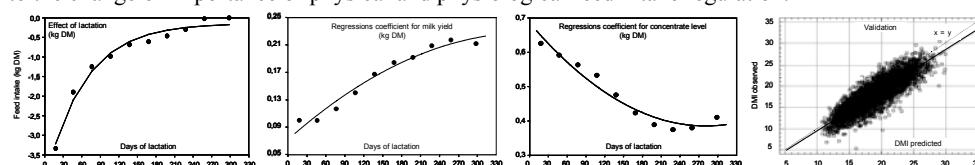
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