Net energy intake model as a function of dietary chewing index


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The aim of this presentation was to present the results of studying a possible linear relationship between net energy intake (NEI) and dietary chewing index (CI) of dairy cows, the quadratic relationship between the slope and intercept, and the forage-to-concentrate substitution rate in a new NEI model. The study included means of intake per treatment group from 14 Nordic production experiments with a total of 986 primi- and multiparous lactating dairy cows of different breeds fed 136 different diets ad libitum. The CI of the diets was adjusted for BW and forage NDF intake (CI_cor) different from the standard used in NorFor. The relationship between NEI and CI_cor was modelled nonlinearly, using the equation NEI = NE0 – k×NE0a×CI_cor, where NE0 is considered as the theoretical intake capacity of the cows fed without physical constraints on intake. The parameter k represents the decline in NEI with the increasing dietary CI_cor values, and the exponent a defines the relation between the decline and the NE0; when a = 2, results in a constant maximum daily chewing time (CT_max) of 819 minutes per day. The NEI model implies a decreasing forage-to-concentrate substitution rate increasing NE0 and an increasing substitution rate at increasing concentrate supplementation. The model is considered to be valid for NEI higher than ½*NE0 and for diets with a CI_cor value higher than 3 min/MJ NE, which is considered to represent the range of partly metabolic and partly physical constraints on intake. The NE0 was parameterised from animal characteristics as a linear function of energy corrected milk yield (ECM), days in milk (DIM), DIM2, and a non-significant effect of metabolic body size (BW0.75). Prediction accuracy was evaluated by mean square prediction error (MSPE), root mean square prediction error (RMSPE), and decomposition of error into central tendency (ECT), regression (ER), and disturbance (ED), across experiments on independent data from 19 experiments including 812 primi- and multiparous lactating dairy cows of different breeds fed 80 different diets ad libitum. The NEI-model was evaluated and compared together with the NorFor intake model. The models predict NEI similarly with an RMSPE of 11MJ NE/day. Evaluated across the 19 experiments the ECT, ER and ED for the NEI and NorFor models were 4.2% and 11%, 11% and 41% and 85%, and 49% of MSPE, respectively. The residual NEI values were positively related with the CI_cor values in both models; residual NEI from the NorFor model was furthermore negatively related to ECM and body weight, but no significant relations were found for the NEI-model.