

Independent effects of chemical fibre and physical fibre on dairy cows

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Fibre effectiveness has been defined by physically effective fibre (peNDF), which is the product of neutral detergent fibre (NDF) and the fraction of feed particles retained on a 1.18-mm sieve. To evaluate the concept of peNDF for predicting cow responses, a meta-analysis was performed to assess the independent and interaction effects of NDF and physical fibre (PF). A database was compiled from 24 published experiments (exp) that were designed as 2x2 or 2x3 factorial arrangement using lactating dairy cows and 104 (n) treatments where dietary NDF and PF were reported. Forages were long, chopped or grounded. Dietary NDF averaged $35.3 \pm 7.1\%$ of dry matter (DM). Two PF were considered: particles retained on a 2-mm sieve (P2; $42.4 \pm 15.5\%$ DM, n=40) or on 19-mm and 8-mm sieves of the Penn State Particle Separator (pef8; $49.5 \pm 12.7\%$ DM, n=36). Meta analyses were carried out using GLM procedure including the effects of experiment, NDF, PF and the interaction.

Effect of experiment was systematically significant. The analyses on pef8 resulted to residual standard deviation (LSD) low, whereas, the root mean square error (RMSE) was often high due to low number of database. When the pef8 was significantly associated to the NDF, the prediction for the variables of DM intake (DMI), chewing and rumen pH was better than that using peNDF (*i.e.*, product effect). The two fibres affected DMI, chewing and rumen pH in a way of coherence. Interaction of NDF with PF on chewing time (min/d) was significant; chewing (min/d) = $3.9 + 0.25\text{NDF} + 3.73\text{PF} - 0.10\text{NDF}*\text{PF}$ (exp=13, n=66, R=0.86, RMSE=0.12). The effects of NDF and PF on rumen pH were additive, pH = $5.19 + 0.03\text{NDF} + 0.09\text{PF}$ (exp=14, n=56, R=0.82, RMSE=0.025). There was no effect of PF and pef8 on milk fat (MF% = $3.01 + 0.014\text{NDF}$, exp=17, n=72, R=0.12, RMSE=0.026).

Implication: the effects of NDF and PF appeared to be additive in published trials, which questions the principle and the validity of their product (peNDF) for predicting lactating cow responses.