Session IV: Nutrition and Gut Health I

207 Estimated metabolizability of diets fed to lactating dairy cows containing Immunis[3] or yeast culture.

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Lactating dairy cows were allocated into one of 2 groups at approximately 25 d post-calving to evaluate effects of products containing either hydrolyzed yeast, live yeast, lactic acid bacteria (LAB) and digestive enzymes (Immunis[3], I3) or yeast culture (YC) on feed intake and milk energy content. Dry matter intakes for either group were determined daily using a commercial utility (Feed Watch), individual milk production and composition were determined every 14 d. Intake energy (IE, Mcal/cow·d^{-1}) was calculated from diet composition and milk energy content (LE, Mcal/cow·d^{-1}) from milk production (kg/d) and composition (fat, protein and lactose). Intake energy was partitioned into that required for maintenance functions and LE; estimates of metabolizability (Q), maintenance (ME_m) and efficiency of ME use for lactation (k_l) were determined using a non-linear model. It was assumed that neither k_l nor ME_m differed between groups and, if differences existed, they were due to differences in Q for cattle fed either I3 (Q_{I3}) or YC (Q_{YC}). Variability in parameter estimates Q, ME_m and k_l were evaluated using Markov Chain Monte Carlo (MCMC) simulation. Ten runs (2,500 simulations) were performed; the first 1000 of each were excluded from analysis. Intake energy for I3 was 110 Mcal/d and for YC, 113 Mcal/d ($P = 0.087$), LE for I3 was 32.9 Mcal/d and for YC, 32.6 Mcal/d ($P = 0.350$). Gross efficiency of energy utilization (LE/IE) was greater ($P < 0.001$) for I3 (0.300) than for YC (0.288). Non-linear estimates of Q_{I3} and Q_{YC} were 0.730 and 0.690, respectively; k_l was estimated to be 0.562 and ME_m, 22.0 Mcal/d, which is approximately $0.160W^{0.75}$. Markov Chain Monte Carlo estimates of ME_m and k_l were 30.0 Mcal/d and 0.762; the former is approximately $0.220W^{0.75}$ Mcal/d. While MCMC estimates of ME_m and k_l are greater than those determined using conventional linear procedures, ME_m is consistent with non-linear estimates of maintenance in growing beef cattle and k_l is less than the theoretical maximum (0.79). Metabolizability estimates, from MCMC simulations, were 0.667 (Q_{I3}) and 0.632 (Q_{YC}) and were different ($P < 0.001$). Estimated IE were 110 Mcal/d (I3) and 115 Mcal/d (YC), observed IE were 110 Mcal/d (I3) and 113 Mcal/d (YC). The model accounted for 99.8 percent of the variability in IE for I3 cows and 102 percent of the variability in IE for YC cows. Adjusting Q_{YC} to account for 100 percent of the variability for YC gives a value of 0.642, still different ($P < 0.01$) from Q_{I3}. Because IE × Q = ME, increases in Q are indicative of reduced fecal, urinary and gaseous energy losses consistent with the role of hydrolyzed yeast, yeast and LAB in enhancing utilization.

Key Words: metabolizability, lactic acid bacteria, yeast culture

208 Influence of diet's physical form (feed grinding/compaction) on colonization and spread of *Salmonella* Enteritidis in experimentally infected broiler chicks.

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Zoonotic diseases due to food of animal origin, in particular infections with *Salmonella* spp. are of major public interest. As a result the pressure on livestock production to ensure food safety increases ("from farm to fork"). The hypothesis of this study was that a coarse feed structure, determined by grinding and further treatment, may decrease the spread of infection and therefore should lower *Salmonella* prevalence in poultry flocks. A total of 312 male broilers (Ross 708; 7 d old) in 3 consecutive trials were fed 1 of 4 botanically and chemically identical diets, which only differed in grinding and further compaction. Only two 14-d-old broilers per group were inoculated directly into the crop with *Salmonella* Enteritidis (10^8 cfu; SE 147; Methner et al., 1995 J. Vet. Med. B 42:459–469) and placed back into the group ("seeder birds"). The spread of infection was measured by cloacal swabs (on d 2, 4, 6, 13 postinfection) and by cecal content and liver tissue samples taken at 21.5 and at 35.5 d of age in average. Each sample was analyzed for *Salmonella* Enteritidis after qualitative enrichment. To follow up the spread of the infection in each group, only the contact birds were monitored and therefore their data are exclusively shown in Table 1. According to this study only the diet including 22% whole wheat significantly reduced the spread of infection and the frequency of colonization and translocation of *Salmonella.* species. The causative mechanisms are, in contrast to pigs, still in debate and need further investigations for elucidation. This project was supported by the Federal Ministry of Food, Agriculture and Consumer Protection of Germany based on a decision of the Parliament of the Federal Republic of Germany

Table 1. Characterization of the experimental diets (13 MJ of ME; 234 g of XP/kg of DM) and results of *Salmonella* spp. testing of cloacal swabs, cecal content and liver tissue

	Pellet			
Item	Fine	Coarse	Whole wheat	Extrudate
Grinding form/intensity[1]	HM (fine)	RM[2] (coarse)	HM (fine) + 22% whole wheat[2]	RM (coarse)
Compaction	pellet	pellet	pellet	extrudate
Particle size distribution[3] (% of DM)				
>1 mm	12.4	38.8	30.7	19.4
<0.2 mm	42.9	32.4	37.3	58.9
Birds with proof of *Salmonella* (%)	47.2[b]	52.2[ab]	30.0[c]	65.6[a]
Cecal content (%)	23.6[a]	37.7[a]	10.0[b]	36.1[a]
Liver tissue (%)	26.4[a]	31.9[a]	11.4[b]	34.7[a]

[ab]Denotes statistical differences between the groups ($P < 0.05$).
[1]HM = hammer mill; RM = roller mill.
[2]Added before pelleting.
[3]By wet sieve analysis (extrudate: modified wet sieve analysis).

Key Words: feed structure, whole wheat, *Salmonella*