

rDNA. Two species could be isolated in pure culture, not producing equol. Isolation of the two other species is currently being performed. Further investigation of the consortium showed that hydrogen gas and SCFA, intestinal metabolites of dietary carbohydrates, stimulate equol production. Especially hydrogen gas played an important role, probably as an electron donor.

Metabolism of the soy isoflavonoid daidzein into equol by the microbial community from the human gut. J. Mathey^{a,b}, V. Lamothe^c, C. Bennetau-Pelissero^c, V. Coxam^b, A. Bernalier-Donadille^a (^a Unité de Microbiologie, INRA, CR de Clermont-Ferrand/Theix, 63122 Saint-Genès-Champanelle, France; ^b Unité des Maladies Métaboliques et Micronutriments, INRA, CR de Clermont-Ferrand/Theix, 63122 Saint-Genès-Champanelle, France; ^c Unité Micronutriments, Reproduction, Santé, ENITA de Bordeaux, 33175 Gradignan Cedex, France).

Isoflavonoids, diphenols found in legumes, are recognised for providing health benefits. These phytoestrogens remain a source for putative new and innovative dietary health intervention to prevent a wide range of hormone-dependent diseases. Ingested isoflavonoids are mainly converted in the colon by the intestinal microflora. This biotransformation is essential for providing highly estrogenic and anti-oxidant metabolites. In this context, daidzein, one of the main isoflavonoids found in soybeans in its glycoside form, daidzin, is known to be metabolised by the gut microflora into the powerful compound equol. The ability of the intestinal microflora to produce equol is known to be subjected to important inter-individual variations. However, little is known regarding this microbial status and the bacterial population involved. The objective of our study was to investigate the microbial community responsible for equol production from soybean daidzein in the colon of equol-producing and non-equol-producing women ($n = 15$). The baseline level of the equol-producing flora (i.e. diet without soybean supplementation) was close to 10^6 – 10^7 ·g⁻¹ faeces in equol-producing subjects whereas this population remained undetectable ($< 10^3$ ·g⁻¹ faeces) in non-equol-producing ones. Supplementation of the diet with soybean (100 mg·day⁻¹) for 30 and 60 days increased significantly the level of this bacterial

population in equol-producing individuals. The effect of soybean supplementation was further amplified by the addition of a prebiotic or a probiotic. Enrichments of the equol-producing community were obtained from different faecal specimens. Microbial and metabolic characterisations were further carried out on one enrichment, maintained *in vitro* for 2 years. The kinetics of daidzein transformation seemed to be dependent on H₂ transfer. The bacterial community appeared to be composed of a relatively restricted number of species that were further isolated in pure cultures. Some strains were able to transform daidzein into a compound that chemically resembled equol.

Effect of different environmental conditions on fermentation end-products in colon of suckling piglets. A. Awati^a, B.A. Williams^a, M. Bosch^a, B. Miller^b, K. Haverson^b, D. Patel^b, M.W.A. Verstegen^a (^a Animal Nutrition Group, Wageningen Institute of Animal Sciences (WIAS), Wageningen, The Netherlands; ^b Department Clinical Veterinary Science, University of Bristol, Langford House, Langford, Bristol, UK).

For an *in vivo* study, seven litters were selected, after farrowing. Ten piglets from each litter were randomly divided into two groups of five piglets following one day of colostrum suckling. One group was kept in an SPF isolator (ISO). They were fed a milk replacer hourly to mimic normal suckling behaviour. The environmental conditions were controlled. The second group was kept with the sow on the farm (FM), and was therefore potentially exposed to a wide range of pathogenic, dietary, social and environmental influences. Two piglets (one from each group) were slaughtered at 2, 5, 10, 21 and 28 days of age. Samples were collected from the colon contents of all animals for DM, VFA and ammonia analysis. Combining results from all time intervals, the DM of colon contents was higher in FM piglets compared to ISO piglets. Total VFA concentration was higher in FM piglets, though not significantly different. Acetic acid was proportionally higher for ISO piglets (60% of total VFA) compared to that of FM piglets (48%). On the other hand, propionic acid (16%) and butyric acid (9%) for ISO piglets was proportionally lower than that of FM piglets (19% propionic and 14% butyric acids). BCFA (*iso*-butyric and *iso*-valeric), usually considered an end-product

of protein fermentation, were proportionally higher in the FM group. Ammonia concentration was also significantly higher in the FM group. These results suggest that the environmental conditions from the time of birth to weaning may affect the microbial activity of the colonic microbial population.

Characterising the fermentation capabilities of gut microbial populations from cattle and sheep grazing heathland forage using gas production. D.R. Davies, M.D. Fraser, V.J. Theobald, A.E. Brooks (Institute of Grassland and Environmental Research, Plas Gogerddan, Aberystwyth, SY23 3EB, UK).

A gas production experiment, as part of a larger programme developing management regimes for the regeneration of heather moorland, was conducted to determine the effects of substrate and breed on the rumen fermentation characteristics of cattle and sheep grazing *Calluna* heath. Samples of *Calluna vulgaris* (Heather) and *Nardus stricta* dominated semi-natural grazing (Grass) were cut as substrate, from an area which two breeds each of sheep and cattle had grazed. Faeces was collected from six animals per type and diluted (1:1 w/v) in medium, and used as inoculum. The fermentation data showed Grass substrate had significantly ($P < 0.001$) shorter lag time and greater total gas pool size and DM loss than Heather substrate. There were significant differences between animal species, but few differences between animal breeds within species. For Heather substrate only DM loss was ($P < 0.001$) different between animal types, with greater digestion for the sheep inocula. All fermentation parameters were significantly different between animal species for the Grass substrate, with the initial and secondary rates and final DM losses significantly ($P < 0.001$) higher for sheep inocula. In conclusion, the data confirm that heath grasses are more digestible than heather. The data indicate that sheep and cattle possessed gut microflora showing different activities, despite being exposed to the same forage. These results alongside corresponding diet selection and intake data will be used to quantify the consequences of different foraging strategies, which will be incorporated into models developing grazing guidelines for heather moorland.

Nutrient utilisation, blood constituents and growth performance of growing lambs fed varying concentrate levels. M.K. Tripathi^{a,b}, O.H. Chaturvedi^a, B.M. Goyal^a, S.A. Karim^a, V.K. Singh^a (^a Central Sheep and Wool Research Institute, Avikanagar (via- Jaipur) Rajasthan, 304 501 India; ^b Present address: UEPSD, Bât. 440, INRA, Jouy-en-Josas 78352, Cedex, France).

High concentrate diets improve growth performance and lower the cell wall degradation in the rumen because of a shift in rumen microbiota from cellulolytic to amylolytic. A lower ruminal pH decreases the protozoa population and subsequently increases bacterial biomass thus improving ruminant energy utilization. Under three feeding regimens comparing 1.5 and 2.5% of live weight concentrate allowances, and ad libitum with free access to roughage (*Zizyphus nummularia* and *Albizia lebback*, leaves 50: 50), the lambs consumed 85 parts of concentrate, when given free access to concentrate and roughage. Interestingly acidosis did not occur and ruminal pH was above 6.0 among the three groups. Nutrient intake, digestibility and growth improved with increased concentrate intake. Cell wall utilization was also higher ($P < 0.001$) in the lambs consuming 85 percent concentrate compared to restricted concentrate feeding. Average daily gain was 77.2, 97.6 and 150.7 g, respectively in lambs fed concentrate 1.5, 2.5% of live weight and ad libitum. ME intake 56.8 MJ for each kg live weight gain was lower in lambs fed a high concentrate than in those given a restricted quantity. Apparent nitrogen retention and absorption was also higher ($P < 0.001$) in lambs having free access to concentrate. Blood metabolites did not differ and were within normal range of variation among the three groups. Higher cell wall utilization was expected under the restricted concentrate feeding regimen, however, we observed poor cell wall utilization. Probably higher *Zizyphus nummularia* leaf intake caused a lower nitrogen pool in the rumen thus restricting rapid rumen microbial turnover. *Zizyphus nummularia* leaves are known for higher tannin content, while *Albizia lebback* leaves contain higher ash that also limits microbial growth and promotes a faster rate of passage. The tannins and ash contents of the roughage source might have regulated the rumen pH under high concentrate intake. Therefore, the nature of roughage feeding is detrimental under a high concentrate feeding regimen for fat lamb production.