when variation in kd was taken into account. For the NRC model, the ranking of critical inputs was, for diet 1, SBM kd (r=-0.5), CS A fraction (r=-0.34), and dried corn kd (r=-0.25), for diet 2, SBM kd (r=-0.55), grass hay CP (r=0.32), and dried corn kd (r=-0.31). For the CNCPS, the ranking was, for diet 1, SBM kd of B2 pool (r=-0.5), dried corn kd (r=-0.26), and WB CP (r=0.26), for diet 2, SBM kd (r=-0.52), grass hay CP (r=0.36), and dried corn kd (r=-0.35). One SD increase (1.5 %/h) in SBM kd resulted in a 0.5 SD decrease in MP from RUP (Diet 1 SD= 153 g, Diet 2 SD=208 g), while for the CNCPS model, 1 SD increase (4 %/h) in kd for SBM B2 kd resulted in a $>$ 0.5 SD decrease (Diet 1 SD=136 g, Diet 2 SD=177 g). Because of the intrinsic variation in kd measurements and the sensitivity of the current models, research is needed to improve the methodology used to obtain kd.

	Diet 1			Diet 2		
	CNCPS1	CNCPS2	NRC	CNCPS1	CNCPS2	NRC
MP milk from RUP	1.9	2.8	3.1	2.2	3.6	4.2
MP milk from Met in RUP	2.2	2.9	1.8	2.3	3.0	4.2
MP milk from Lys in RUP	1.4	2.2	2.4	1.3	2.6	2.7

Key Words: Nutritional Models, Monte Carlo, Digestion Rates

Ruminant Nutrition: Dairy - Fats

622 Effect of rumen protected conjugated linoleic acid on energy metabolism of dairy cows during early to mid-lactation. K. J. Shingfield*[1], D. E. Beever[1], C. K. Reynolds[1], S. K. Gulati[2,3], D. J. Humphries[1], B. Lupoli[1], G. Hervas[1], and M. J. Griinari[4], [1]*Centre for Dairy Research, University of Reading, Reading, UK,* [2]*University of Sydney, Sydney, Australia,* [3]*Rumentek Pty Limited, Australia,* [4]*University of Helsinki, Helsinki, Finland.*

Trans-10, cis-12 conjugated linoleic acid (CLA) inhibits milk fat synthesis and reduces milk energy content. Controlled decreases in milk energy secretion could be used to improve energy balance of the dairy cow during early lactation. Twelve multi-parous Holstein-British Friesian cows were used in a randomized block study to evaluate the effects of rumen protected CLA (RCLA) on energy metabolism in early lactation. Supplements were prepared by casein-formaldehyde treatment of CLA methyl esters containing equal amounts of cis-9, trans-11 and trans-10, cis-12. At calving, cows were paired and allocated at random to a control diet (C) or the same diet supplemented with 110 g of RCLA that supplied 14.3 g trans-10, cis-12 CLA/d. Energy balance (MJ/d) was estimated during weeks 3, 7, 11 and 15 of lactation using 6d excreta collection and respiration calorimetry. On average, RCLA reduced milk fat content (34.9 vs. 19.2 g/kg; P<0.001) and milk fat yield (1395 vs. 901 g/d; P<0.001), increased (P<0.05) milk yield (40.3 vs. 47.4 kg/d) and milk protein output (1.25 vs. 1.42 kg/d) and tended to increase DMI (22.2 vs. 24.6 kg/d; P=0.06) and BW (614 vs. 661 kg; P=0.11). The effects on DMI and production occurred within one week of lactation. RCLA increased (P=0.08) energy intake (389 vs. 434, for C vs. RCLA, respectively), but had no effect (P>0.10) on estimated heat energy (155 vs. 169), milk energy (112 vs. 103) or energy excreted in methane (25.0 vs. 26.0), urine (11.1 vs. 11.0) or feces (108 vs. 119). However, RCLA improved (P<0.05) tissue energy balance (-17.1, 8.5, 6.6 and 24.4 at weeks 3, 7, 11 and 15 of lactation, respectively) compared with C (-53.1, -19.3, -8.2 and -6.5). In conclusion, RCLA decreased milk fat content, increased milk production and improved tissue energy balance of dairy cows during the first 15 weeks of lactation, with evidence of improved tissue N retention (19 vs. 42 g/d; P = 0.05). In contrast to the effects in growing mice, heat energy/BW.75 was not affected (1.26 vs. 1.30).

Key Words: Conjugated Linoleic Acid, Energy Metabolism, Dairy Cows

623 Effects of dietary CLA on production parameters and milk fatty acid variables in Holstein and Brown Swiss cows during heat stress. C. E. Moore*, H. C. Hafliger III, O. B. Mendivil, R. J. Collier, and L. H. Baumgard, *University of Arizona, Tucson.*

Heat stressed dairy cattle are bioenergetically similar to transition cows in that dietary intake may be inadequate to support maximum milk and component synthesis. Objectives were to evaluate whether CLA induced milk fat depression (MFD) during heat stress would allow for increased milk production and component synthesis. In addition, CLA effects on production variables, MFD and milk composition were compared between Holstein and Brown Swiss cows. Multiparous cows (n = 8, Holstein; n = 5, Brown Swiss) averaging 97 $\pm$ 17 DIM were used in a crossover design during the summer (mean THI = 75.7). Treatment period lengths were 21 d with a 7 d acclimation period prior to and between periods. During acclimation periods all cows received EnerGII® (a supplement of palm fatty acid distilla; Bioproducts Inc., Fairlawn, OH). Dietary treatment consisted of either 250 g/d of CLA (Bioproducts Inc.) or EnerGII. The CLA supplement contained a variety of CLA isomers (5.4% trans-8, cis-10; 6.3% cis-9, trans-11; 7.9% trans-10, cis-12; and 8.2% cis-11, trans-13 CLA). Treatment was applied 2x/d with half of the supplement top dressed at 0600 h and the remaining at 1800 h. There was no overall treatment effect on DMI (23.9 kg/d), milk yield (40.0 kg/d), SCC (305,000), protein% (2.86) or lactose% (4.52) or yield of these milk components. CLA supplementation decreased (P $<$ 0.01) overall milk fat content and yield by 21 and 24%, irrespective of breed. The reduction of milk fat content and yield was greater on d 21 (28 and 37%, respectively). Energy balance was improved (P $<$ 0.01) by 3.1 Mcal/d for the CLA group (-1.1 vs. 2.03 Mcal/d, respectively). Respiration rate (78 breaths/min) and skin temperature (35.4°C) were not affected by treatment. The CLA supplemented group had higher total milk fat CLA concentrations (8.3 vs. 4.8 mg/g). CLA supplementation caused MFD similarly between breeds and improved energy balance during heat stress, but had no effect on production parameters under these conditions.

Key Words: CLA, Milk Fat, Heat Stress

624 Effects of source and level of dietary lipid on in vitro production of conjugated linoleic acid and trans vaccenic acid. X. Qiu*[1], K. E. Griswold[2], G. A. Apgar[1], D. W. Murdach[1], E. D. Frantz[1], D. L. Hastings[1], and B. N. Jacobson[1], [1]*Southern Illinois University, Carbondale,* [2]*Penn State University Extension, Lancaster.*

Two in vitro experiments were conducted to investigate the effects of source and level of lipid on biohydrogenation (BH) and the production of conjugated linoleic acid (CLA) and trans vaccenic acid (TVA). Exp. 1 examined the effect of partial (50%) or complete replacement of 4% yellow grease with each of the following three plant oils: soybean oil, corn oil, and sunflower oil (SUO), respectively. Based on the results of Exp 1, Exp 2 with a total of six treatments was designed to investigate the effect of four other plant oil sources, olive oil, peanut oil, canola oil, and safflower oil (SAO), as compared to yellow grease and SUO at 4% of dietary DM. Diets were composed of corn silage, alfalfa hay, soybean meal, and contained 18.4% CP and 32.4% NDF on average. The incubation periods were 0, 8, 12, or 16 h for Exp 1 and 0, 12, 18, and 24 h for Exp. 2. Three samples were incubated per treatment per time point. Fatty acid data were analyzed using the MIXED procedure of SAS with repeated measures. Rate of BH was estimated by linear regression. In Exp. 1, source of lipid did not affect the production of TVA but affected (P $<$ 0.05) the production of CLA isomers and total CLA, with SUO producing the largest increase in TVA and CLA yields; elevated level of plant oil increased the production of TVA (P $<$ 0.05), total CLA (P $<$ 0.01) and CLA isomers (P $<$ 0.01). In Exp. 2, SUO and SAO were similarly effective (P $<$ 0.01) in increasing TVA production compared to other plant oils. However, SAO was more effective (P $<$ 0.01) than SUO in increasing CLA production and SUO (P $<$ 0.01) was more effective than the other oils. In addition, combined information from both experiments showed that, within the range of 4% of dietary DM, rate of BH was not affected by lipid source but slightly increased as oil level increased; production of CLA peaked between 12 and 18 h, whereas the peak for TVA occurred later, around 24 h.

Key Words: Conjugated Linoleic Acid, Vaccenic Acid, In Vitro