assigned to one of four dietary treatments, varying in LA and ALA intake. Differences between low and high intake were designed to be identical for LA and ALA: Low ALA and LA intakes were 0.15 and 1.30, and high ALA and LA intakes were 1.45 and 2.60 g/(kg $BW^{0.75}$/d), respectively. Intakes of saturated and monounsaturated FA, and other nutrients were kept constant. Consequently, energy intake increased with LA and ALA additions. After 28d on the dietary treatments, pigs were sacrificed. Liver and brain tissues were sampled and analyzed for FA composition and mRNA levels of Δ5 and Δ6 desaturase and elongase 2 and 5. In the liver, LA intake substantially increased C20:4n-6 (ARA) and ALA intake increased C20:5n-3 (EPA) concentrations, but decreased C22:6n-3 (DHA) (all P<0.01). Competition between n-3 and n-6 pathways was evidenced by substantial reductions of ARA at high ALA intakes (>40%) and EPA (>35%) and DHA (>20%) by increased LA intake (all P<0.001). Liver mRNA levels of Δ5 and Δ6 desaturase were increased by LA intake, and elongase 2 by both ALA and LA (P<0.01). Brain DHA was virtually unaffected by the dietary treatments, but C22:5n-3 was increased by ALA and decreased by LA (all P<0.001). mRNA levels of Elongase 2 were increased by ALA intake. In conclusion, ALA is a strong regulator in both the n-3 and n-6 LC PUFA chains. In addition to desaturation (Δ6), elongation from EPA and ARA may be rate limiting in brain and liver. Finally, brain DHA is virtually unaffected by ALA and LA.

Key Words: fatty acids, pig, brain

780 Comparing oxidation of fatty acids in pigs fed starch, animal fat or soy oil using ^{13}C labeled fatty acids. J. J. G. C. van den Borne[1], E. M. A. M. Bruininx[1], E. van Heugten[2], J. van Milgen[3], and W. J. J. Gerrits*[1], [1]*Wageningen University*, *Wageningen, the Netherlands*, [2]*North Carolina State University*, *Raleigh*, [3]*INRA, UMR1079, Systèmes d'Elevage, Nutrition Animale et Humaine*, *St Gilles, France*.

A study was conducted to compare oxidative loss of dietary starch, unsaturated and saturated fats in growing pigs. Eighteen barrows (28 kg BW) were assigned to one of 3 dietary treatments, in which starch (20%), animal fat (9.7%) or soy oil (9.1%) were exchanged isocalorically. Diets were fed twice daily at a rate of 1200 kJ DE/(kg $BW^{0.75}$.d) for an adaptation and experimental period of 7d each. A bolus dose of [U-^{13}C] labeled glucose was administered 1 h after feeding on d 1, and [U-^{13}C] bolus doses of linoleic (C18:2), stearic (C18:0) and oleic acid (C18:1) with the feed on d 2, 4 and 6, respectively. Pigs were housed individually in climate-respiration chambers. Based on $^{13}CO_2$ measurements by non-dispersive infrared absorption, ^{13}C recoveries of tracers were calculated (Table 1). Complete energy balances were measured using indirect calorimetry. Exchanging starch for fat, regardless of its source, reduced heat production by 4%. Cumulative recovery of ^{13}C from labeled glucose was unaffected. Replacing starch by fat increased the ^{13}C recovery of all fatty acid tracers used (P<0.01). Exchanging animal fat for soy oil did not affect the recovery of any of the tracers used. Recovery of ^{13}C from C18:0 was markedly lower compared with that of C18:1 and C18:2, which may result from a reduced tracer digestibility, but more likely reflects a reduced β oxidation of C18:0. In addition, these results indicate that exchanging starch for fat, regardless its source, increases fatty acid oxidation but reduces heat production.

Table 1. Treatment effects on heat production (HP, kJ/(kg $BW^{0.75}$.d)) and on recovery[1] of an oral bolus of ^{13}C tracers as $^{13}CO_2$ in pigs (% of dose)

	Diet			P-value
Item	starch	animal fat	soy oil	diet
C18:0	3.6[a]	9.5[b]	6.6[ab]	<0.01
C18:1	7.6[a]	14.4[b]	20.4[b]	<0.01
C18:2	8.5[a]	15.0[b]	15.7[b]	<0.01
glucose	49.1	48.4	46.9	0.69
HP	692[a]	664[b]	665[b]	<0.05

[a,b] means within a row without common superscript differ (P<0.05); [1] 24h (glucose) or 48h (fatty acids)

Key Words: pig, fatty acid, stable isotopes

781 Essential oil micro encapsulation increases stability during pelleting and premix and feed storage. D. Bravo, C. Ionescu*, A. Vienne, and S. Oguey, *Pancosma*, *Geneva, Switzerland.*

This experiment evaluated the influence of micro encapsulation technologies and encapsulate formulation on recovery of essential oils during the feed production process. Encapsulate formulations incorporated carvacrol (CA) into silica (SI), fat with a large particle size (HYB), modified starch (MS), maltodextrin (MA), arabic gum combined with maltodextrin (MAG) or as maltrodextrin coated with either salts (MAS) or with fat (MAF). Encapsulates were produced using adsorption (SI), spray granulation (MA, MS, MAG), spray cooling (HYB), or their combination (MAS, MAF). Encapsulates were then blended into mineral premixes and meal feeds. Unblended encapsulates were stored at room temperature for 20 wks, premixes were stored at 20C or 40C for 3 and 5 wks. Meals were expanded at 120C and then pelleted (75C). Pelleting stability was checked and samples of meals and pellets stored at 25C or 40C for 3, 6 and 20 wks. CA level was measured in feed samples. Under the most stringent condition for mineral premixes (40C for 5 wks), CA recovery was greater ($P < 0.01$) for MAG, MAS and MA (100, 97 and 97%, respectively) than for MAF (91%), with lower recovery from HYB, SI and MS ($P < 0.01$, 74, 72 and 70%, respectively). Pelleting stability was higher ($P < 0.001$) for MS, MAG and HYB (97, 96 and 96%, respectively) than for MA, MAF, MAS and SI (89, 87, 86 and 81%, respectively). After 6 weeks at 25C, CA recoveries in meal feed were higher ($P < 0.001$) for MA, MAG, MAS, MS and MAF (100, 100, 100, 97, 97%, respectively) than for HYB and SI (91 and 84%, respectively). Under the same conditions, recoveries in pellets were higher ($P < 0.001$) for MA and MAG (100 and 98%, respectively) compared with MAF, MAS, MS, HYB and SI (94, 93, 92, 92 and 90%, respectively). These results show that micro encapsulation method and formulations of the encapsulated additive itself are important determinants of essential oil recovery during feed production.

Key Words: Carvacrol, microencapsulation, stability