1493 Influence of feed intake patterns on LH secretion and concentrations of serum insulin and plasma glucose in lactating sows

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Our objective was to determine how feed intake patterns influence circulating levels of metabolic and reproductive hormones and reproductive performance. Thirty-six primiparous sows were assigned to each of five treatments designed to mimic common patterns of feed intake observed in previous studies of commercial farms. There were 5 treatments: positive control (HHH); negative control (LLL); reduced intake during week 1 (LHH), week 2 (HLH) and week 3 (HHL). The metabolizable energy intake was either 16.5 (H) or 6.5 (L) Mcal/ day. These diets were isolysine, providing 45 g/ day.

Item	HHH	LLL	LHH	HLH	HHL
INS d21 μIU/ml	15[a]	7[b]	14[ab]	12[ab]	11[ab]
GLU d21, mg/dl	84[a]	75[b]	86[a]	85[a]	80[ab]
Mean LH d21, ng/ml	0.7	0.7	0.6	0.7	0.7
LH peaks/8h d14	1.5[a]	0.2[b]	0.9[ab]	0.5[b]	1.6[a]
LH peaks/8h d21	2.0[a]	0.0[c]	1.1[ab]	1.5[ab]	0.9[b]
LH amplitude d21, ng/ml	0.6[a]	0.0[b]	0.8[a]	0.8[a]	0.5[a]
WEI days	9[a]	23[b]	14[ab]	22[b]	18[b]

[a,b] Means with different letters were significantly (P<0.05) different.

Our results (Table) indicate that low energy intake in lactation affects LH pulse and amplitude, and weaning-to-estrus interval (WEI), perhaps through reduced circulating insulin (INS) and glucose (GLU) during lactation.

Key Words: LH, Insulin, Glucose

1494 Determining the valine requirement of high producing sows. B.T. Richert[1]*, R.D. Goodband[1], M.D. Tokach[1], J.L. Nelssen[1], L.J. Johnston[2], R.D. Walker[2], J.E. Pettigrew[2] and S.A. Blum[3]. [1]Kansas State University, Manhattan, [2]University of Minnesota, [3]Lonza Inc., Fair Lawn, NJ.

Two hundred-three (40 or 41/treatment, avg parity 3.7) large white × landrace or large white × chester white × landrace sows were used in a 26 d lactation experiment to determine the valine requirement of high producing sows. All diets were formulated to .9% lysine with all amino acids other than valine formulated to be at least 110% of lysine using ratios implicit in NRC (1988) and ARC (1981). Synthetic valine replaced corn starch to provide .75, .85, .95, 1.05, and 1.15% dietary valine. Corresponding valine:lysine ratios were 83, 94, 106, 117, and 128%. The experiment was conducted at two experiment stations from July, 1993 through January, 1994. There were four blocks of sows based on time of year and sows were grouped by parity (1-2, 3-5, 6-11) to form three lactation groups. Treatment, lactation group, block, and experiment station were used as independent variables with adjusted litter size at d 0 and days of lactation used as covariates for the statistical analysis. There were no treatment × station or treatment × lactation group interactions observed (P > .10). Mean litter size after adjustment was 10.33 pigs across treatments. Sow feed intake and grams of lysine intake were not different among treatments (P > .12). Grams of valine intake increased (linear, P < .001) as dietary valine increased. Litter weight at d 21 and weaning increased (linear, P < .02) with increasing dietary valine. Litter weight (LW) gain from d 0 to 7 increased (linear, P < .06) as dietary valine increased to 1.15%. Litter weight gain from d 0 to 21 and d 0 to weaning increased (linear, P < .02) as dietary valine increased with the greatest portion of the response observed as valine increased to 1.05% of the diet. Dietary valine level had no effect (P > .10) on sow weight change, 10th rib backfat change (BF), or last lumbar backfat change from d 0 to 21 or d 0 to weaning. These results demonstrate that high producing sows have a dietary valine requirement of at least 117% of lysine during lactation (66.4 g/d valine for this trial), much greater than is currently recommended by NRC (1988; 100% of lysine) or ARC (1981; 70% of lysine) to maximize litter weaning weights and litter weight gains.

	Dietary valine, %					
Item	.75	.85	.95	1.05	1.15	CV
ADFI, kg	6.42	6.00	6.15	6.34	6.27	14.3
Lysine intake, g/d	57.8	53.8	55.3	57.0	56.5	14.3
Valine intake, g/d[a]	48.3	50.9	58.4	66.4	72.1	14.7
Pigs weaned/litter	10.16	10.18	10.13	10.17	10.25	3.7
LW d 21, kg[b]	62.44	62.55	63.97	64.97	65.53	11.9
LW at wn, kg[b]	76.19	76.13	77.77	78.80	79.92	11.0
LW gain d 0 to 7, kg[c]	12.23	12.70	12.70	12.89	13.24	18.0
LW gain d 0 to 21, kg[b]	46.86	47.07	48.30	49.51	49.60	13.9
LW gain d 0 to weaning, kg[b]	60.60	60.66	62.09	63.34	63.59	12.6
BW change d 0 to weaning, kg	1.31	-3.72	-2.98	-1.02	-1.99	-409.4
BF change d 0 to weaning, mm	-1.8	-2.3	-2.5	-2.0	-2.4	-103.1

[a,b,c] Linear effect of valine P<.001, P<.02, P<.06, respectively.

KEY WORDS: Sow, Lactation, Valine

1495 Milk yield, but not milk composition, may be influenced by body fatness in primiparous sows. J.L. Ranford[1], D.K. Revell*[1], B.P. Mullan[2], I.H. Williams[1] and J.K. Toussaint[1]. [1]The University of Western Australia and [2]Western Australian Department of Agriculture.

The aim of this experiment was to determine if body fatness in primiparous sows (Large White x Landrace) at the start of lactation influences the yield or composition of milk. Twelve fat sows (backfat 24.8 ± 0.89 mm; mean ± SE) and 12 lean sows (backfat 17.0 ± 0.61 mm) were fed *ad libitum* either a low-protein diet (7.8% CP, 15.5 MJ DE/kg) or a high-protein diet (19.0% CP, 15.6 MJ DE/kg) during a 4-week lactation. As no differences in milk composition were found between time of lactation or teat number, milk samples were pooled within each sow across time and teat number. Milk samples were collected at the start of milk let-down (fore samples) and at the completion of milk let-down (hind samples). Hind samples were consistently 18% higher in fat concentration than fore samples, but there was no difference in the protein or lactose concentrations between fore and hind samples. The milk composition data presented are averages of the fore and hind samples. Milk yield was estimated by the equation; average daily gain (ADG) of piglets x corrected litter size x 4.5.

The change in liveweight and backfat varied widely between treatment groups. Sows fed the low-protein diet during lactation lost between 17 and 35 kg more liveweight than sows fed the high-protein diet. Sows that were fat at farrowing lost 3-5 mm more backfat than sows that were lean at farrowing. Despite this variation, there was no difference in milk composition. High body fat at farrowing reduced ADG and weaning weight of piglets, and the milk yield of the sows, when the low-protein diet was fed during lactation. No affect of body fatness on ADG, weaning weight or milk yield was observed when sows were fed the high-protein diet during lactation.

Body fatness:	fat	fat	lean	lean
Lactation diet:	low-protein	high-protein	low-protein	high-protein
litter size	8.0 ± 0.32	7.8 ± 0.95	8.8 ± 0.83	9.7 ± 0.47
ADG (g/day)	184 ± 9.7	234 ± 15.5	205 ± 16.1	231 ± 4.6
weaning weight (kg)	7.0 ± 0.37	8.7 ± 0.50	7.6 ± 0.61	8.2 ± 0.27
est. milk yield (kg)	7.1 ± 0.38	9.0 ± 0.60	7.9 ± 0.62	8.9 ± 0.18
milk fat (g/l)	50.2 ± 5.10	62.0 ± 5.11	50.7 ± 4.79	54.0 ± 4.60
milk protein (g/l)	41.0 ± 3.29	47.7 ± 3.28	45.8 ± 3.09	48.8 ± 2.97
milk lactose (g/l)	50.0 ± 1.49	54.1 ± 1.24	54.5 ± 1.28	56.6 ± 1.24

Key Words: Milk composition, milk yield, piglet production.

1496 Body fatness influences voluntary feed intake and liveweight loss during lactation in primiparous sows. D.K. Revell*[1], I.H. Williams[1] B.P. Mullan[2], and R.J. Smits[1]. [1]The University of Western Australia, Nedlands and [2]Western Australian Department of Agriculture.

Voluntary feed intake (VFI) by sows during lactation affects the supply of exogenous substrates available for milk synthesis and influences the amount of body tissue mobilised from the sow. VFI, and possibly the mobilization of body reserves during lactation, are influenced by body fatness at farrowing. Twenty four sows (Large White x Landrace) were fed either 2.3 kg/day of a diet low in protein (5.8% CP, 14.6 MJ DE/kg) or 1.7 kg/day of a diet high in protein (15.6% CP, 14.5 MJ DE/kg) during gestation to produce fat or lean sows of similar weights at farrowing. Backfat thickness was measured by ultrasound 65 mm from the midline over the last rib. Immediately after farrowing, sows in the fat group weighed 161.0 ± 2.47 kg (mean ± SE) with 24.8 ± 0.89 mm backfat, while sows in the lean group weighed 150.4 ± 2.29 kg with 17.0 ± 0.61 mm backfat. During a 4-week lactation, the sows were fed *ad libitum* either a low-protein diet (7.9% CP, 15.5 MJ DE/kg) or a high-protein diet (19.0% CP, 15.6 MJ DE/kg).

VFI during the first two weeks of lactation was not dependent on the protein content of the lactation diet, but rather on the amount of body fat at farrowing. VFI during the final two weeks of lactation was dependent on the protein content of the diet with sows eating more when fed the high-protein diet than when fed the low-protein diet. Changes in liveweight were not reflected in changes in backfat during lactation. Changes in liveweight depended on the protein content of the diet fed during lactation, while changes in backfat depended on body fatness at farrowing. This implies that there were differences in the composition of body tissue lost during lactation and hence differences in the endogenous supply of substrates for milk synthesis.

Body fatness:	fat	fat	lean	lean
Lactation diet:	low-protein	high-protein	low-protein	high-protein
Voluntary feed intake				
week 1	2.5 ± 0.27	2.8 ± 0.52	4.4 ± 0.40	4.1 ± 0.50
week 2	3.5 ± 0.48	3.8 ± 0.56	5.6 ± 0.29	5.9 ± 0.42
week 3	3.5 ± 0.63	4.7 ± 0.59	5.4 ± 0.54	6.1 ± 0.53
week 4	3.4 ± 0.61	5.4 ± 0.50	5.3 ± 0.52	6.4 ± 0.35
Δ liveweight (kg)	-34.8 ± 6.90	-2.8 ± 2.19	-19.8 ± 6.74	3.2 ± 3.68
Δ backfat (mm)	-4.6 ± 1.39	-3.2 ± 1.01	-0.3 ± 0.83	0.2 ± 0.70

Key Words: feed intake, sow lactation, body fat.