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Effect of High-Energy Diets on the Performance of Lactating Sows in Tropical Climate

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Abstract

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To study the effect of high-energy diets on performance of lactating sows in a tropical climate, 78 multiparous PIC sows on d 100 of gestation were divided into 4 groups (20x3, 18x1). From d 7 before parturition (d-7) until d 21 of lactation (weaning), sows were fed ***ad libitum*** *diets containing 3.2, 3.3, 3.4 or 3.5 Mcal ME/kg. At farrowing, BW was not different among diets (P>0.05), but at weaning it was lower for the control diet (P<0.05). BFT and BCS at farrowing and weaning and overall feed, energy and protein intake were lower for control group (P<0.05). Litter weight at birth was higher for the 3.5 Mcal ME/kg diet (P<0.05), and at weaning it was lower for the control diet (P<0.05). Weaning-first service interval was longer in control group (P<0.05). In conclusion, increasing the dietary energy content by adding fat improved the overall performance of lactating sows in a tropical climate and prevented them from decreasing their voluntary feed intake.*

Keywords: Dietary energy, dietary fat, feed intake, lactation, sows.

Introduction

Greater prolificacy of sows has increased nutrient requirements during pregnancy and lactation (Dourmad and Étienne, 2002). During lactation, the greater litter size and milk production increase voluntary feed intake (VFI) (Dourmad and Étienne, 2002), but this is not sufficient to meet the higher energy requirements and sows must catabolize body fat and protein, which affects the weaning-estrus interval and overall productivity (Quesnel and Prunier, 1995).

VFI is reduced when ambient temperature exceeds the thermoneutral zone (15 to 20C). This decreases heat production due to thermic effect of feed (Renaudeau *et al.*, 2001). Diets with low crude protein level and/or added fat result in lower heat production (Le Bellego *et al.*, 2001). Thus, fat can be added to lactation diets to increase energy intake with reduced heat production (van den Brand *et al.*, 2000).

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Little information is available on the overall performance of lactating sows raised in tropical climates (Gourdine *et al.*, 2004). Therefore, the aim of this study was to determine the effect of feeding diets with high levels of metabolic energy on the productive and reproductive performance of lactating sows in a tropical climate.

Materials and Methods

This study was conducted in Veracruz, Mexico, in a humid tropical climate. Seventy-eight multiparous PIC sows on d 100 of gestation were selected from one commercial herd. Seven days before expected parturition, sows were moved from the gestation area to a semi-open farrowing area equipped with standard facilities. A pre-starting diet (19% CP) was offered *ad libitum* to the piglets from d 15 to weaning (d 21). Throughout the study, average ambient temperature and relative humidity were 26C and 70%.

During pregnancy, sows were fed a sorghum-soybean meal based gestation diet containing about 18% CP and 3.2 Mcal of ME/kg, until 7 d before expected parturition (d 7). From d 7 until d 21 sows were fed either the gestation diet (control diet) or diets having 3.3, 3.4 or 3.5 Mcal ME/kg (NRC, 1998) for lactating sows. High energy diets were formulated by addition of dry tallow.

Body weight (BW), backfat thickness (BFT) and body condition score (BCS) of sows were determined 24 h after farrowing and at weaning. The BFT was ultrasonically measured at the last-rib level at 65 mm from the midline. The BCS was assessed using a five-points scale (1 = thin to 5 = obese, Vargas *et al.*, 1991).

Feed, energy and protein intakes were evaluated during the lactation period (days 1 to 21). The number and weight of piglets born alive and at weaning were recorded.

From d 22 to d 43, sows were checked twice daily for signs of estrus behavior using a mature boar. Sows were artificially inseminated 24 h after detected estrus and the weaning-first service interval was recorded.

Data were analyzed through analysis of variance (SAS Inst. Inc.).

Results and Discussion

At farrowing, BW was not different among diets ($P>0.05$), but at weaning it was lower for the control group ($P<0.05$; Table 1). The sows fed the high-energy diets had a greater BW, BFT and BCS at weaning (Table 1) and a higher intake of feed, energy and protein (Table 2) throughout the study, compared to the sows fed the control diet. Averette *et al.* (2002) reported that sows fed supplemental fat during lactation had a lower overall decrease in BCS and a greater BFT gain. This BFT gain was contrary to our results, as BFT decreased from farrowing to weaning in all the diets, although BFT was greater for the sows fed the high-energy diets. One explanation for this loss of BFT might be that because of high ambient temperatures the VFI of the sows either decreased or did not increase and was not sufficient to meet the higher energy demands for milk production, leading to a loss of BCS, BW and BFT even in the sows fed high energy diets. Renaudeau *et al.* (2001) found a decreased VFI of lactating sows exposed to 29C *vs* 20C.

The number of piglets at birth and weaning was not affected by the diet ($P>0.05$; Table 3), similar to other reports (Renaudeau and Noblet, 2001; Averette *et al.*, 2002). Litter weight at birth was higher for the diet with 3.5 Mcal ME/kg ($P<0.05$; Table 3) and at weaning it was lower for the control group ($P<0.05$; Table 3). Feeding supplemental fat to sows in late gestation and (or) lactation increased litter weight (Averette *et al.*, 2002; van den Brand *et al.*, 2000), perhaps via an increase of milk energy output, particularly in a hot environment (Quiniou *et al.*, 2000). In our study, a higher conversion efficiency from dietary fat to milk fat as a result of the fat added to the diets might explain the difference of weight among the litters of the sows fed the

Table 1
Effect of energy content in diet on body measurements of lactating sows raised in a tropical climate

Diet (Mcal ME/kg)		3.2 (control)	3.3	3.4	3.5	SEM[1]
Body weight kg	Farrowing	249.2[a]	254.4[a]	242.8[a]	249.0[a]	0.352
	Weaning	209.1[a]	231.8[b]	229.4[b]	223.9[b]	0.412
BFT, cm	Farrowing	2.51[a]	4.50[b]	4.41[b]	4.06[b]	0.191
	Weaning	1.85[a]	3.53[b]	3.35[b]	3.19[b]	0.175
BCS, 1 to 5 scale	Farrowing	2.3[a]	2.6[b]	2.6[b]	2.6[b]	0.0408
	Weaning	1.8[a]	2.2[b]	2.3[b]	2.3[b]	0.0443

[a,b]Different superscripts in a row mean statistically differenct values (P<0.05).
[1]Standard Error of Means. BFT: Back fat thickness; BCS: Body condition score.

Table 2
Effect of energy content in diet on intake of feed, energy and protein of lactating sows raised in a tropical climate

	Diet (Mcal ME/kg)				
	3.2 (control)	3.3	3.4	3.5	SEM[1]
No. of sows	20	20	20	18	
Feed (kg//21 d/sow)	71.4[a]	92.7[b]	90.3[b]	93.3[b]	0.1108
Energy (Mcal/day/sow)	10.1[a]	14.3[b]	14.4[b]	15.1[b]	0.3580
Protein (g/day/sow)	595[a]	769[b]	770[b]	787[b]	19.40

[a,b]Different superscripts in a row mean statistically different values (P<0.05). [1]Standard Error of Means.

Table 3
Effect of energy content in diet on size and weight of litters of lactating sows raised in a tropical climate

Diet (Mcal ME/kg)		3.2 (control)	3.3	3.4	3.5	SEM[1]
Litter size	Birth (born alive)	9.6[a]	8.6[a]	8.8[a]	9.6[a]	0.2482
	Weaning	8.2[a]	8.3[a]	8.5[a]	9.4[a]	0.2482
Litter weight kg	Birth	9.7[a]	9.5[a]	9.4[a]	10.7[b]	0.2734
	Weaning	48.6[a]	52.5[b]	55.0[b]	60.8[b]	1.7827

[a,b]Different superscripts in a row mean statistically different values (P<0.05). [1]Standard Error of Means.

high-energy diets and those fed the control diet; however, milk fat percentage was not determined. Although the sows were exposed to ambient temperatures higher than 22C, this did not affect litter growth, perhaps because of the higher energy intake of sows. However, the litters of the sows fed the control diet had a lower BW gain, which could be attributed to a lower milk production or to a direct effect of reduced VFI when lactating sows were exposed to high ambient temperatures (Quiniou and Noblet, 1999).

The sows on all the four diets came into estrus within 10 days after weaning. Averette *et al*. (2002) found no effect of supplemental fat on the weaning-to-estrus interval. In our study the interval weaning-first service was 5.2±0.4, 5.3±0.8 and 5.2±0.4 d for the sows on the diets of 3.3, 3.4 and 3.5 Mcal ME/kg, respectively ($P>0.05$) and 6.2±0.9 d for the sows on the diet of 3.2 Mcal of ME/kg (control group; $P<0.05$). In reproductive sows, a reduced feed supply during lactation inhibits LH secretion, which delays ovarian activity and oestrus after weaning (Quesnel *et al*., 1998). The lower energy level of the control diet might be responsible for the longer weaning-to-estrus interval in the sows of this group, but LH concentrations were not measured. Therefore, increasing VFI of lactating sows could help offset the catabolic losses and permit maintenance of body condition and a more rapid return to estrus (Payne *et al*., 2004).

In conclusion, increasing the energy content of the lactation diet of multiparous sows by adding fat reduced losses in BW, BFT and BCS and shortened the weaning-first service interval.

References

Averette, G.L., Odle, J., Soede, J. and Hansen, J.A. 2002. Dietary medium- or long-chain triglycerides improve body condition of lean-genotype sows and increase suckling pig growth. J. Anim. Sci., 80: 38-44.

Dourmad, J.Y. and Étienne, M. 2002. Dietary lysine and threonine requirements of the pregnant sow estimated by nitrogen balance. J. Anim. Sci., 80: 2144-2150.

Gourdine, J.L., Renaudeau, D., Noblet, J. and Bidane, J.P. 2004. Effects of season and parity on performance of lactating sows in a tropical climate Anim. Sci., 79: 273-282.

Le Bellego L., van Milgen J., Dubois S. and Noblet J. 2001. Energy utilization of low protein diets in growing pigs, J. Anim. Sci., 79: 1259-1271.

NRC. 1998. *Nutrient Requirement of Swine*. 10th Ed. National Academy Press, Washington, DC.

Payne, R.L., Lirette, R.D., Bidner, T.D. and Southern, L.L. 2004. Effects of a novel carbohydrate and protein source on sow performance during lactation. J. Anim. Sci., 82: 2392-2396.

Quesnel, H. and Prunier, A. 1995. Endocrine bases of lactational anoestrus in the sow. Reprod. Nutr. Dev., 35: 395-414.

Quesnel, H., Pasquier, A., Mounier, A.M. and Prunier, A. 1998. Influence of feed restriction during lactation on gonadotropic hormones and ovarian development in primiparous sows. J. Anim. Sci., 76: 856-863.

Quiniou, N. and Noblet, J. 1999. Influence of high ambient temperatures on performance of multiparous lactating sows. J. Anim. Sci., 77: 2124-2134.

Quiniou, N., Gaudré, D., Rapp, S. and Guillou, D. 2000. Influence de la température ambiante et de la concentration en nutriments de l'aliment sur les performances de lactation de la truie primipare. J. Rech. Porc. Fr., 32 : 275-282.

Renaudeau, D. and Noblet, J. 2001. Effects of exposure to high ambient temperature and dietary protein level on sow milk production and performance of piglets. J. Anim. Sci., 79: 1540-1548.

Renaudeau, D., Quiniou, N. and Noblet, J. 2001. Effects of exposure to high ambient temperature and dietary protein level on performance of multiparous lactating sows. J. Anim. Sci., 79: 1240-1249.

van den Brand, H., Heetkamp, M.J.W., Soede, N.M., Schrama, J.W. and Kemp, B. 2000. Energy balance of lactating primiparous sows as affected by feeding level and dietary energy source. J. Anim. Sci., 78: 1520-1528.

Vargas, G.J., Trujillo, O.M.E. y Doporto, D.J.M. 1991. Evaluación productiva terminal en una granja porcina. Vet. Mex., 4: 272-278.