EFFECTS OF DIETARY FAT ON MILK COMPOSITION AND LITTER PERFORMANCE OF INDUCED AND NATURALLY-FARROWING SWINE

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Introduction

Continuous improvements in production efficiency have been made throughout the swine industry, however, piglet mortality remains a major problem and limits sow reproductive performance. In 1995 data from the 1,477 farms responding resulted in a figure of 20.5% of piglet deaths attributed to starvation (USDA, 1997). Because neonatal energy stores are limited, sufficient energy intake during the first 24 h after birth is imperative to ensure survival. Adding fat to the sow diet may improve energy levels in sow colostrum and milk. In addition, results showed that dams induced to farrow early had decreased fat levels in their mammary secretions. Therefore, an experiment was conducted to determine the effects of supplemental dietary fat and induction of parturition (d 112) on colostrum and milk composition and litter performance.

Materials and Methods

Gilts (n = 24) and sows (n = 24; parity 3)(PIC 231/233) were randomly assigned to one of four treatment groups according to a 2x2x2 factorial design. Treatments included diet (0 vs 10% choice white grease), parity, and farrowing (natural vs induced on d 112) variables. The dietary treatments were initiated on d 90 of gestation and were continued throughout the 21-d lactation. Mammary secretions were collected from the right first thoracic gland beginning at the birth of the first pig (0 h) and subsequently at 3, 6, 9, 12, 24, 48, 72, and 168 h post-partum. Samples were analyzed for total protein, lactose, fat, and IGF-I &-II. Dam weights were recorded on d 90, d 109, at farrowing, and at weaning. Dam feed intake was recorded daily over lactation. Piglets born alive, stillborns, and mummies were recorded on d 1 of lactation. Litters were weighed at birth, d 7, d 14, and at weaning (avg 21 d). No cross-fostering was applied to any litter after 48 h when the number of piglets on each sow was recorded in order to determine survival (%) from 48 h to d 21.

Results and Discussion

Piglet ADG was 25% greater in dams fed fat over all three weeks of lactation (250 vs 200 g/d; P ≤ .01)(Figure 1). This result was supported by an elevation in milk fat concentration at 48 and 72 h post-farrowing by 21.6 and 22.6%, respectively, compared to milk from dams fed no supplemental fat (fat×time, P < .05). Milk fat and lactose concentrations progressively increased over time (P < .01).
Figure 1. Supplemental dietary fat increases piglet ADG by 25% (P < .01).

When milk fat concentration increases, even if there are no changes in protein or lactose levels, the percentage of calories per gram of milk provided by protein or lactose will decrease. This increase in energy density of the milk should not reduce the volume of colostrum consumed by the piglet because they do not seem to regulate their intake by the energy density of the diet. When compared to non-fat controls, multiparous sows fed 10% fat showed a more consistent rise in milk fat concentration with a 26% and 41% increase for induced or naturally-farrowing sows, respectively compared to a 19% decrease or a 1% increase in induced or naturally-farrowing gilts (P < .01). The reduction of milk fat levels of gilts induced to farrow when dietary fat was supplemented may be due to the variability in mammary development and body energy reserves compared to multiparous sows, or due to dietary amino acid supply. Because an energy dependency exists for milk production (Tokach et al., 1992) the amount of energy consumed can change the amino acid demand for milk synthesis. The lysine to energy ratio of the diets used in this study were not constant and increased protein may benefit the gilt since the growth rate of lean tissue is high in young dams. This may be important to producers considering an increase in the dietary fat content fed to replacement gilts. Milk IGF-I levels in animals fed 10% added dietary fat and induced to farrow (144.86 ± 22.38 µg/mL) at 12 h post-farrowing were not dissimilar from animals allowed to farrow naturally and consuming a diet with no added fat (110.43 ± 18.63 µg/mL)(P < .04)(Figure 2).
In comparison, milk IGF-I was different in induced animals receiving no additional dietary fat (65.91 ± 19.8 µg/mL; \( P < .04 \)). Insulin-like growth factor I (IGF-I) has some bioactivity in the neonatal gastrointestinal tract. In the newborn piglet, once dietary IGF-I and -II reach the intestine they may have a mitogenic effect on the intestinal epithelium (Donovan et al., 1996). Houle et al. (1997) showed that the villus height was greater in piglets fed oral IGF-I. If IGF-I and -II exert immunological effects on the gut or speed intestinal repair after infection (Odle et al., 1996) it would be a benefit to increase the levels of these growth factors in sow colostrum and milk. In conclusion, supplemental dietary fat in sow diets can increase the milk fat concentration, especially 2 to 3 days post-partum, regardless of parity or parturition treatment. The increase in milk fat when dietary fat was added was more consistent in multiparous sows than in gilts. An increase in milk fat will increase the energy available to the piglet, and potentially affect post-natal survival and growth. Indeed, the increase in milk fat content led to a 25% increase in piglet ADG over the three week lactation. Induction of farrowing did affect the IGF-I concentrations in milk; however this difference was eliminated with additional dietary fat.

References


