

The Effect of Virginiamycin on Gilt Productivity : A Field Trial

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ABSTRACT

A field trial to demonstrate the effect of virginiamycin (VM) on sow productivity under local environment was conducted on a 1,200 sow herd in Suphanburi province. A twin set of gilts was randomly allocated to either control or treatment group. Gilts in the treatment group received gestation and lactation diets containing 40 ppm of VM while gilts in the control group received diets containing none. Gilts were served on their second observed estrus using artificial insemination. The number of services and the sequence of boar used at the mated estrus were forced to be the same within a twin set. A twin set was excluded from this trial if either one returned to estrus, exhibited vaginal discharge or failed to conform with the service rules.

The farrowing rates between groups did not differ significantly (84.7 VS 82.6, P= 0.7780). The treated gilts produced 1.7 piglets born alive/litter (P = 0.000) and 1.6 piglets weaned/litter (P = 0.0044) more than the control gilts. However, the average weaning weight of piglets nursed by the treated gilts was significantly lower (6.28 VS 5.67, P = 0.0114). When the treatment factor was withdrawn and the reproductive performance of both groups was followed through the subsequent parity, the averages of weaning to the first service interval (5.54 VS 5.60, P = 0.8465), the farrowing rates (75.75 VS 75.75) and the piglets born alive/litter (9.10 VS 9.78, P = 0.5575) in both groups became similar.

Key words : virginiamycin, gilts, litter performance

INTRODUCTION

To be more competitive in the market place seems to be a consistent desire of modern swine producers. Any alternative that enhances sow productivity and produces high benefit to cost ratio is likely to be adopted and utilized. Since the number of litters/sow/year and piglets weaned/litter are the major determinants of breeding herd productivity (Stein *et al.*, 1987), anything that may improve conceptivity, shorten the average of weaning to first service intervals and/or increase the number of piglets weaned/litter merits through investigation in order to determine its potential benefit in terms of consistency and magnitude.

The effects of energy and protein intake in improving sow performance have been well documented (Nelssen *et al.*, 1985; Johnston, 1989).

Virginiamycin (VM), an antibiotic discovered and isolated from a sample of Belgian soil 30 years ago, has been considered as a classic growth promoter due to its sparing effect on protein and energy utilization (Vervaeke *et al.*, 1979). Recent research data indicated that VM may be used as a sow performance enhancer. Adding VM to gestation and lactation diets has been shown to reduce weight loss from farrowing to weaning, decrease the duration of the reproductive cycle, increase milk fat content, improve litter size and body weight at weaning. In addition the effects were more pronounced with higher concentrations of VM in the diets ranging from 20 to 40 ppm (Kyriakis *et al.*, 1992).

Regardless of the additive's benefit claimed by researchers, local swine producers usually suspect if such claim can be observed under their management environment. In Thailand where the hot-humid climate

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constitutes the most limiting factor, it is tempting to determine if the benefit of adding **VM** to the sow diets could be observed under close to normal operation of the farm.

MATERIALS AND METHODS

A trial was conducted on a 1,200 sow herd in Suphanburi province, 150 kilometers west of Bangkok, full sibling twin sets of gilts weighing approximately 90 kilograms (kgs) were used. In the gilt pool, each twin was randomly assigned to be in either the treatment or control group. Gilts in the treatment group received gestation and lactation diets containing 40 ppm of **VM** while those in the control group received none. The treatment gilts started receiving diets containing **VM** right after service, continued through gestation and lactation, and stopped when they were bred back after weaning.

Gilts were housed in groups of 6-8 in the gilt service area until they were found to be in the second estrus, usually weighing between 120-130 kgs, when they were bred by the artificial insemination using fresh semen diluted with Kiev extenders (Evans, 1986) at 12 and 24 hours after the onset of estrus. The number of mates per service and the sequence of boars used at mated estrus were forced to be the same within a twin set. Gilts were excluded from the trial as a twin set if either one returned to estrus, aborted, exhibited vaginal discharge, failed to conform with the service rules and/or had trouble nursing her litter.

The served gilts were moved to gestation crates in a concrete slatted floor building where they were checked for their returning to estrus and pregnancy at 18-24 and 35 days post-service respectively. The pregnant gilts were moved to the farrowing pens approximately 1 week prior to the farrowing dates and remained there to nurse their litters for exactly 28 days. Piglets began to receive creep diet at 10 days of age. Cross fostering was not allowed in the farrowing barn since there were not enough farrowed sows to ensure that piglets be crossed within the treatment or the control groups.

The gestation and lactation diets were mixed on farm. The Smith Kline Beecham (Thailand) provided **VM** diluted with calcium carbonate for mixing with the treatment group diet. Feeding regimes followed that described by Patience and Thacker (1989). The ingredient composition of the lactation diet was held constant throughout this trial but that of the gestation diet was changed according to the market prices of

Table 1 Recommended nutrient content of gestation and lactation diets on as fed basis.

	Gestation	Lactation
Crude Protein (%)	15	17
Metabolizable Energy (Kcal/kg)	3,200	3,150
Crude fiber (%)	4.50	5.00
Calcium (%)	0.95	1.00
Available phosphorus (%)	0.60	0.80
Lysine (%)	0.70	0.90

ingredients in order to minimize the feed cost. The restrictions imposed on the diet mixing and feeding practices are that: (1) diets must be formulated to obtain nutrients as recommended in Table 1, (2) a diet containing no additive must be mixed before a diet containing 40 ppm of **VM** and (3) only broken rice, soybean meal, full fat soybean, raw rice bran and tuna oil are allowed to be used as basic ingredients.

The trial site was visited by a veterinarian on a weekly basis to check the accuracy of the records and to decide whether to cull a twin set or not. Feed samples were collected every other week and were submitted to the Smith Kline laboratory in Belgium for **VM** quantification.

The parity data were recorded on the individual sow cards for each sow. The birth date, date of first estrus, service dates, boar identity for each mating, service result, farrowing date, born alive litter size, litter birth weight, number of piglets weaned, weaning weight, sow weight at weaning, weaning date, culled date and reason for culling were recorded. Any conclusion concerning with litter performance was deduced from the twin sets that both of each twin completed their parity data, which were subsequently analyzed using the Paired T-Test (Ott, 1984). The reproductive parameters such as farrowing rate were calculated within each experiment group regardless of the twin constraint and were compared between groups using the chi-square goodness-of-fit test (Fienberg, 1985).

RESULTS

Table 2 provides a guideline to the number of observations available for analyses. It shows that 33 completed twin set parity data were available for the litter performance analysis as shown in Table 3. These 33 twins were reserved after weaning and 25 of them

Table 2 The number of gilts served in the control and treatment groups along with the classified service results.

Number of gilts	Control	Treatment	Twin sets ¹
Served	47	47	47
Violated service rule	1	0	46
Died	0	1	45
Return to estrus	7	6	37
Not in pig	0	1	36
Aborted	0	1	35
Farrowed	39	38	35
Fail to nurse litter	2	0	33
Weaned	37	38	33
To be followed to P ²	33	33	33
Served again	33	33	33
Farrowed again	25	25	19

1 Number of completed twin sets that can be obtained for evaluating litter performance.

2 P² means second parity.

Table 3 Comparison of litter performance between the groups .

Parameters	Control	Treatment	P-values
Number of observations	33	33	-
Born alive/litter	8.33	10.03	0.0000
Average birth weight (kgs)	1.37	1.34	0.5410
Number weaned/litter	7.27	8.87	0.0044
Average weaning weight (kgs)	6.28	5.67	0.0114
Sow weight on weaning date (kgs)	152.30	152.60	0.8642
VM1 found in diets (ppm)	8.42	37.17	0.0000

1 VM stands for virginiamycin

Table 4 Comparison of reproductive performance of the 33 twin sets through their second parity. The treatment sows continued to receive VM in lactation diets until first mated after weaning their first litters.

Parameters	Control	Treatment	P-values
Number sow served after weaning	33	33	-
Average wean to first service (days)	5.54 (33) ¹	5.60 (33)	0.8465
Farrowing rate (%)	75.75 (25)	75.75 (25)	1.0000
Born alive/litter	9.10 (19)	9.78 (19)	0.5575

1 Number in parentheses are the number of observations used in comparing such parameters.

farrowed again in both groups but only 19 completed twin set parity data could be obtained for comparing the number of piglets born alive per litter of the second parity as shown in Table 4.

For those 13 gilts returning to estrus (Table 2), 10 were the members of 5 twin sets bred during summer, 2 were gilts from the control group and

another one was a gilt from the treatment group. Therefore, only 8 twin sets, rather than 13, were excluded from litter the performance analysis. The farrowing rate of the the control group was 84.7% (39/46) as compared to 82.6 % (38/46) which was the farrowing rate of the treatment group. ($\chi^2 = 0.08$, $P = 0.778$).

DISCUSSION

It is relatively disappointing to find that a few feed samples collecting from the control group contained low concentrations of VM (10-20 ppm). In addition VM concentration in a control feed sample taken during September 1992, was as high as 42 ppm. The evidence clearly indicated that there were some errors in mixing and delivery of VM. However, a common error on every swine production unit doesn't seem to invalidate any result concluded from this trial for two reasons. Firstly, the average concentrations of VM from 27 samples were only 8.42 ppm for the control and 37.17 for the treatment. These two means differed significantly. Secondly, the sow productivity in response to VM dosages doesn't follow an all-or-none law. It is, however, a graded response. This means that the higher dose of VM given to a sow the higher the productivity that can be expected up to the optimum dose response level (Kyriakis *et al.*, 1992).

The most obvious benefits of VM found in this trial were the improvement in the numbers of piglets born alive and piglets weaned per litter. The farrowing rates appeared to be similar between groups. In addition similar averages of weaning to the first service interval theoretically suggested that the sow weight loss from farrowing to weaning be similar (King and Williams, 1984; Nelssen *et al.*, 1985; Johnston, 1989). In this study almost all the sows returned to services at 5 days.

Although the treated gilts weaned more piglets per litter than the control gilts, the average weaning weight of piglets from the treated gilts was significantly lower than that of the control gilts. This finding was the opposite to that reported by Kyriakis *et al.* (1992). Different finding may stem from the fact that the treated gilts in this trial had to nurse considerably more piglets than the control gilts. While the treated gilts in the Kyriakis's trial produced 1.02 more piglets than the control gilts, the treated gilts in this trial produced 1.70 more piglets.

In spite of the fact that gilts were predetermined to be in either the control or the treatment groups in the gilt pool before being served, the fraction of control gilts being served before the treated gilts was significantly higher than 0.5 ($\chi^2 = 4.124$, $P = 0.0211$). Therefore, the higher born alive litter size observed in the treated gilts may be confounded in that they were served after passing more heat events or they were at heavier body weight. This argument can, however, be nullified by the following evidence. Firstly,

a chi-square test said that being served before or after its twin was not associated with having smaller or larger born alive litter sizes ($\chi^2 = 1.02$, $P = 0.3136$). Secondly, the regression analysis (Weisberg, 1980) said that the number of days the control gilts was served before the treated gilts could not be used to predict the difference in the number of piglets born alive between the control and the treated gilts ($P = 0.9900$, $R^2 = 0.000$). Thirdly, given that the gilts in both groups had a similar weight loss during lactation as suggested previously, similar sow weight at weaning (152.3 VS 152.6) indicated that the gilts in both groups were bred around the same body weight. Finally, when VM was withdrawn from the diets of the treated gilts during the next parity, the advantage for born alive litter size of both groups was narrowed (9.10 VS 9.78).

Since the difference in the piglets weaned per litter between the groups was quite large (1.60) and the sow weight loss during lactation is the function of its subsequent reproductive efficiency, it is safe to conclude that diets supplemented with 40 ppm of VM are likely to produce an observable improvement in breeding herd productivity.

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