EFFECTS OF SARCOPTIC MANGE ON LACTATING SWINE AND GROWING PIGS[1]

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ABSTRACT

The impact of Sarcoptic mange on sows and on performance of their offspring from birth to slaughter was determined. Sows naturally infested with Sarcoptic mange were paired, mated to the same boar, and assigned randomly to treated or control farrowing groups. Treated sows received ivermectin s.c. at 300 μg/kg body weight; control sows received the vehicle s.c. Sow performance was evaluated via sow feed consumption, litter size, litter birth weights, litter weaning weights and piglet death loss from birth to weaning. Seven replicates (farrowing groups), each with six sow pairs, were included in the trial. Offspring from treated and control sows, 35 head/group, were fed to slaughter weights. Untreated sows had litters that weighed 4.14 kg less than ivermectin-treated sow litters at 21 d ($P < .07$). Treated sows consumed 1.95 kg less feed per weaned piglet and .13 kg less feed per kilogram of weaned piglet ($P < .05$). Piglets from treated sows were 5.79 kg/head heavier at slaughter ($P < .05$) and had a .05 kg/d superior average daily gain ($P < .05$). (Key Words: Mange, *Sarcoptes scabiei*, Pigs, Lactation, Piglets.)

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Introduction

The economic impact of Sarcoptic mange on swine is of concern to swine producers, but only recently have data become available that quantify the losses in days to market, feed conversion and weight gains in growing and finishing pigs that a mange infestation can cause (Cargill and Dobson, 1979; Alva-Valdes et al., 1986; Gaafar et al., 1986). There are few data available on the impact of Sarcoptic mange in the breeding herd, even though a mange infestation can be maintained in boars and gestating sows with mites being transmitted to piglets or uninfested animals via contact with infested animals.

Experimental Procedure

This trial was conducted at the North Carolina Swine Development Center, Rocky Mount, North Carolina. Gestating sows were maintained in six farrowing groups in a curtain-sided, gutter-flush gestation barn with five to six sows per pen. Boars were maintained in a curtain-sided breeding barn in individual pens. All sows were the product of a Yorkshire-Landrace-Chester rotation; all boars were purebred Duroc, Chester White, Landrace or Yorkshire. Sows were farrowed in individual farrowing stalls in an environmentally controlled, totally slatted pit recharge farrowing house. Growing swine were maintained in curtain-sided, totally slatted finishing buildings during the finishing phase of the experiment.

From 16 to 20 sows made up a farrowing group. These sows were hand-mated in pairs to the same boar to ensure that at least two sows bred to any one boar were available for use in the trial.

The presence or absence of *Sarcoptes scabiei* var. *suis* was determined on all animals used in the trial. Animals were restrained and a skin scraping was taken from the inner surface of one ear. Scrapings were taken by flooding

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the inner surface of the ear with mineral oil and then scraping the skin with a 2.54-cm wood chisel until the capillary layer was reached. The scraping material was placed into petri dishes, returned to the laboratory, and examined under low power with a dissecting microscope (40×). The total number of eggs, immature and adult mites was determined for each animal at each scraping date. Sows were scraped prior to treatment and piglets were scraped at weaning, at the time of treatment, and again at 30-d intervals until slaughter.

Prior to the initiation of the trial, the internal parasite status of the herd was determined by fecal flotation. During the experiment, the normal deworming schedule was followed. All pregnant females were dewormed with dichlorvos[3] approximately 7 d prior to farrowing. Boars were dewormed at 6-mo intervals with dichlorvos. Growing pigs were dewormed approximately 7 d after weaning and again approximately 7 d prior to being transferred to the finishing floor with levamisole[4] in their drinking water (5 and 8 wk of age, respectively).

Boars and gilts were fed approximately 2.72 kg of feed per head daily. Gestating females received approximately 2.72 kg per head daily for the first trimester of pregnancy; feed supply was gradually increased to approximately 5.44 kg per head daily during the third trimester of pregnancy. Each animal was given as much feed as she would consume at and after parturition. Piglets from weaning to placement in the finishing building received a 19% protein diet, and pigs weighing from 56.7 kg to finish weight received a 14% protein diet. Piglets from weaning to market weight had ad libitum access to feed. All diets were composed of corn, 48% protein soybean meal and a vitamin-mineral premix. The breeding herd diet contained 15% crude protein, with all diets, meeting or exceeding the recommendations of the National Research Council (NRC, 1988).

Sows were vaccinated against atrophic rhinitis 6 wk prior to farrowing, gilts were vaccinated at 6 mo of age, and boars were vaccinated at 6-mo intervals. Parvovirus vaccinations were given 2 wk after farrowing; gilts were vaccinated when they were moved into the breeding herd and boars were vaccinated every 6 mo. Piglets were vaccinated for atrophic rhinitis at approximately 7 and 19 d of age.

Six sow pairs with natural infestations of Sarcoptic mange were selected for use in the trial in each of the seven replications. Pregnant sows were paired according to the boar to which they were mated, and each animal within a pair was individually weighed, scraped and placed randomly into either a treated or untreated group via coin flip. Treated (mange-free) animals were given ivermectin (Ivomec) at 300 μg/kg BW by injection subcutaneously in the neck. Untreated animals were treated with vehicle at the same rate. All animals were treated approximately 10 d prior to farrowing. Untreated and treated sow groups were maintained in separate gestation pens until 4 to 6 d prior to farrowing, at which time they were moved to the farrowing house. Untreated and treated sow groups were assigned to opposite sides of the farrowing house to ensure that there was no sow to sow contact to transfer mange mites. These assignments (north vs south) were rotated with each new farrowing group. Feed consumption records for each sow were maintained while the sow was in the farrowing house. All animals that died during the trial were necropsied.

All piglets within a farrowing group were weaned on the same day and 21-d adjusted litter weights were calculated by procedures outlined by the National Swine Improvement Federation. Piglets were weaned and placed in a slatted-floor nursery with piglets from treated and control sows maintained in separate pens side by side separated by a solid wooden partition to prevent mange transmission. At approximately 10 kg in weight, pigs were moved to the finishing floor. All piglets within a nursery group were weighed as a group. Due to pen size in the finishing building, only 35 head could be placed in each finishing pen for the finishing phase of the trial. Nursery group size was reduced to 35 pigs/group by visually estimating individual weights and alternately removing the smallest pig and then the largest pig from the group; the remaining 35 pigs were placed in the appropriate pen in the finishing building. Piglets from treated sows were treated with 1 cc of ivermectin, and piglets from untreated sows were given 1 cc of vehicle. Treated and untreated pigs were

[3]Atgard, Fermenta Animal Health, Kansas City, KS.
[4]Tramisol, American Cyanamid, Princeton, NJ.

TABLE 1. MEAN NUMBER *SARCOPTES SCABIEI* VAR. *SUIS* PER SKIN SCRAPE[a]

Item	Adults	Immature	Eggs	Percentage
Treated				
Sows	0	0	0	0
Pigs[a]	0	0	0	0
Untreated				
Sows	.42	.32	.15	26.4
Pigs[a]	.062	.09	.003	12.3

[a]Mean of 480 scrapings.

weighed and scraped for mites at approximately 28-d intervals. Treated and untreated pigs were sold on the same day and final pen weights were determined.

Data were analyzed using ANOVA and means were tested using Tukey's procedure to determine statistical differences between treatments (SAS, 1982).

Results and Discussion

Pretreatment evaluation of sows (Table 1) showed that both treated and control sows were infested with Sarcoptic mange, and the number of sows positive for mange in each group of six paired animals ranged from 1/12 animals to 11/12 animals. Skin scrapings indicate presence or absence of mange mites. The total number of each life stage found in a scraping can be used as an indication of the severity of the infestation (i.e., low, moderate or high). However, the number of mites in a scrape cannot be used to definitively number or rank animals due to the variability of this procedure. The infestations found in the sows in this trial would be characterized as a low infestation; the mean percentage of infested animals (animals with one mite/total number of animals) was 26.4%. In addition to the scraping data, sows in each group were observed to show visual symptoms of a mange problem, (i.e., scabby, crusty skin, dirty ears and red, scruffy appearance).

In each replication (sow group), piglets from sows treated with ivermectin showed no evidence of a mange infestation (Table 1), whereas piglets weaned from untreated sows were found to have a mange mite infestation by weaning age. Scrapings taken from untreated piglets revealed that 12.3% of the pigs in the finishing stage of the trial were positive for mange. The 12.3% level of Sarcoptes infestation in the growing piglets observed in this trial was similar to that observed by Courtney et al. (1983), who found that 10% of the animals in their study were positive for mange. Chronic mange (scabby, rough skin and "dirty ears") was observed in sows in the herd; however, chronic mange was not seen in any of the piglets. These results agree with those of Cargill and Dobson (1979), who found that chronic mange was rare in growing pigs. Untreated pigs were positive for mange at each of the scraping dates; however, we did not observe a seasonal variation of mite numbers or variation in the number of animals/scrape that were positive for mites within a group. This finding agrees with field data that show that, compared with unconfined pigs, those in confinement exhibit less difference in mite numbers between winter and summer (J. J. Arends, unpublished data). The visual clinical symptoms worsened as the pigs reached 120 d of age. This agrees with Arlian et al., (1988), who found no impact on performance between rabbits infested with mange vs rabbits maintained mange-free until

TABLE 2. LITTER WEIGHTS AND FEED CONSUMPTION IN IVERMECTIN-TREATED AND UNTREATED SOWS WITH SARCOPTIC MANGE[a]

Item	Daily feed per day, kg	21-d litter wt (adj), kg	Sow feed per weaned piglet, kg	Kg feed/kg weaned piglet
Treated sows	4.78	54.60	14.60	1.16
Untreated sows	4.87	50.46	16.55	1.29
		4.14*	−1.95**	−.13**

[a]Mean days with piglets = 28.5.

*$P < .07$.

**$P < .05$.

TABLE 3. PERFORMANCE OF IVERMECTIN-TREATED AND UNTREATED PIGS INFESTED WITH SARCOPTIC MANGE

Item	Treated pigs	Untreated pigs	Difference
No. at start[a]	245	245	
No. at finish	221	218	
Starting wt, kg	10.48	10.38	
Finished wt, kg	98.94	93.05	
Total wt gain, kg	88.45	82.66	5.79*
ADG	.718	.668	.05**

[a]Seven pig groups.

*$P < .07$.

**$P < .05$.

17 wk postinfestation. Cargill and Dobson (1979) found puritis and skin lesions to peak at 11 wk postinfestation in pigs; in humans this peak was found 12 to 16 wk postinfestation (Mellanby, 1977). Our observations of growing pigs in this trial would agree with these authors that the most severe visual symptoms were observed 12 to 17 wk postinfestation, with piglets being infested from sows initially at 1 to 10 d of age.

All pigs in the ivermectin-treated group were found to be free of mange mites, which agrees with Courtney et al. (1983) and Campbell and Berz (1984), confirming the efficacy of ivermectin on mange mites when used at 300 mg/kg body weight. Cargill and Dobson (1979) found that piglets became infested with mites from their mothers during the time from birth to weaning. Our data illustrate this point clearly, in that in all six farrowing groups no piglets at birth were positive for mange, but in each of the six control farrowing groups, scrapings from piglets at 3 wk of age were positive.

Litter sizes at birth and at weaning were 9.62 and 8.65 piglets for control sows versus 10.40 and 9.46 piglets for treated sows. Birth to weaning piglet death loss was 10.08% and 9.04% for untreated and treated piglets, respectively. This difference was not significant ($P > .05$). All farrowings were attended and litters were equalized within groups as soon as possible, which may have contributed to the low death loss observed.

Litter weights (21-d adjusted) from litters of treated sows were 4.14 kg heavier ($P < .07$) than those litter weights from untreated sows (Table 2). The sow lactation period averaged 28.5 d; total feed per sow consumed during this time period did not differ between treated and untreated sow. However, the amount of feed consumed by each sow for each piglet weaned and for each kilogram of piglet weaned was significant ($P < .05$; Table 2). These data show that fewer piglets and fewer kilograms of piglet were produced for equal amounts of sow feed. These two indicators of sow feed efficiency combined indicated that Sarcoptic mange had a significant impact on lactating sow performance. Although performance improvements in feed efficiency in growing pigs has been reported for pigs treated for mange (Sheahan, 1974; Cargill and Dobson, 1979; Gaafar et al., 1986), there have been no previous data reported on the impact of Sarcoptic mange on lactating sows.

Treated and untreated piglets were moved to the finishing floor when they averaged 10.48 kg and 10.38 kg, respectively. No difference was observed in death loss between groups in the finishing buildings (Table 3). Both treated and untreated pigs were sold the same day, at an average 178.5 d of age after being on feed for an average of 123.5 d. Mean finished weight for treated and untreated pigs was 98.94 kg and 93.05 kg, respectively. Total weight gains of 88.45 kg and 82.66 kg with ADG of .718 kg and .668 kg were observed in treated and untreated pigs.

The mean weight gain difference of 5.79 kg ($P < .07$; Table 3) between treated piglets and

TABLE 4. CUMULATIVE WEIGHT GAIN DIFFERENCE BY WEIGH PERIOD BETWEEN IVERMECTIN-TREATED AND UNTREATED PIGS[a]

	Days of age				
Item	84	100	135	164	178.5
Treated pigs, kg	12.0	34.54	55.4	77.36	88.45
Untreated pigs, kg	11.4	33.14	53.26	72.16	82.66
Difference between treated and untreated, kg	.6	1.40	2.14	5.20	5.79

untreated piglets and a difference in ADG of .05 kg/d ($P > .05$) were indicators of lowered performance in mange-infested piglets. These data agree with Cargill and Dobson (1979), Larsen and Strom (1980), Hewett and Heard (1982), Alva-Valdes et al. (1986) and Gaafar et al. (1986), who found that mange-infested pigs did not perform as well as mange-free pigs. Acaricidal treatments used to treat pigs for mange differed in these trials, but in each case, after the mites were controlled, improvements in performance were observed.

Weight differences between groups by month (Table 4) show that treated pigs were slightly heavier even at the first 28-d weigh period. This difference between groups increased slowly until the end of the third weigh period (135 d of age). Between 135 d and 164 d of age, the average weight difference between treated and untreated pigs increased rapidly from 2.14 kg to 5.2 kg/head.

Some parasitic mite infestations require time to develop to a level high enough to influence an animal's performance. This has been observed with *Psoroptes ovis* (Fisher and Wright, 1981); no weight differences were observed until the infestation reached an optimum level. Arlian et al. (1988) found that rabbits infested with Sarcoptes mites gained weight in a similar fashion until 17 wk postinfestation, at which time growth of the infested animals suddenly stopped. In this trial, if we assume that the piglets were infested with mange during the 1st wk of life, the largest impact on weight gain was not observed until been 18 and 22 wk of age. If we assume that peak irritation and host reactivity will coincide with the decreased weight gain observed, these data agree with Mellanby (1977), Fisher and Wright (1981) and Arlian et al. (1988), who indicated that it requires an extended period (12+ wk) for the full impact of a mange infestation to be reached. These findings disagree with Sheahan (1975), who purported that the time needed for the impact of mange in swine to be observed was much shorter.

Implications

For pigs to reach equal slaughter weight, 8.6 more days would have been required for those infected with mange. Although the lowered weights are important, the poorer feed conversion and increased amount of feed needed to reach slaughter weight may be even more important. The full financial impact of a mange infestation at chronic low levels goes undetected, but feed, performance and death losses range from $84 to $115 per sow yearly.

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