PRELIMINARY STUDY ON SEXUAL BEHAVIOR OF SOCIALLY DOMINANT AND SUBORDINATE BOARS IN A SEMINATURAL ENVIRONMENT

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ABSTRACT

The objective of this preliminary study was to determine whether domestic pig social dominance confers later reproductive success. Two seminatural environments were established with a feeder, shaded pond, shelter and 2 acres of ground cover with alfalfa. Four prepuberal (2 males and 2 females) "resident" pigs were placed on the fields after the post-weaning dominance order was established. Pigs on one field showed a very stable dominance order, while the other field's dominance order was more volatile. Later, additional estrous gilts were brought to each field to determine which boar(s) bred each gilt. Boars shared estrous gilts, that is, both boars on each field bred estrous gilts. Fathership of litters from resident gilts was also shared by both boars on each field. Certain males which were socially dominant mounted estrous gilts more frequently. But all boars shared breedings of estrous gilts and paternity of litters.

INTRODUCTION

A central theory of ethology is that social dominance confers reproductive success (Poole, 1985). It is not known to what degree social dominance impacts typical swine farm conception rates (of 70 to 90 percent). Furthermore, domestication may have altered any natural relationship between dominance and reproductive success. Little or no research has been conducted, with domestic pigs, asking questions central to issues of ethology. A better understanding of mechanisms controlling behavior may lead to greater reproductive performance on swine farms.

The objective of this study was to determine if social dominance attained prior to puberty confers later reproductive success. This research was conducted primarily in a large semi-natural enviroment.

METHODS

Animals. Two Duroc (red) boars, two Yorkshire by Landrace (white) boars, and four Yorkshire by Landrace (white) gilts were the primary subjects. Two groups of four pigs were established indoors after weaning at 28 days of age. Table 1 indicates the identification, sex of the pigs, and their birth and weaning weights.

Pigs were moved to the field at about nine weeks of age. They were fed a sorghum-soybean meal diet ad libitum from a three hole self-feeder. Pigs on each field also had access to 2 acres of planted alfalfa. Three months later the feeders were removed and one daily meal of 2 kg per head and native alfalfa were the available feed sources.

TABLE 1. DEMOGRAPHIC DATA FOR EXPERIMENTAL PIGS

Identification	Sex	Pen	Field	Birth weight,lb	Weaned weight,lb
Orange tag	gilt	C[a]	East	3.5	15.1
Yellow tag	gilt	C	East	4.6	18.3
White	boar	C	East	4.8	20.4
Red	boar	C	East	4.0	17.9
Orange tag	gilt	D[b]	West	4.7	19.9
Yellow tag	gilt	D	West	4.5	17.9
White	boar	D	West	3.8	18.0
Red	boar	D	West	3.9	18.6

[a] These pigs later put on east field.
[b] These pigs later put on west field.

When resident pigs were five to six months old, the red boar on the west field injured a leg. This slight impairment may have reinforced his social position.

Social Dominance. The groups were formed when pigs were 5 weeks old and marked with coded eartags for identification. At this time, they were placed in a 4 by 4 foot pen indoors with a 5 hole feeder and nipple waterer. Behavior was video recorded for the first 72 hours they were together. Data were collected from video records to establish a social order based on aggressive attacks, and submission. At five months of age pigs were observed once per week for four weeks to confirm that the earlier-determined dominance was maintained. Aggression was defined as boars or gilts alternating bites and pushes. Most attacks were among males. Submission was defined as any pig receiving attack but not retaliating. These behaviors were more fully described by McGlone (1985).

Reproductive Success. Pigs were allowed to live together, breed and eventually give birth. Because of sire colors, the offspring could be examined to determine which boar(s) sired the litter. However, actual numbers of pigs per litter by each sire could not be determined.

Boar Dominance for Estrous Test Gilts. When pigs were eight months of age, resident gilts appeared pregnant. Because little sexual behavior had been actually observed among resident pigs, estrous gilt tests were conducted. Estrous gilts used for sexual tests, were 6 to 7 month old crossbred gilts, weighing 200 to 220 pounds. When it was determined that they were in estrus (by testing with a mature boar), they were put on one of the fields. There were a total of nine trials. Five were completed on the west field and four on the east field. An estrous gilts was brought into each field and the following duration and frequency data were taken: mounting,

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another pig located within one body length, sniffing, touching, aggression, and time spent away from the gilt. Mounting was when a boar was positioned on top of the estrous gilt's rump, backside, or front end. The gilt could be standing, sitting or lying down (but primarily standing). Within one body length was when a focal pig was at least one body length from the estrous gilt. While being within one body length, pigs could be standing, walking, pursuing, rooting or performing any behavior. Written observations were also taken continuously. The test periods were 90 minutes.

RESULTS

Social Dominance. Prepuberal social dominance data are presented in Table 2. In pen C, the dominance order was relatively stable. The red boar was dominant over the white boar. Boars were dominant over gilts. However, the two gilts in pen C were approximately equal in social dominance.

In pen D the white boar was dominant over the red boar in every social encounter. The submissive behavior shown by the white boar during the 24-48 hour period was due to his defeat by the orange tag gilt.

In pen D (what later will become the west field pigs), boars showed long durations of aggressive behavior compared with that shown in pen C. The white boar in pen C was clearly subordinate to the red boar. Thus, in pen C (later put on the east field) a clear relationship between dominance status and reproductive success could be shown (if such a relationship exists in the domestic pig). However, in pen D since the social structure was volatile among males, a clear relationship between dominance and reproductive success would be difficult to demonstrate.

Reproductive Success. The most critical measure of reproductive success is production and survival of offspring. All "resident" gilts gave birth, indicating that they were bred about the time they reached puberty. When planned breedings are preformed, some piglets from red sires have light red spots on their skin, while all piglets from white sires are exclusively white.

In this preliminary study each litter of piglets had some pigs with light red spots on their skin. Most piglets were all white. This indicated that both boars sired each litter. The exact number of piglets sired by each boar could not be determined in this study. Use of red females and white or red boars would have confirmed the exact numbers of piglets from each sire. Such a determination requires further study.

TABLE 2. BEHAVIOR OF PIGS ON FIRST THREE DAYS IN PENS

Behavior	Post-Grouping hour	Yellow tag gilt	Orange tag gilt	White boar	Red boar
		PEN C[a]			
Agression, minutes	0-24	1.08	0.24	6.21	9.6
	24-48	0.0	0.0	2.4	2.58
	48-72	0.0	0.12	0.12	0.48
Submission, minutes	0-24	0.45	1.05	1.23	0.0
	24-48	0.0	0.03	0.03	0.0
	48-72	0.0	0.09	0.15	0.0
		PEN D[b]			
Aggression, minutes	0-24	24.27	6.3	97.51	84.48
	24-48	55.49	3.0	24.32	35.52
	48.72	71.0	0.0	79.42	8.09
Submission, minutes	0-24	2.61	3.57	0.0	0.24
	24-48	0.69	1.47	1.14	0.12
	48-72	0.09	0.09	0.0	0.33

[a] These pigs later put on east field.
[b] These pigs later put on west field.

Boar Dominance for Estrous Test Gilts. Listed in Table 3 are the results from the sexual behavior tests. The boar by field interaction was significant for duration of mounting (P=.01) and tended to be significant for frequency of standing within one body length (P=.10) and frequency of sniffing (P=.08). The white boar on the east field (the socially subordinate male) showed lower sexual and investigatory sniffing behaviors. This was replicated on the west field where the red boar (socially subordinate) also showed lower levels of sexual and investigatory sniffing behaviors.

Although differences in behavior were evident due to field and boar-type (red or white), all boars were sexually active. In fact, in each estrous gilt test, both boars mounted and successfully bred the estrous gilts. Therefore, although certain boars were more or less active, both resident males attained apparent reproductive success.

TABLE 3. MEANS, STANDARD ERRORS AND RESULTS OF ANALYSIS ON ESTROUS GILT TESTS

	East Field				West Field				PR > F		
Behavior	N	RB	WB	SE	N	RB	WB	SE	B	Fi	B*F
Mounting, D	4	16.6	7.9998	2.0077	5	4.9169	6.5143	1.7706	.07	.01	.01
Mounting, F	4	40.000	17.7500	6.3957	5	18.6750	13.9321	5.6450	.03	.10	.14
Within one body length, D	4	16.8768	18.8843	4.9741	5	17.8942	26.1765	4.3867	.26	.46	.91
Within one body length, F	4	133.8427	108.5927	28.2399	5	98.5283	149.5200	24.9050	.61	.93	.10
Sniffing, D	4	14.9748	8.0598	3.5334	5	8.8884	9.5150	3.4693	.38	.60	.30
Sniffing, F	4	175.0375	97.2875	34.5313	5	65.6485	101.6557	30.4535	.50	.19	.08
Touching, D	4	6.5333	1.4886	1.3740	5	3.3301	1.3583	1.2118	.01	.29	.23
Touching, F	4	94.6935	27.1935	16.5303	5	45.4345	26.1488	14.5782	.01	.19	.12
Agression, D	4	0.06556	0.08550	0.0284	5	-0.0124	-0.0144	0.02500	.72	.01	.67
Aggression, F	4	1.2083	1.4583	0.7970	5	0.4333	0.2333	0.7029	.97	.28	.75
Away	4	34.9498	53.4823	10.1287	5	54.9821	46.450	8.9326	.58	.57	.15

N = # of Trials
SE = Standard Error
D = Duration, minutes/90 minute test period
F = Frequency or number of times behavior was observed
RB = Red boar (Duroc)
WB = White boar (York X Landrace)
B = Boar effect
Fi = Field effect
B*F = Boar by field interaction

DISCUSSION

Domestication may have altered the domestic pigs' sexual and social behavior. While the European Wild Boar (the ancestor of the domestic pig) male is a solitary animal (Graves, 1982), our postpuberal males lived peacefully and were commonly observed near one another. The resident females remained together. However, the two males and two females were not often observed together. Boars and gilts were together typically when resting and when the females were in estrus.

Interesting behavior was observed when the test estrous gilts were brought to the experimental pens. Resident boars showed excitement and considerable investigatory behavior in the presence of novel gilts while resident gilts showed little interest or aggression (unless test gilts came near resident gilts). Dominance was not overt. Only when a limited amount of a palatable feed was given could dominance be surmised.

The determination of social dominance when prepuberal pigs were first placed together was a critical part of our dominance determination. Observers felt uncomfortable assigning social status to pigs based on live observations of relatively peaceful pigs.

As is evident from Table 2, a clear social dominance order was formed in pen C (the east field). The red boar showed no submissive behavior during hierarchy formation. In pen D (the west field), both boars showed some submissive behavior, but the white boar eventually was considered the more dominant winner among males because he showed the least submission.

Social dominance status influenced male sexual behavior. Dominant boars mounted more often and for longer durations. However, subordinate boars also mated estrous test gilts (they just did so less often). Males shared estrous test gilts and, apparently, they shared the paternity of the litters. Perhaps if boars bred a large number of females, the increased breedings by dominant boars would result in more offspring sired by the dominant male. Therefore, the small advantage dominance confers in reproductive success may be the reason aggression-dominance behaviors remain fixed in the gene pool of the domestic pig. Further examination of this theory is needed since the number of groups of pigs used was limited. A larger number of replications may lead to more conclusive results.

LITERATURE CITED

Graves, H.B. 1984. Behavior and ecology of wild and feral swine (sus scrofa). **J. Animal Science. 58**: 482-491.

Poole, T. 1985. **Social behavior in mammals**. Blackie and Sons Ltd., Glascow and London.

McGlone, J.J. 1985. A quantitative ethogram of aggressive and submissive behaviors in recently regrouped pigs. **J. Animal Science. 61**: 559-565.