Reproductive Performance of Young Sows from Various Gestation Housing Systems

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Summary and Implications

Overall, the reproductive performance for two parities of sows (litter size and sow weight and condition) from various gestation housing systems was similar. The study was conducted at the Iowa State University L. Christian Swine Research and Demonstration Farm, Atlantic, IA. The gestation housing systems were individual crates in a mechanically ventilated confinement building (CRATE) and group-housed sows in a modified-open front building (MOF) or a bedded hoop structure (HOOP). All sows were fed individually. The group-housed sows were fed with either feeding stalls (FS) or electronic feeders (EF). The data analyzed were for litters born from April through December 1998. The trial was terminated because of a pseudorabies outbreak and subsequent depopulation of the farm. Therefore, the results of this study are only partial and should be interpreted with caution. A similar trial is planned after repopulation of the farm.

Methods

The effects of swine gestation housing on reproductive performance of sows were evaluated at the Iowa State University Lauren Christian Swine Research and Demonstration Farm near Atlantic, IA. The gestation housing systems were 1) individual gestation crates in a mechanically ventilated, partially slatted floor, manure flush building (CRATE); 2) group pens in a naturally ventilated, curtain-sided, partially slatted floor, modified-open front building with no bedding and a deep manure pit (MOF); and 3) group pens in deep-bedded, naturally ventilated hoop structures (HOOP). The group-housed gilts were individually fed with either individual feed stalls (FS) or electronic computerized feeders (EF). Sows fed with the electronic feeder received an initial training period the week after breeding during which time they learned to use the feeders.

Sows were naturally mated in a centralized, slatted floor confinement breeding barn. Three to 7 days after breeding, the sows were randomly assigned to one of the gestation systems. The sows returned to the same assigned gestation housing system after breeding for the second parity gestation. The groups of sows consisted of 40 to 60 sows. Sows were added weekly to the groups from the breeding barn and sows were removed weekly from the groups for transfer to the farrowing rooms. Three to five sows were added or removed each week. The sows were Yorkshire × Landrace or Hampshire × Yorkshire × Landrace in approximately a 1:1 ratio. Duroc terminal boars were mated to all sows.

The records analyzed were for farrowings that occurred from April 1998 through December 1998. The first farrowings on the farm started in April 1998. In early 1999 pseudorabies virus (PRV) was diagnosed and the farm was depopulated and later repopulated. The records of the herd after the PRV diagnosis and for approximately 30 days prior to the diagnosis were not analyzed. A total of 585 litters was included in the analysis. This included first parity litters (n=409) and second parity litters (n=176).

The gilts were purchased as market weight replacement gilts and were generally cycling on arrival. After a 60-day isolation period the gilts were eligible for breeding. Breeding was delayed slightly to allow for construction to be completed. Therefore, the gilts were bred no earlier than three estrus cycles after puberty.

The sows were weighed and scanned for tenth rib backfat prior to farrowing (approximately 110 days of gestation) and at weaning. Sow lactation feed intake also was recorded. During gestation all sows were fed 4.5 lb/day of a corn-soy diet. The last trimester of gestation feed was increased to 6 lb/day.

At farrowing the number of pigs born live, stillborn pigs, and mummified pigs was recorded. The birth weight of the live pigs was recorded. At weaning, the litter was counted and weighed. Weaning occurred at 17–19 days of age. Pig gain per day during lactation was calculated. The litter data and the sow data were analyzed for each parity with SAS.

Results and Discussion

Note. Because of the short time period (April to December), the variability of many of the parameters measured and the few number of parities (1 and 2) in this data set, the conclusions drawn from these data should be limited and regarded as preliminary. In addition, the second parity was cut short by the disease outbreak. After repopulation a similar experimental protocol will be initiated without the challenges of new construction, multiple sow breed lines, and management of a new farm.

Parity 1. The litter performance data for parity 1 are shown in Table 1. In the first parity, there were 141, 61, 73, 52, and 82 litters for the CRATE, MOF/EF, MOF/FS, HOOP/EF, and HOOP/FS gestation housing systems, respectively. Overall litter performance for the first-parity

sows housed in the various gestation housing systems was similar. Average number of live pigs at birth (9.2 to 10.2 pigs/litter) and average pig birth weight (>3.3 lb/pig) was acceptable for all gestation housing systems. The sows gestated in individual crates (CRATE) weaned more pigs per litter than the sows gestated in groups (P<.001).

The pigs were weaned at about 18 days of age and weighed an average of approximately 11 lb each with slightly more than .4 lb/day average daily gain during lactation.

The sow performance for the first parity is shown in Table 2. Prior to farrowing the sows weighed approximately 415 lb (393 to 426 lb). The HOOP/EF gestated sows weighed less prefarrowing than the sows from the other systems (P<.001). At weaning the sows weighed approximately 355 lb (350 to 361 lb). The MOF/EF gestated sows consumed less feed during lactation (P<.001).

Parity 2. The litter performance data for parity 2 are shown in Table 3. In the second parity, there were 91, 17, 21, 23, and 24 litters for the CRATE, MOF/EF, MOF/FS, HOOP/EF, and HOOP/FS gestation housing systems, respectively. Overall litter performance for the second-parity sows housed in various gestation systems was similar. Average number of live pigs at birth (9.5 to 10.4 pigs/litter) and average pig birth weight (>3.5 lb/pig) was acceptable. The CRATE gestated sows weaned more pigs than the HOOP/EF gestated sows (P<.001).

The pigs were weaned at about 19 days of age and weighed an average of 13 to 14 lb each with more than .5 lb/day average daily gained during lactation.

The sow performance for the second parity is shown in Table 4. Prior to the second farrowing the sows weighed approximatly 455 lb (430 to 466 lb) At weaning the sows weighed approximately 430 lb (414 to 443 lb). At weaning the sows fed with the EF during gestation weighed less than the other sows (P<.001).

Acknowledgments

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Table 1. First-parity litter performance for various gestation housing systems.

	Housing System										
Item	CRATE		MOF/EF		MOF/FS		HOOP/EF		HOOP/FS		
	mean	sem	mean	sem	mean	sem	mean	sem	mean	sem	n
NBA	10.2	0.2	9.2	0.4	9.3	0.3	9.2	0.4	9.5	0.3	409
SB	0.84^{ab}	0.11	1.07^{ab}	0.17	1.00^{ab}	0.16	0.58^{b}	0.18	1.17^{a}	0.15	409
MM	0.14	0.04	0.21	0.06	0.14	0.06	0.27	0.07	0.11	0.05	409
BW	3.39^{d}	0.05	3.42^{cd}	0.07	3.59^{c}	0.07	3.36^{d}	0.08	3.42^{cd}	0.06	409
NW	9.18^{e}	0.21	7.54^{f}	0.32	8.11^{f}	0.29	7.54^{f}	0.35	7.60^{f}	0.28	408
WW	11.4^{ef}	0.2	11.5^{ef}	0.3	11.3^{ef}	0.2	10.9^{f}	0.3	11.8^{e}	0.2	384
WA	18.3	0.3	17.7	0.4	17.9	0.4	18.0	0.4	18.2	0.4	395
ADG	0.43^{ef}	0.01	0.45^{e}	0.01	0.43^{ef}	0.01	0.41^{f}	0.01	0.44^{e}	0.01	384

^{ab}Means in the same row with different superscripts differ P<.05.
^{cd}Means in the same row with different superscripts differ P<.02.
^{efg}Means in the same row with different superscripts differ P<.001.

Item abbreviations
NBA = born live, pigs/litter
SB = stillborn, pigs/litter
MM = mummified, pigs/litter
BW = birth wt., lb
NW = weaned, pigs/litter
WW = wean wt., lb/pig
WA = wean age, days
ADG = pig gain, lb/day

Housing system abbreviations
CRATE = individual crate
MOF/EF = modified-open front/electronic feeder
MOF/FS = modified-open front/feeding stalls
HOOP/EF = hoop structure, bedded/electronic feeder
HOOP/FS = hoop structure bedded/feeding stalls

Table 2. First-parity sow weights, backfat thickness, and lactation feed intake for various gestation housing systems.

	Housing System										
Item	CRATE		MOF/EF		MOF/FS		HOOP/EF		HOOP/FS		
	mean	sem	mean	sem	mean	sem	mean	sem	mean	sem	n
PWF	426^{e}	3	421^{e}	6	414^{e}	5	393^{f}	6	416^{e}	5	403
PFBF	13.8	0.4	13.5	0.4	13.1	0.5	13.0	0.4	13.1	0.4	240
SWW	361	5	353	6	355	6	350	6	355	6	295
SWBF	13.1	0.3	12.4	0.4	12.1	0.4	12.5	0.4	12.4	0.4	274
ADFI	9.6^{e}	0.2	8.5^{f}	0.3	9.5	0.3	10.1^{e}	0.4	9.8^{e}	0.3	341

^{efg}Means in the same row with different superscripts differ P<.001.

Item abbreviations
PFW = prefarrow wt., lb
PFBF = prefarrow backfat, in.
SWW = sow wean wt., lb
SWBF = sow wean backfat, in.
ADFI = lactation feed intake, lb/d

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Table 3. Second-parity litter performance for various gestation housing systems.

	Housing System										
Item	CRATE		MOF/EF		MOF/FS		HOOP/EF		HOOP/FS		
	mean	sem	mean	sem	mean	sem	mean	sem	mean	sem	n
NBA	10.4	0.3	9.5	0.7	9.6	0.6	9.5	0.6	9.7	0.6	176
SB	0.65	0.14	0.88	0.32	0.57	0.29	0.39	0.28	0.42	0.27	176
MM	0.18	0.05	0.12	0.11	0.05	0.10	0.13	0.10	0.00	0.10	176
BW	3.55	0.06	3.72	0.14	3.59	0.12	3.60	0.12	3.73	0.12	175
NW	9.27^{e}	0.26	8.76^{ef}	0.60	8.86^{ef}	0.54	8.13^{f}	0.52	9.13^{ef}	0.51	176
WW	13.3	0.2	14.0	0.5	13.5	0.4	14.0	0.4	13.6	0.4	176
WA	19.3	0.3	18.9	0.8	19.0	0.7	18.6	0.7	20.1	0.6	176
ADG	0.51^{f}	0.01	0.55	0.02	0.53^{ef}	0.02	0.56^{e}	0.02	0.49^{f}	0.02	175

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HOOP/FS = hoop structure bedded/feeding stalls

Table 4. Second-parity sow weights, backfat thickness, and lactation feed intake for various gestation housing systems.

	Housing System										
Item	CRATE		MOF/EF		MOF/FS		HOOP/EF		HOOP/FS		
	mean	sem	mean	sem	mean	sem	mean	sem	mean	sem	n
PFW	466^{e}	5	457^{ef}	11	461^{e}	10	430^{f}	10	459^{e}	9	174
PFBF	14.2	0.3	14.8	0.7	13.8	0.7	13.4	0.7	14.5	0.7	148
SWW	436^{e}	5	413^{f}	11	436^{e}	10	414^{f}	9	443^{e}	9	165
SWBF	13.6	0.4	12.9	0.7	13.6	0.7	13.3	0.6	12.8	0.7	124
ADFI	12.8^{f}	0.2	12.5^{f}	0.5	13.9^{e}	0.5	13.3^{ef}	0.5	14.1^{e}	0.4	174

^{efg}Means in the same row with different superscripts differ P<.001.

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