

# The Impact of Gestation Housing Systems on Sow Longevity

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# Introduction

- Many major US commercial pork producers to begin phasing out gestation stalls
- Greater interest in group gestation housing systems.
- 1960s / 1970s pork producers began moving their gestation sows
  - From group housing systems,
    - Outdoor lots,
    - Pens in barns, and
    - Other existing facilities (pens in renovated finishing facilities)
    - Lacked the ability to provide individual feeding and health management.
  - To individual gestation sow housing systems
    - Designed with the aim to provide individual sow management.
    - Improved labor efficiency
    - Began to see farms get larger
  - New group housing
    - Not going back to outdoor systems
    - Electronic sow feeding systems (ESF)
    - Many new management challenges will evolve.

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## Paper Objective

Provide an overview of impacts that gestation housing systems have on sow longevity.

Examine the impact that genetics might have on the behavior of sows housed in a group gestation housing setting.

# Longevity Definition

- Before a discussion on longevity can begin, the trait needs to be defined.
- Is longevity the most appropriate term to use in the pork industry?
  - As it relates to humans, longevity implies living to one's natural lifespan.
  - In the pork industry very few animals remain in the herd until through their natural life span, estimated to be between 12 and 15 years (Pond and Mersmann, 2001).
- Sows are culled when their productivity declines below some point or the sow has some reproductive problem or failure.
- Most appropriate term might be sow productive lifetime or something similar.

# Longevity Definition

- Definition is dependent on the goal(s) of the evaluation.
  - Economic evaluation could be concerned with lifetime productivity
  - Genetic, nutritional or other studies might be concerned with length of life, herd life, productive life, parity removed, or some similar measure.
- Other suggested definitions (D'Allaire et al., 1992)
  - removal rate,
  - culling rate,
  - replacement rate,
  - percent gilts in herd,
  - mean parity of females in inventory, and
  - mean parity at removal.

# Longevity Definition

- Within all of these traits differences can occur based on the record keeping program used
  - Compare apples to apples
  - Adhere to the National Pork Producers Council's Production and Financial Standards.
- Management practices employed by commercial pork operations make it difficult to use or apply simple definitions for sow longevity.
  - Replacement gilts are purchased and their birth dates are not provided,
  - Cannot accurately arrive at a length of life measure.
  - It is clear that appropriate measures of longevity are dependent upon the objectives of the study

# Longevity Definition

- Length of Productive Life or Productive Lifetime (SPL)
  - Is associated with a time span
    - Days
    - Months
    - Years
    - Parities
  - Can further associated production
    - Pigs produced per some measure of productive lifetime

# Defining Sow Housing Systems

- Many gestation sow housing systems in used today out sow housing
  - crates,
  - tethers,
  - groups,
  - electronic group systems,
  - straw bedded pens, etc.).
- More variation or more types of loose housing systems.
  - Likely the result of an industry that is in the infancy stage
  - Unsettled on a standardized system.

# Defining Sow Housing Systems cont'

- Before the U.S. pork system settles on a relatively standardize group housing system the sow management considerations and other factors will need to be worked out.
- Different group housing systems
  - Static
  - Dynamic groups.
- Facility variations include crate type
  - half crate,
  - self locking, etc.
- Feeding system
  - floor feeding,
  - trickle feeding,
  - electronic sow feeders, etc.,
- Facility
  - hoop structures,
  - confinement structures, etc.
- Multitude of combinations possible

# Defining Sow Housing Systems cont'

- The management and other factors impacting sow longevity or sow productive lifetime likely differs depending on the type of gestation housing used (stall vs. group housed).
- Within the group housing system, management factors that will improve sow productive lifetime will likely differ based on the type group housing system utilized.

# Housing Influence on Sow Longevity

- Few scientific studies associating housing and sow productive lifetime.
- Group and individually housed sows do differ for traits that indirectly influence SPL:
  - Trauma or injuries (lameness, shoulder sores, vulva biting, etc),
  - General management (working conditions, sow observation),
  - Health (cross infections, new infections, exercise, etc.),
  - Nutrition ,
  - Well-being, and other traits.
- There are advantages and disadvantages relative to SPL for all sow gestation housing systems.

# Housing Influence on SPL

- Tethering, stalls, and group sow housing were evaluated by den Hartog et al. (1993) for:
  - Productivity,
  - Labor input and management,
  - Well-being,
  - Health, and
  - Economics. Further, den Hartog et al. (1993) reiterated five criteria that have been previously identified that should be avoided when developing housing systems for sows “1. malnutrition, 2. thermal and physical discomfort, 3. injury or disease, 4. suppression of normal behavior, and 5. fear and stress.”

# Housing Influence on Sow Longevity

den Hartog et al. (1993) reported five criteria that have been previously identified that should be avoided when developing housing systems for SOWS

1. malnutrition,
2. thermal and physical discomfort,
3. injury or disease,
4. suppression of normal behavior, and
5. fear and stress.

# Housing Influence on Sow Longevity

Similarly, den Hartog et al. (1993) pointed out research that has identified requirements of sow housing systems from a commercial pork producer perspective that include

1. high biological performance,
2. low labor input,
3. ease of management,
4. acceptable capital cost, and
5. acceptable financial returns.

Table 1. Comparison of three farm systems for pregnant sows (least square means  $\pm$  SD) (Adapted from den Hartog et al., 1993).

Item	Housing		
	Stall	Tethering	Group
No. of litters	933	956	951
No. of pigs born alive	10.32 $\pm$ 3.0 <sup>a</sup>	10.07 $\pm$ 3.0 <sup>b</sup>	10.11 $\pm$ 3.1 <sup>a,b</sup>
Average birth wt., g	1538 $\pm$ 235 <sup>a</sup>	1,532 $\pm$ 241 <sup>a</sup>	1507 $\pm$ 249 <sup>b</sup>
Mortality, %	10.7	10.6	11.9
No. of litter per sow per year	2.24	2.24	2.22
Weaned pigs per sow per year	20.1	19.5	19.1
Replacement of sows during the study, %	43.7 <sup>a</sup>	53.2 <sup>b</sup>	55.6 <sup>b</sup>

Table 1. Comparison of three farm systems for pregnant sows (least square means  $\pm$  SD)(Cont') (Adapted from den Hartog et al., 1993).

Item	Housing		
	Stall	Tethering	Group
Timer per 24 h spent			
Sham chewing, %	9.58	7.63	7.29
Bar biting, %	0.20	0.92	0.00
In apathathy, %	0.19	0.27	0.29
Hoof lesion score			
4 wk Gestation	2.8	2.7	3.5
15 wk Gestation	4.0	4.0	6.8

# Housing Influence on Sow Longevity

den Hartog et al. (1993) study, the major difference between the different housing systems was

- Replacement rate which favored ( $P < 0.05$ ) stall housed sows when compared to tethered or group housed sows (Table 1).
- They also reported that the stall housed sows had lowest hoof lesion score when compared to the other types of gestation housing systems evaluated.

**• Are these effects are direct results of the housing system or from other factors or combination factors within the study.**

Table 2. Treatment percentages for subsequent return to estrus variables and farrowing rate from sows housed in either gestation stalls or group housed with an electronic sow feeder (Adapted from Bates et al. 2003).

Item	Treatment	
	Gestation Stalls	Group housed – Electronic Sow Feeder
Return to estrus, %	91.7	94.5
Return to estrus, 7 days postweaning, %	68.4 <sup>c</sup>	72.0 <sup>d</sup>
Farrowing rate, %	89.4 <sup>c</sup>	94.3 <sup>d</sup>

# Housing Influence on Sow Longevity

- Sows not returning to estrus and found in pig (contributes to lower farrowing rate), often are culled shortening their productive lifetime or reducing their longevity.
- In this study one could extrapolate that sows housed in a stall have poorer longevity than sows that were group housed and fed with an electronic sow feeder.

Table 3. Trait LS means examining the effect of housing in gestation crates (GC) and in the Hurnik-Morris (HM) system on sow and litter performance (Adapted from Morris et al. 1998).

Trait	GC	HM	SEM <sup>a</sup>	P
Initial and maintained herd size	29	23		
Total number of sows used in the study	90	59		
Average parity of sows	2.6	3.1	0.10	0.05
Total born / litter	10.2	10.8	0.53	0.21
Number born alive / litter	9.4	10.1	0.33	0.11
Number weaned / litter	8.0	8.6	0.26	0.14
Litter birth weight, kg	15.7	16.3	0.54	0.45
Litter weaning weight, kg	63.6	66.4	3.85	0.42

<sup>a</sup>Standard error of the mean

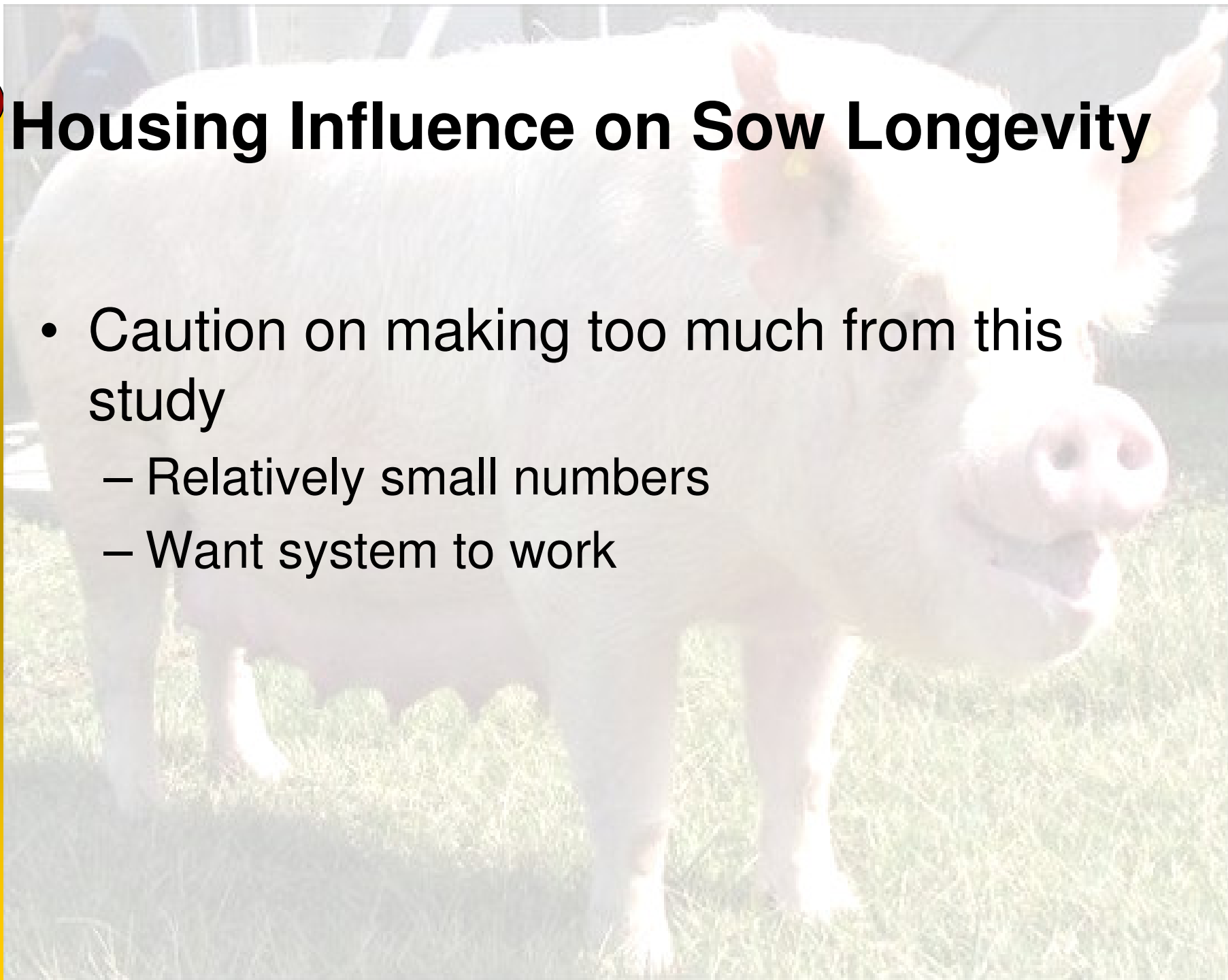
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Trait	GC	HM	SEM <sup>a</sup>	P
Initial and maintained herd size	29	23		
Total number of sows used in the study	90	59		
Lifetime total born / sow	27.2	35.1	2.52	0.02
Lifetime born alive / sow	25.1	32.8	2.31	0.02
Lifetime number weaned / sow	21.5	27.2	1.97	0.05
Lifetime weight of pigs born / sow, kg	43.1	53.1	4.01	0.08
Lifetime weight of pigs weaned / sow, kg	173.4	215.5	17.65	0.10

<sup>a</sup>Standard error of the mean

# Housing Influence on Sow Longevity

- Caution on making too much from this study
  - Relatively small numbers
  - Want system to work

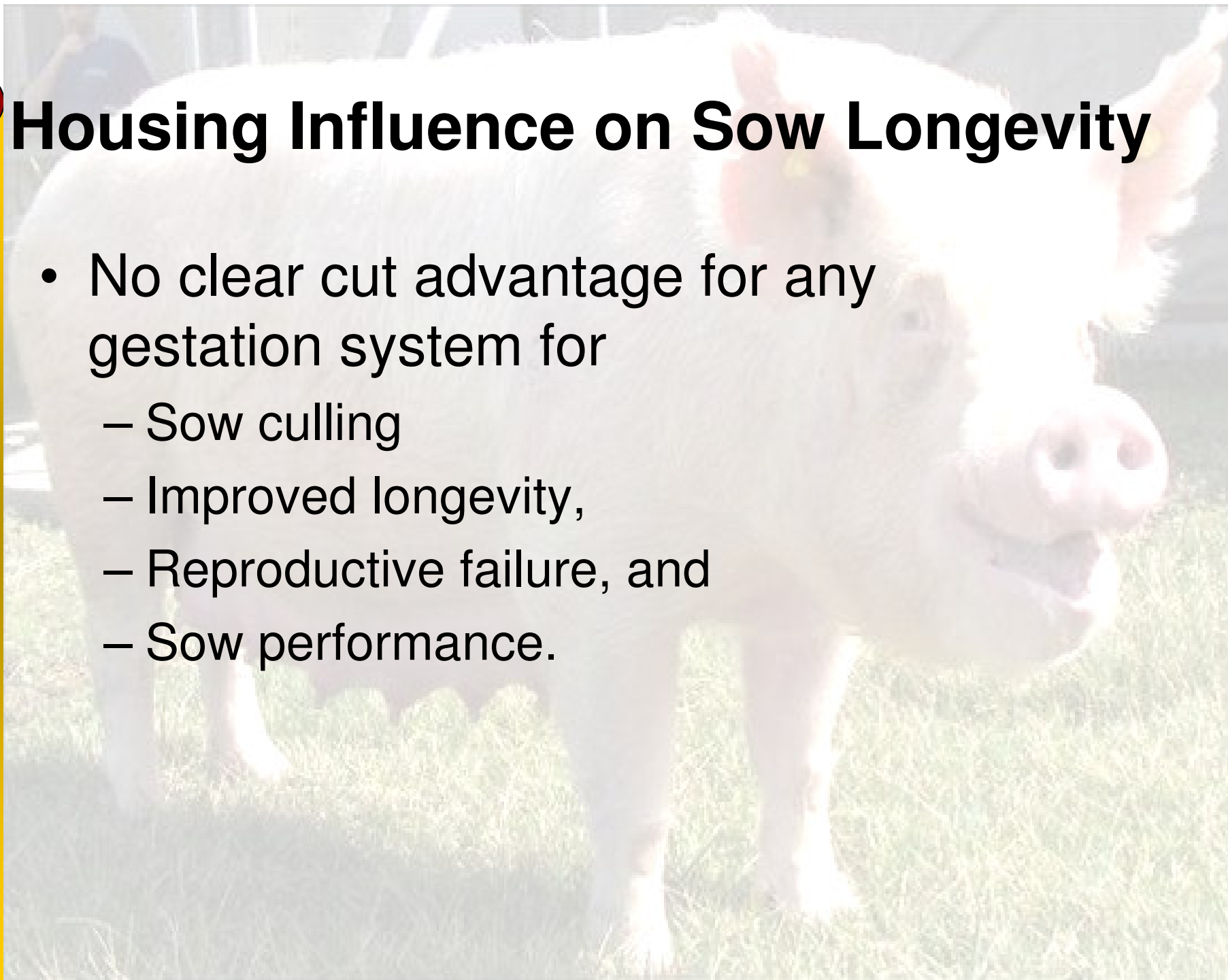


# Housing Influence on Sow Longevity

- It is possible to find reports that suggest the stall is better for some traits
  - Backus et al. (1997) sows gestated in stalls took fewer days to return to oestrus after weaning than sows that were group housed with electronic feeders.
  - Barbari (2000) reported lower farrowing rates for farms that have group gestational housing.
  - Stone (1981) and Friendship et al. (1986) both reported that improved sow longevity did not appear to be associated with sows housed in either individual stalls or grouped in pens during gestation.
  - Svendsen (1975), in a study involving a limited number of farms, suggested that sows individually stalled during gestation had less culling when compared to sows housed in a group housing system.
  - Number of piglets born alive tends to be similar in group and stall gestational housing (Cronin et al., 1996; Backus et al., 1997).

# Housing Influence on Sow Longevity

- No clear cut advantage for any gestation system for
  - Sow culling
  - Improved longevity,
  - Reproductive failure, and
  - Sow performance.



# Housing Effects on Sow Injuries

- Factors, like injury, impact sow longevity through increased culling and mortality.
- It is easy to imagine that sows with poor feet and leg conformation might not fair well in a group housing system.
  - Fighting
  - More locomotion required
- Some studies have reported 2-3 times greater incidence of cracked hooves and heel injuries when sows are housed on slatted floors when compared to solid concrete or straw bedding (Ehlorsson et al., 2002).
- Injuries can occur in crates as well
  - Larger sows = more injuries

# Housing Effects on Sow Injuries

- Leg soundness scores, poor structure, or animals having a substantial number of feet and leg problems will not fare well regardless of the type of housing system utilized.
- Incoming replacement gilts have a thorough feet and leg evaluation
- In all cases evaluate flooring for poor casting, improper handling, and wear and tear.

# Stockmanship

- Stockmanship always important!!!
- Will take employees time to develop skills in a group housing system
  - Individual care
  - Training needed
  - Feed and leg soundness even more critical

# Genetic Selection for Sow Behavior

- Most breeding programs have traditionally focused on improving traits of economic importance
- Consumers are beginning to attach value to traits that have little or no direct economic effect at the farm level.
  - =“**societal important trait**”
- Selection of gilts that interact well in a group sow housing situation
- Selection of animals that perform well in a group situation may have direct economic impact

# Genetic Selection for Sow Behavior

- Newsham Hybrids attempted to select for group sow housing effects.
- Newsham Hybrids (USA) began working with the competition effects and incorporating the effects in the genetic evaluation models (Gunsett, 2005).
- From 1996 through 2002, Newsham developed and marketed the GENTEL® program
  - focused on the production of sow lines.
  - “behavior within a pen appeared to be more docile, space allocation within a finishing pen could be reduced, reduced mortality of small pigs and finishing pigs was reduced, increased percentage of pigs were marketed at full market value”

# Genetic Selection for Sow Behavior

- Anecdotal evidence that some sows are less aggressive or more docile
  - temperament to perform better in a group sow housing situation.
- Competitive effects (Muir, 2005) = classic studies that have examined how animals perform in a group setting
- Competition adversely impacts productivity
  - in the case of sows, number born alive, number weaned, return to estrus, etc. T
- Traditional quantitative genetic selection ignores the competitive effects or interactions could result in selecting the wrong animals for a situation where the animals must perform in a group setting, in this case group sow housing situation.

# Molecular Selection for Traits related to Sow Longevity

- Markers could play a useful in identifying individuals or lines that may be more adaptable in a group sow housing setting.
- ISU colleagues have identified molecular markers for sow longevity in traditional systems
- Plausible that markers could be identified in a similar manner once group sow housing more widely used.
  - Possible that same markers would at least have some affect.

# What is possible?



**DOB: 8/2/1997**

TRAIT3	10 LITTER AVG	21 LITTER AVG	TRAIT	10 LITTER AVG	210 LITTER AVG
NBA	12.10	11.24	ADJ WWT	138.1 lb	151.5 lb
SB	1.00	1.67	AGE	15.9 d	17.4 d
NAT	10.0	9.86	W2E	6.56 d	6.10 d*
WEANED	9.30	9.19	FI	136 d	147.4 d*

# Conclusions

- Difficult to predicting results of sow studies based on previous work because the industry has changed so much.
- How does the concept of group gestation play in a system that designed to wean 2000 pigs a week?
- This requires more 150 sows to farrow each week let a alone a total sow herds of 150 sows.