Impressions of Sow Overgrown Toes on U.S. Farms: What Environmental Factors are Driving This?

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Derek J. Henningsen, Graduate Research Assistant, Department of Animal Science, Iowa State University
Jennifer, M. Bundy, Associate Professor, Department of Animal Science, Iowa State University
Anna K. Johnson, Professor, Department of Animal Science, Iowa State University
Kenneth J. Stalder, Professor, Department of Animal Science, Iowa State University
Marta Mainenti, Clinical Assistant Professor, Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University
Locke A. Karriker, Professor, Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University

Summary and Implications

The purpose of this study was to poll farm managers regarding (1) prevalence of sow overgrown toes at their farm, and (2) to determine if environmental factors were a driving factor behind prevalence of overgrown toes. All survey questions were self-reported by the participants. There was a total of 20 questions, which were separated into 6 different categories: farm demographics, flooring, sow characteristics, lameness, incidence of overgrown toes, and removal reason. The top 20 swine producing companies were chosen as potential survey participants by utilizing the Successful Farming Exclusive: Top 40 U.S. Pork Powerhouse List of 2020. Survey questions regarding overgrown toe percentage will be presented descriptively as tallies and percentages. For environmental factors, four models were created using overgrown toe percentage as the dependent variable. A variable was deemed significant if the *P*-value was ≤0.05. The survey was open for 72 d (May 20, 2022, to July 29, 2022). Surveys were considered "complete" if greater than 80 % of the questions were answered. A total of 63 surveys (that encompassed 275,000 gilts and sows) were completed. When parceling out the percentage of overgrown toes on-farm, half of the participants ranked the prevalence as low (≤5%) and only 6% of respondents reported overgrown toe percentages greater than 15%. There were no observed correlations between housing type, flooring type, or flooring condition and the percentage of overgrown toes ($P \geq 0.36$). There was an observed significant correlation between lameness reason and percentage of overgrown toes ($P = 0.0017$). This study provided no evidence that housing type, flooring type or flooring condition contributed to increased instances of overgrown toes potentially suggesting an alternative causation for the toe overgrowth.

Introduction

Gilt selection based on feet structure is critical so that a robust female is successfully added into the breeding herd. Stalder et al., (2010) identified ideal gilt feet structure as large, square, evenly spaced toes with even toe size across the lateral and medial digit. The sow's foot is comprised of 4 individual toes, also framed as digits or claws, two of which are weight bearing. The remaining two toes are often referred to as dew claws and they are non-weight bearing. All four toes can be further classified as lateral or medial depending on the proximity to the center of the pig (medial) or the outside of the pig (lateral). Typically, the lateral toe is slightly larger and thus, bears a larger portion of the sow weight. Selecting gilts with ideal feet structure will result in better length of stay, profitability, improved sow welfare and caretaker morale. Gilt feet structure interplays with sow lameness and the most prevalent etiologies include overgrown toes and overgrown dew claws. Overgrowth occurs when the mean rate of hoof horn growth exceeds the mean rate of hoof horn wear. Most overgrowth evaluations are subjective assessments provided by the farm personnel. Reports on sow breeding populations indicate variable overgrown toe incidences from 4.5% to greater than 25%. The incidence rate along with the randomness of farm location, suggest that environment factors, such as flooring type, hygiene and housing type may impact toe overgrowth. However, the relationship between environmental factors and the overgrown toe prevalence in breeding herds in the United States (U.S.) remains unclear. Therefore, the purpose of this study was to poll farm managers regarding (1) prevalence of sow overgrown toes at their farm, and (2) to determine if environmental factors were a driving factor behind prevalence of overgrown toes.

Materials and Methods

This study was reviewed and approved as exempted research by Iowa State University Institutional Review Board (IRB: 21CFR56) for Human Subjects Research and complied with CFR 45 Part 46.

***Survey development**:* A single survey instrument was created using the 2022 Qualtrics online software (Qualtrics Provo, UT, 2022). All survey questions were self-reported by the participants. There was a total of 20 questions, which were separated into 6 different categories: farm demographics, flooring, sow characteristics, lameness, incidence of overgrown toes, and removal reason. Fifteen questions allowed participants to select the one answer that best applied. A single question allowed multiple answers to be selected. Four questions were labeled "*open ended*" and allowed participants the option to respond with their own answer (Table 1). Questions highlighted in blue font will be included in this report. The Qualtrics survey was translated to Spanish via a translation company, Distynct (Ames, IA), whose employees have a comprehensive swine production background.

Survey participants: The top 20 swine producing companies were chosen as potential survey participants by utilizing the Successful Farming Exclusive: Top 40 U.S. Pork Powerhouse List of 2020. Two Qualtrics survey links (one in English and one in Spanish) were sent via e-mail to a Pork Powerhouse contact company. The contact had a professional relationship with a member of the research team and contacts ranged in job seniority and job title. Each contact forwarded the e-mail on to an individual sow farm manager. If the farm manager oversaw several farms, they were instructed to complete the survey for each individual farm they oversaw. For a sow farm manager to be enrolled into the survey, they had to be fluent in English or Spanish and be familiar with all the sow farms they managed. Responses were submitted either online using the Qualtrics online software or were emailed to the primary author (DH) and they entered the responses. All responses were entered into Qualtrics anonymously, with no traceability back to the respective sow farm, manager, or production company.

Statistical analysis: Survey questions regarding overgrown toe percentage will be presented descriptively as tallies and percentages. For environmental factors, four models were created using overgrown toe percentage as the dependent variable. The four independent variables were gestation housing type (stall versus group), gestation flooring type (solid concrete, partially slatted, and fully slatted), gestation flooring condition (wet versus dry) and, the primary lameness reason (dew claw, foot lesions, joint issues, long/overgrown toes or other). Due to the categorical nature of the responses, an ordinal logistic regression was utilized, and odds ratios were created. A variable was deemed significant if the *P*-value was ≤0.05.

Results and Discussion

The survey was open for 72-d (May 20th, 2022, to July 29th, 2022). Surveys were considered "complete" if greater than 80 % of the questions were answered. A total of 63 surveys (that encompassed 275,000 gilts and sows) were completed with 56 surveys submitted directly by the farm using the 2022 Qualtrics online software and 7 submitted using Microsoft Word and were then entered into the Qualtrics software. When parceling out the percentage of overgrown toes on-farm, half of the participants ranked the prevalence as low (≤5%) and only 6% of respondents reported overgrown toe percentages greater than 15% (Figure 1).

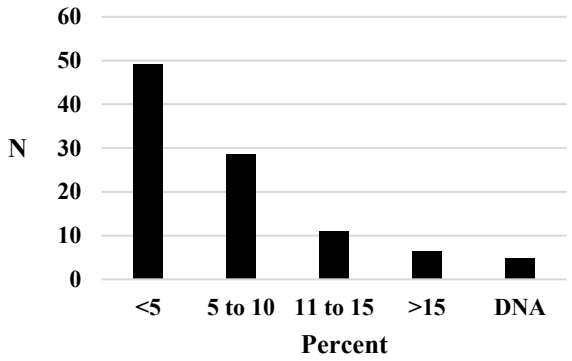

Figure 1. Farm manager impressions regarding the percentage of sows that have overgrown toes (DNA = Did not answer)

There were no observed correlations between housing type, flooring type, or flooring condition and the percentage of overgrown toes, but there was an observed significant correlation between lameness reason and percentage of overgrown toes (Table 2).

Table 2. F ratios and *P*-values for survey response questions when compared to the percentage of overgrown toes reported on-farm.

Question	F-Ratio	*P*-Value[1]
Housing type	2.024	0.36
Flooring type	1.562	0.46
Flooring condition	0.295	0.59
Lameness reason	17.348	0.0017

[1]*P*-value <0.05 was considered significant.

It is important to note some survey limitations as it pertains to the results. First, all data were self-reported providing potential bias and thus, potentially impacting the outcome of the data analysis and the reported results. Additionally, participants provided the perceived prevalence of overgrown toes in categories (<5%, 5-10%, etc.) which limited the variance that we could observe related to this question. Second, this survey does not account for the genetic background of the sows, the early development of both gilts and sows, the nutritional components of the feed and the variation of water quality. These unknowns and the potential farm to farm variability of these components could

also have altered the responses submitted in the survey. In conclusion, a large portion of farm managers reported extremely low instances of overgrown toes on their farms. Furthermore, this study provided no evidence that housing type, flooring type or flooring condition contributed to increased instances of overgrown toes potentially suggesting an alternative causation for the toe overgrowth.

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Table 1. Survey questions with response options and answer response styles.

Question	Options	Answer style
Farm demographics		
In which state is the sow farm located?	All U.S. States	Open ended
What is the age of the sow farm? (Yr)	<5	Select the answer that best applies
	6-10	
	11-20	
	>20	
How many sows and gilts are on this farm? (Number)		Open ended
Gestating housing type of the farm?	**Individual Stalls**	**Select the answer that best applies**
	Group Housing	
Flooring		
Flooring type in gestation	**Solid concrete**	**Select the answer that best applies**
	Partially slatted	
	Fully slatted	
Flooring type in lactation	**Cast iron**	**Select the answer that best applies**
	Expanded wire	
	Tri-bar	
	Plastic	
	Concrete	
	Other	
General flooring hygiene in gestation?	**Wet**	**Select the answer that best applies**
	Dry	
Gestation stall or pen covered in fecal matter? (%)	<25	Select the answer that best applies
	25-50	
	51-75	
	>75	
Sow		
What type of gilt production system does your farm utilize?	System internal gilt production	Select the answer that best applies
	Purchase replacement gilts	
What is the average parity over the past 12 mo?	Parity 1	Select the answer that best applies
	Parity 2	
	Parity 3	
	Parity 4	
	Parity 5	
	Parity 6	
	Parity 7	
	Parity 8 or older	

Question	Options	Answer style
What is the approximate average body condition score in gestation (just prior to farrowing) over the past 12 mo?	BCS 1 (thin) BCS 3 (ideal) BCS 5 (fat)	Select the answer that best applies
What is the overall farm consistency of BCS?	Low Medium High	Select the answer that best applies
Lameness		
What is your most prevalent reason for observed sow lameness that occurs on the farm you manage or supervise?	**Dew claw** **Foot lesions** **Joint issues** **Long/Overgrown toes** **Other**	**Select the answer that best applies**
When does sow lameness most often occur on the farm you manage or supervise?	Lactation Breeding Gestation	Select the answer that best applies
What foot issues do you most commonly see among the sows on the farm you manage or supervise?	Hoof wall cracks Pad lesions/cracks Severely overgrown toes Uneven toes	Select all answers that apply
Overgrown toes		
What is the most frequent location for long toes when it is observed on the farm you manage or supervise?	Front feet Rear feet All feet	Select the answer that best applies
What percentage of sows have overgrown toes on your farm?	<5 6-10 11-15 >15	Select the answer that best applies
Among the sows, what parity do you most often recognize toe overgrowth in the sow herd you manage or supervise?	Between parity 1 and 2 Between parity 2 and 3 Between parity 3 and 4 Between parity 4 and 5 Older than parity 5	Select the answer that best applies
Do you currently practice trimming overgrown toes on breeding herd sows?	Yes No	Select the answer that best applies

Question	Options	Answer style
Removal reason		
What is the primary reason for culling sows from the breeding herd on the farm you manage or supervise?	Age Body condition score Performance Reproductive failure Structure	Select the answer that best applies