

How Does the Type of Vaccine Affect Pig Approachability Pre- and Post-vaccination?

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Shawna Weimer, Graduate Research Assistant;
Anna Johnson, Associate Professor;
Kenneth Stalder, Professor,
Department of Animal Science;
Locke Karriker, Professor
Swine Medicine Education Center, Veterinary Diagnostic
and Animal Production Medicine,
Iowa State University;
Thomas Fangman, Boehringer Ingelheim Vetmedica Inc., St
Joseph, Missouri

Summary and Implications

The objective of this study was to determine if nursery pigs display different behaviors and postures pre- and post-injection using a live- and digital image methodology. A total of 149 pens housing approximately 19 barrows and gilts/pen (a mix of approximately 50% barrows and 50% gilts; 0.3 m²/pig) were used. Barrows and gilts were approximately 6-wk of age from a commercial crossbred genetic line. The pen applied injection treatments were (1) Ingelvac CircoFLEX[®]/Ingelvac MycoFLEX[®] vaccine, (2) Circumvent[®] PCVM vaccine (3) Saline. **Pre-injection** were conducted at 1600h the day before injections were administered. Pigs received their treatments at 1000h on the consecutive day and **post-injection** was conducted, 6 h after treatments were administered and 24 h after pre-injection observations. An animal-human interaction tests was completed at pre- and post-injection time points using a live- and digital image methodology. The experimental unit was the pen of pigs. The statistical model evaluating methodologies used PROC GLIMMIX. A $P \leq 0.05$ value was considered to be significant. There were no **pre-injection** “approach” or “not” behavioral differences for the live human- ($P > 0.05$). Regardless of methodology used, CV-PCVM treated nursery pigs had fewer “approach” and more “not” compared to CF/MF and saline injected pigs ($P < 0.0001$). When examining the **percentage difference** between **pre-** and **post-**injection “approach” and “not,” 19.3 ± 2.3 % (6 pigs) fewer pigs classified as “approach” using live methodology and 17.0 ± 2.0 % (6 pigs) fewer pigs using the digital image. In conclusion, nursery pigs were less willing to voluntarily approach a human in their home pen 6-h after receiving a vaccine and this information is useful when considering when to conduct an on-farm animal-human measure in an assessment or third party audit.

Introduction

On-farm welfare assessments and third party audits are carried out to document compliance with animal care and welfare policies and procedures. Welfare assessment and audit criteria can be divided into resource- and animal-based measures. One animal-based measure is the human approach paradigm. The aim of this paradigm is to determine the animal-human relationship i.e. positive, neutral or negative. The Welfare Quality Assurance program assesses this paradigm, however, the Pork Quality Assurance Plus Program and the Common Swine Industry Audit describe the importance of pig-human interactions, but do not formally assess/audit the paradigm. Misinterpretation of the human approach paradigm and inaccurate conclusions may occur if the auditor does not have detailed production management information. For example, preliminary work using the human approach paradigm noted that recently PCV2 vaccinated nursery pigs were reluctant to approach a human in their home pen. Vaccines are extremely important to protect pig health and improve welfare, but pigs not approaching the human because they were recently injected/vaccinated could be misinterpreted as being poorly handled. Therefore, the objective of this study was to determine if nursery pigs display different behaviors and postures pre- and post-injection using a live- and digital image methodology.

Materials and Methods

Animal care and husbandry protocols for this experiment were overseen by the company veterinarian and farm manager. These protocols were based on the U.S. swine industry guidelines presented in the Swine Care Handbook and the Pork Quality Assurance Plus[™] (2010). In addition, all procedures were approved by the Iowa State University IACUC committee.

Animals and location: A total of 149 pens housing approximately 19 barrows and gilts/pen (a mix of approximately 50% barrows and 50% gilts; 0.3 m²/pig) were housed in four rooms within 2 barns (2 rooms in each barn). Barrows and gilts were approximately 6-wk of age from a commercial crossbred genetic line. The experiment was conducted in November 2011 at a commercial nursery site located near St. Joseph, Missouri.

Diets, housing and husbandry: Pens measured 1.8 m width x 3 m length with steel dividers. Pens were situated with 10 pens on the right, 10 on the left and 20 in the center separated by two alleyways (91.4 cm wide). Feeders were located on the right or left side of the pen. Pigs were provided *ad-libitum* access to a pelleted diet (1549 kcal per kg metabolizable energy and 22% crude protein) formulated

to meet or exceed NRC 2010) nutrient requirements. Each pen contained one stainless steel nipple drinker that was positioned between pens and opposite the feeder. Wire flooring was utilized in all pens. Average room temperature was 24°C. Caretakers observed all pigs twice daily.

Animal-human interaction methodology: Upon entry to the nursery room the observer and the digital image photographer walked down the length of the nursery room to the farthest pen on the right side of the alleyway. The observer quietly set the nursery pen image capturing device at the midpoint at the front gate of the adjacent pen across the 91.4 cm alleyway and quietly stepped over and entered the nursery pen. In conjunction, the photographer quietly sat on a bucket behind the observer and leaned back on the front pen gate. At the conclusion of the 15-s period, the observer signaled to the photographer, by leaning back against the front gate, for the photographer to capture a digital image using a wireless remote.

Nursery pen image capturing device: The device location was free-standing across the alleyway from each pen gate where the live human assessment occurred. A 2.5 cm radius PVC connector, and a second 40 cm height PVC pipe was added to the top of the 1.6 m height PVC pipe to create a total nursery pen image capturing device height of 2.0 m. The tripod head was angled at 47 degrees relative to the vertical PVC pipe. The camera was angled at 50 degrees relative to the horizontal tripod head and was secured into position.

Injection treatment: The pen applied injection treatments were (1) Ingelvac CircoFLEX®/Ingelvac MycoFLEX® vaccine (Boehringer Ingelheim Vetmedica Inc., St. Joseph, Missouri), (2) Circumvent® PCVM vaccine (Merck, Whitehouse Station, New Jersey) and (3) Saline (Hyclone Phosphate Buffered Saline, Sigma Aldrich, St. Louis, Missouri).

Injection methodology: An entire pen of pigs received an injection treatment. Injection treatments were given by a veterinarian whom worked for Boehringer Ingelheim and the producer. Pens were assigned a treatment in an alternating fashion across the alleyway. The first injection treatment was a killed baculovirus vector, CircoFLEX/MycoFLEX vaccine (**CF/MF**). Because this is a single dose vaccination, 2 mL of saline was given upon nursery and was followed with a 2-mL dose of CF/MF 14 d after the first injection during the study. The second injection treatment was a killed baculovirus vector, Circumvent PCVM vaccine (**CV-PCVM**). A total of 2 mL of CV-PCVM was given upon arrival to the nursery and a second 2 mL dose was given 14 d after the first treatment during the study. In the third injection treatment, pigs received 2 mL of CF/MF upon nursery arrival and 2 mL of **saline** control 14 d after the first injection during the study. Injections were made into the lateral cervical musculature

on the right side of the neck using an 18-gauge, 1.6 cm length Uni-Matic 2-mL, multi-dose syringe taking 1-s/pig. The same technician performed vaccination procedures for all treatments. Pigs were moved by a sort board towards the alley end of their home pen. Pigs were not picked up and individually handled in an effort to avoid any additional handling-associated stressors on the pigs. To avoid injecting the same pig twice, a mark was placed between the pig's scapula's using an animal-safe crayon after injection.

Timing of behavioral measures: Pre-injection were conducted at 1600h the day before treatments were administered. Pigs received their treatments at 1000 h on the consecutive day and **post-injection** measurements were conducted, 6 h after treatments were administered and 24 h after pre-injection observations. A **percentnage difference** measure was further calculated for both methodologies:

$$\text{percentnage difference} = \text{pre-injection} - \text{post-injection}$$

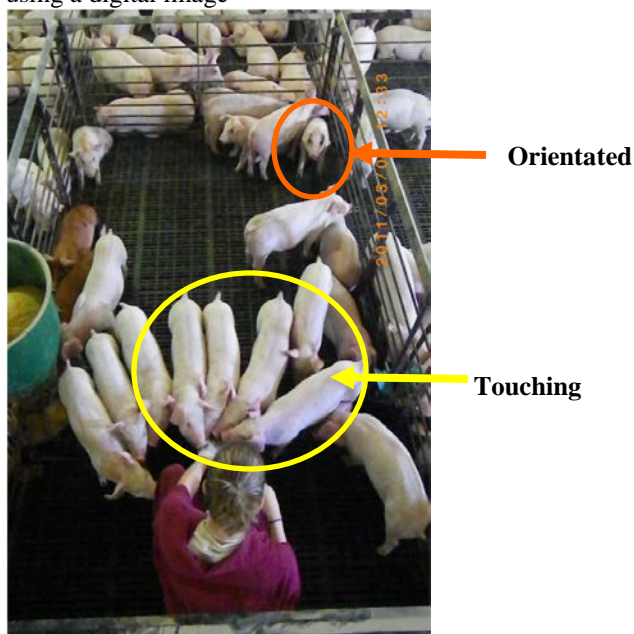
Animal-human interaction methodology: Upon entry into the nursery room the observer and the digital image photographer walked down the length of the nursery room to the farthest pen on the right side of the alleyway. The observer quietly set the nursery pen image capturing device at the midpoint at the front gate of the adjacent pen across the 91.4 cm alleyway and quietly stepped over and entered the nursery pen. The observer extended and held still the left leather-gloved hand with the index finger extended, and began a stopwatch, avoiding eye contact with pigs for 15 seconds. The left hand and finger were extended to allow the same anatomical location to be clearly visible on each digital image. In conjunction, the photographer quietly sat on a bucket behind the observer and leaned back on the front pen gate. At the conclusion of the 15-s period, the observer signaled to the photographer, by leaning back against the front gate, for the photographer to capture a digital image using a wireless remote.

Measures: The animal-human interaction observations were conducted in all treatment groups **pre-** and **post-**injection. Behavior was classified as either "**live approach**" "**digital approach**" or "**not**" (Table 1). At the conclusion of the 15-s, the observer raised her head and counted/classified the number of pigs. The digital image was reviewed later in the ISU-Animal Behavior Laboratory using Adobe Photoshop CS5. Pigs were counted using the image into "**digital approach**" and "**not**" (Figure 1).

Table 1. Approach vs not using a live or digital image methodology

Measure	Description
Live approach	Any part of the pig's body touching the human observer and any pig orientated toward the human.
Digital approach	Any part of the pig's body touching the human observer and any pig orientated toward the human ¹ .
Not	All pigs not classified as Approach within either methodology.

Figure 1. Classifying *Touching* and *Orientated* and not using a digital image¹



¹For the digital image, using Adobe Photoshop, a line was drawn from the midpoint between the pig's eyes to the center of the snout, then extended towards the edge of the pen. If the line intersected the human, the pig was also classified as digital approach.

Statistical Analysis: Researchers were blind to injection treatments until the data had been collected and statistical models were confirmed by a statistician. All data were evaluated for normal distribution before analysis by using the PROC UNIVARIATE procedure of SAS. The experimental unit was the pen of pigs. The live observation and digital image methodology models were analyzed by using the PROC GLIMMIX procedure of SAS, respectively. The statistical model evaluating live human included the fixed effect of methodology (n = 149) and random effects of barn and room nested within pen. Fixed effects for room (1, 2, 3, and 4) and injection treatment (CF/MF, CV-PCVM, and saline) were included in the statistical model. The same fixed and random effects were used for the statistical model evaluating the digital image evaluation methodology. The PDIFF option in SAS was used to determine differences between pig behaviors. A $P \leq 0.05$ value was considered to be significant for all measures.

Results and Discussion

There were no *pre-injection* “approach” or “not” behavioral differences for the live human- ($P = 0.39$; Table 2) or digital image methods ($P = 0.22$; Table 3). Regardless of methodology used, CV-PCVM treated nursery pigs had fewer “approach” and more “not” compared to CF/MF and saline injected pigs ($P < 0.0001$; Tables 2 and 3). When examining the *percentage difference* between *pre-* and *post-* injection “approach” and “not,” $19.3 \pm 2.3 \%$ (6 pigs) fewer pigs classified as “approach” using live methodology and $17.0 \pm 2.0 \%$ (6 pigs) fewer pigs using the digital image. In conclusion, nursery pigs were less willing to voluntarily approach a human in their home pen 6-h after receiving a vaccine and this information is useful when considering when to conduct an on-farm animal-human measure in an assessment or third party audit.

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Table 2. Nursery pig behavior means (\pm SE) from **live human methodology** *pre*- and *post*-injection and the **percentage difference** when housed in commercial conditions.

	Injection Treatment [‡]			<i>P</i> -values
	CF/MF	CV-PCVM	Saline	
No. pens [†]	48	51	50	
Pre-injection[§], %				
Approach	44.1 \pm 1.6	47.0 \pm 1.6	44.5 \pm 1.6	0.39
Not	55.9 \pm 1.6	55.0 \pm 1.6	55.5 \pm 1.6	0.39
Post-injection, %				
Approach	40.6 \pm 1.8 ^a	27.7 \pm 1.8 ^b	44.6 \pm 1.8 ^a	<0.0001
Not	59.4 \pm 1.8 ^a	72.3 \pm 1.8 ^b	55.4 \pm 1.8 ^a	<0.0001
Difference, %				
Approach	- 3.5 \pm 2.3 ^a	-19.3 \pm 2.3 ^b	+ 0.1 \pm 2.3 ^a	<0.0001
Not	+ 3.5 \pm 2.3 ^a	+ 19.3 \pm 2.3 ^b	-0.1 \pm 2.3 ^a	<0.0001

[†]Commercial pens measuring 1.8 m width x 3 m length providing 0.3 m² per pig. PIC barrows and gilts (housed in mixed pens) were 42 days of age and weighed approximately 25 kg at trial commencement.

[‡]Pens of pigs were either treated with CircoFLEX[®]/MycofLEX[®] (2 mL dose; Boehringer Ingelheim Vetmedica, Inc., St. Joseph, Missouri; **CF/MF; n=48 pens**), Circumvent[®]-PCVM (2 mL dose; Merck, Whitehouse Station, New Jersey; **CV-PCVM; n=51 pens**) or phosphate buffered saline (2 mL dose; Hyclone Phosphate Buffered Saline, Sigma Aldrich, St. Louis, Missouri; **VSAL; n=50 pens**), each administered as a single intramuscular dose injected into the right lateral cervical musculature using a 16-gauge needle.

[§]When pigs were 42 days of age, pig behavior was collected at 16:00 (*pre-injection*). At 43 days of age, pigs were given their assigned injection treatment at 10:00 and then behavior was collected at 16:00 (*post-injection*).

^{ab}Means within a row with no common superscript are significantly different ($P < .05$).

Table 3. Nursery pig behavior means (\pm SE) from **digital image methodology** *pre*- and *post*-injection and the **percentage difference** when housed in commercial conditions.

	Injection Treatment [‡]			<i>P</i> -values
	CF/MF	CV-PCVM	Saline	
No. pens [†]	48	51	50	
Pre-injection[§], %				
Approach	42.7 \pm 1.6	46.5 \pm 1.6	43.4 \pm 1.6	0.22
Not	57.3 \pm 1.6	53.5 \pm 1.6	56.6 \pm 1.6	0.22
Post-injection, %				
Approach	39.1 \pm 1.7 ^b	29.5 \pm 1.7 ^c	46.3 \pm 1.7 ^a	<0.0001
Not	61.0 \pm 1.7 ^b	70.5 \pm 1.7 ^a	53.7 \pm 1.7 ^c	<0.0001
Difference, %				
Approach	- 3.6 \pm 2.0	- 17.0 \pm 2.0	+ 2.9 \pm 2.0	<0.0001
Not	+ 3.6 \pm 2.0	+ 17.0 \pm 2.0	- 2.9 \pm 2.0	<0.0001

[†]Commercial pens measuring 1.8 m width x 3 m length providing 0.3 m² per pig. PIC barrows and gilts (housed in mixed pens) were 42 days of age and weighed approximately 25 kg at trial commencement.

[‡]Pens of pigs were either treated with CircoFLEX[®]/MycofLEX[®] (2 mL dose; Boehringer Ingelheim Vetmedica, Inc., St. Joseph, Missouri; **CF/MF; n=48 pens**), Circumvent[®]-PCVM (2 mL dose; Merck, Whitehouse Station, New Jersey; **CV-PCVM; n=51 pens**) or phosphate buffered saline (2 mL dose; Hyclone Phosphate Buffered Saline, Sigma Aldrich, St. Louis, Missouri; **VSAL; n=50 pens**), each administered as a single intramuscular dose injected into the right lateral cervical musculature using a 16-gauge needle.

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