

Piglet Mortality in an Outdoor Farrowing Hut: What Behaviors Contribute to Their Demise?

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Summary and Implications

Pre-weaning crushing mortality has been estimated to cost the industry over \$100 million/yr and is a serious animal well-being concern. The objectives of this study were to determine behavior, postures, locations and vicinity to the sow for each piglet 1-h prior to piglet death when housed in an outdoor farrowing hut. No differences ($P > 0.05$) were found for behavior or postures between CR and NC groups. Piglets engaged in more ($P = 0.006$) standing during the daylight hours. No ($P > 0.05$) differences were observed among treatments and time for location within the farrowing hut. For vicinity to the sow, there were no ($P > 0.05$) treatment differences but for time of day, piglets spent more ($P = 0.004$) time close to the sow during dark hours.

In conclusion, piglet behavior, postures, location and vicinity to the sow 1 hour prior to piglet death did not differ between the two treatment groups. Time of day affected standing postures with more piglets standing during the light hours and at night more piglets preferred to be in the vicinity of the sow. Therefore, finding few behavioral differences between treatments may indicate that variation among sow behavior is a more significant cause of piglet crushing than variation among piglet behaviors.

Introduction

Allowing the sow increased mobility at the time of parturition may be detrimental for the well-being of her piglets, if for example the sow frequently alters her posture, is unresponsiveness to her piglets' distress or does not nurse. These factors could result in increased preweaning mortality and a lighter litter at weaning. It has been reported that during the first 72 hours immediately following farrowing the majority of piglet deaths occur; with 50 % attributed to crushing by the sow.

The complex phenomenon of piglet mortality has been well researched, with 30 % of piglet losses attributable to a single factor and 70 % attributed to multiple factors. Pre-weaning crushing mortality has been estimated to cost the industry over \$100 million/yr and is a serious animal well-being concern.

Some work has described the sows' behavior 1 hour prior to a piglet being crushed in an outdoor farrowing hut.

It was reported that 62.5% of sows which crushed a piglet moved from lying sternal to lying lateral, 25% of the sows moved from lying lateral to lying sternal and 12.5% of CR sows transitioned from standing to lying lateral. To date limited information is available on the piglets' behavior 1 hour prior to being crushed by the sow in a farrowing hut system.

The objectives of this study were to determine behavior, postures, locations and vicinity to the sow for each piglet 1-h prior to piglet death.

Materials and Methods

Animals and housing: Each farrowing paddock was 0.4 ha, separated by a single stranded electrical wire (12 A), which was at a height of 59 cm above the ground. Crossbred litters (PIC, USA) were housed in English-style farrowing huts (1.12 m x 2.79 m x 1.65 m). One door was situated to the left side of the farrowing hut (1.23 m x 1.18 m) and a ventilation window was positioned on the back wall (43 cm x 1.19 m). The ventilation window was occasionally closed at the discretion of the farrowing manager. This was achieved by placing a wooden board (0.51 m x 1.19 m) over the open window. Closure rate was the same between all sows in and across pastures. All farrowing huts were orientated with the opening facing the south. Short chopped wheat straw was used for bedding. Tall metal fenders (0.9 m height x 2.7 m width at the back of the hut and 0.7 m at the front x 1.60 m length) with a PVC roller (0.12 m x 0.12 m x 0.64 m) were used. Fenders were attached after the sow had chosen her farrowing hut and prior to farrowing. To decrease the amount of disruption that occurred to the litter, caretakers checked on the litter twice a day (0700 and 1500 hours). Research was conducted from July to December 2000 at the Sustainable Pork Farm situated in an area with a dry steppe climate producing mild winter temperatures near Lubbock, Texas, USA.

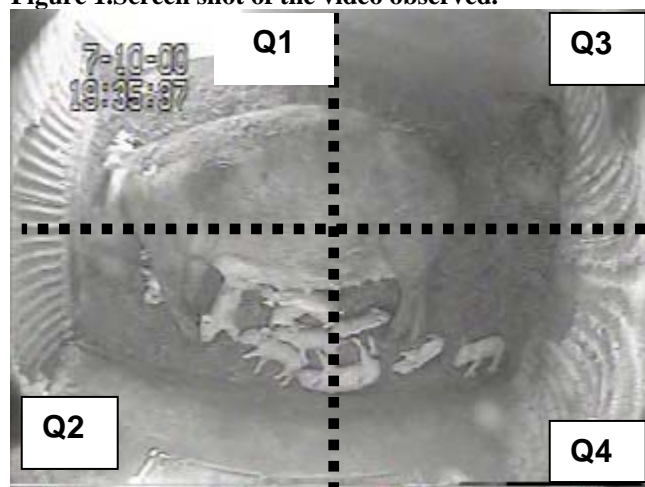
Treatments: Twenty piglets were observed continuously comparing two treatments; piglets that were crushed (CR; N=10) and piglets that lived from the same litter over the same time period (NC; N=10).

Camera set up: A plastic shed inside the central hub area of the farrowing pasture housed four time-lapse video recorders (VCR; Panasonic, Model AG-6540, Matsushita Co Ltd., Japan), which was set to record in 24 h mode, 2.5-frames/s. Each VCR contained an RS-232C interface adaptor (AG-IA671; Panasonic Matsushita Co Ltd., Japan). VCRs were connected to a video switcher (VS-81V Model 625120, Kramer Electronics Ltd., Israel) and this was

connected to one Panasonic black and white monitor so that camera angles and picture clarity could be checked daily.

Four farrowing huts were positioned along the fence line at 45, 60, 75 and 90 m, respectively, from the central hub. A 41 x 41 cm square was cut into the top center of each farrowing hut and a custom made protective 24 gauge galvanized steel camera hut was fixed onto the farrowing hut (Apex Sheet Metal, Lubbock, TX). The lid was hinged so that the camera could be easily adjusted from inside the camera hut unit. The camera hut unit (38.10 cm x 40.64 cm) contained filters on each side to allow air to circulate around the camera while preventing dust particles entering. A clear plexi glass tube (5.08 cm by 8 cm) was inserted into a pre-drilled hole at the base of the camera hut unit to protect the lens of the camera. This tube protruded into the farrowing hut and on either side of the camera one 12 V mini bayonet bulb was suspended from the ceiling of the hut unit. This light source provided ample light for the camera to work at night but was minimal so that it did not interfere with the behavior of the litter. One black and white (Model WV-BP 332, Panasonic Matsushita Co Ltd., Japan) 12 V camera was positioned inside the camera hut unit with the lens directed into the farrowing hut. Each camera had a 1.8 to 3.6 mm variable focal lens (Computar Japan). Cameras were held in position by four steel rods welded inside the camera hut unit. Each hut had one Astron Model RS-4A (Astron Coop. Irvine, CA), 13.8 V transformer to provide power for the camera and light.

Figure 1. Screen shot of the video observed.



Measures: Nursing behavior, five postures (walking, standing, sitting, lying and other), location (in four quadrants), and vicinity to the sow were recorded (as defined in Table 1). Behavioral data were collected by one experienced observer viewing videos recorded at 2.5 frames per second using the Observer V5.0.25 software (Noldus, USA®).

Statistical Analysis: Analyses were performed using the GLM procedure in SAS (SAS Inst. Inc., Cary, NC) software for parametric data. The experimental unit was the farrowing hut (containing one sow with her litter) with two treatments: sows that either killed piglets within the first 72 hours (CR) versus sows that did not kill piglets within the first 72 hours (NC) of parturition. Data were transformed (arcsine) and analyzed using the GLM procedure of SAS®. The experimental design was a randomized block design and the statistical model main plot treatment and time with treatment by batch used as the error term.

Results and Discussion

No differences ($P > 0.05$) were found for behavior or postures between treatments. Piglets engaged in more ($P = 0.006$) standing during the daylight hours. No ($P > 0.05$) differences were observed among treatments and time for location within the farrowing hut. For vicinity to the sow, there were no ($P > 0.05$) treatment differences but for time of day, piglets spent more ($P = 0.004$) time close to the sow during dark hours (Table 2).

In conclusion piglet behavior, postures, location and vicinity to the sow 1 hour prior to piglet death did not differ between the two treatment groups. Time of day affected standing postures with more piglets standing during the light hours and at night more piglets preferred to be in the vicinity of the sow.

Finding few behavioral differences between CR and NC piglets may indicate that variation among sow behavior is a more significant cause of piglet crushing than variation among piglet behaviors.

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Table 1. Description of piglet postures, behavior, location and vicinity to the sow for piglets that were crushed (CR) or not crushed (NC).

	Definition
Posture	
Walking	Any action while the piglet was upright and moving
Standing	Assuming or maintaining an upright position on extended legs but remaining stationary
Sitting	Most of the piglet's body weight and the posterior of its body trunk were in contact and supported by the ground
Lying	Side contacting the ground or underside contacting the ground
Other	Any time piglet was not visible on the screen, including when the piglet was outside of the hut, buried in the straw or hidden by the sow
Behavior	
Nursing	Piglet locates and massages a nipple and begins suckling, maintaining contact with the sow/teat
Location	
Quad 1 (Q1)	Included door to the farrowing hut
Quad 2 (Q2)	Quarter of the farrowing hut opposite from the door, on the back wall of the hut
Quad 3 (Q3)	Quarter of the farrowing hut on the same wall as the door but not including the door
Quad 4 (Q4)	Quarter of the farrowing hut opposite Quadrant 3 on the back wall
Vicinity to sow	
By Sow	Within one piglet body length of the sow
Not by Sow	More than one piglet body length from the sow

Table 2. Least squares means and standard errors for piglet behavior, posture, location and vicinity of the piglet to the sow 1-hour before crushing when housed in an outdoor farrowing hut.

Measure	TRT		Time		P-Values	
	CR	NC	Light	Dark	TRT	Time
Behavior						
Nursing	39.68 ± 5.50	46.14 ± 5.50	37.73 ± 3.81	48.09 ± 6.62	0.32	0.36
Posture						
Walking	15.01 ± 2.82	10.36 ± 2.82	13.41 ± 1.95	11.98 ± 3.40	0.31	0.32
Standing	6.39 ± 0.81	7.37 ± 0.81	8.22 ± 0.56	5.54 ± 0.97	0.26	0.006
Sitting	0.27 ± 0.22	0.36 ± 0.22	0.55 ± 0.15	0.08 ± 0.26	0.96	0.26
Lying	38.29 ± 4.91	35.50 ± 4.91	38.56 ± 3.40	34.31 ± 5.91	0.70	0.72
Other	0.35 ± 0.29	0.26 ± 0.29	1.53 ± 0.20	0.00 ± 0	0.13	0.06
Location						
Quad 1 (Q1)	28.12 ± 3.02	34.27 ± 3.02	32.18 ± 2.09	30.21 ± 3.63	0.18	0.23
Quad 2 (Q2)	23.09 ± 9.86	13.80 ± 9.86	11.55 ± 6.82	25.34 ± 11.86	0.55	0.37
Quad 3 (Q3)	36.18 ± 12.56	32.27 ± 12.56	41.79 ± 8.69	26.67 ± 15.11	0.89	0.37
Quad 4 (Q4)	12.61 ± 4.85	19.66 ± 4.85	14.48 ± 3.35	17.79 ± 5.83	0.31	0.76
Vicinity to sow						
By sow	93.12 ± 2.85	92.09 ± 2.85	78.51 ± 1.97	95.46 ± 3.43	0.64	0.004
Not by sow	6.88 ± 2.85	7.91 ± 2.85	21.49 ± 1.97	4.54 ± 3.43	0.64	0.004