

Drinking Behavior of Seven Week Old Pigs when Water is Either Withheld or Provided Ad Libitum

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Ciara J. Jackson, graduate research assistant;
Anna K. Johnson, assistant professor of animal science;
Ken Stalder, associate professor of animal science;
Locke Karriker, assistant professor of veterinary medicine

Summary and Implications

Detailed information on the pigs' temporal drinking patterns is essential when delivering water based health products because there is a risk that not all pigs will visit the drinker adequately and hence, may not receive sufficient vaccine or medication required to protect the animal. The objectives of this study were to determine the percentage of pigs that drank within a 6 hour time period and the number and length of drinking visits on an hourly basis for seven week old pigs when water was either withheld or not withheld for 15 hours over two consecutive days.

All pigs in the pens took at least one 5 second or longer visit to the drinker over both days (Table 1). Number of drinking visits to the nipple cup drinker per hour differed ($P = 0.0001$) for the first hour (0700) after water was made available between WH and CONT treatments respectively (Table 2). For all other hours there were no ($P > 0.05$) differences. Total length of time spent at the nipple cup drinker differed ($P = 0.0001$) at 0700 with WH spending longer than their CONT counterparts. For all other time periods there were no ($P > 0.05$) differences (Table 3). In conclusion, withholding water over the 15 hour period to make sure all pigs receive sufficient vaccine is not needed.

Introduction

Detailed information on the pigs' temporal drinking patterns is essential when delivering water based health products because there is a risk that not all pigs will visit the drinker adequately and hence, may not have received sufficient vaccine or antibiotics required to protect the animal. One health product that is delivered in the pigs' drinking water is Enterisol® Ileitis, a *Lawsonia intracellularis* vaccine. Enterisol® Ileitis provides protection against proliferative enteropathy (ileitis), a disease that has been estimated to cost the US swine industry \$98 million annually. Labeled recommendations for this product indicate that the vaccine should be provided to pigs for a "minimum of four hours". Therefore, if a sub population of pigs does not visit the drinker when the vaccine is being delivered; there is a risk that a sub population of pigs might move into the grow-finish production phase without the necessary protection against ileitis. Limited research has evaluated drinking bouts and

water disappearance in nursery pigs. There are guidelines for producers which address the amount of water needed during different stages of growth and recent work has begun to investigate the pig to water resource ratio, and the types of water delivery systems when providing oral vaccines to the nursery pig. The objectives of this study were to determine the percentage of pigs that drank within a 6 hour time period and the number and length of drinking visits on an hourly basis for seven week old pigs when water was either withheld or not withheld for 15 hours over two consecutive days.

Materials and Methods

Animals and housing: A total of 194 PIC (USA) (49 ± 4 d) pigs weighing 23.0 ± 5.38 kg were used in this study. Research was conducted over two days in May 2006 at a commercial nursery facility with climate control. Each nursery pen measured 1.5 x 3.7 m, providing 0.22 m^2 / pig. Steel penning dividers were 3.6 m length x 90 cm height. Tenderfoot™ flooring was utilized in all pens and all pigs had ad-libitum access to a corn-soy diet (3264 kcal and 20 % CP) which met or exceed NRC nutritional requirements for this phase of production. Diets were provided through a five-hole stainless steel feeder measuring 10.2 cm deep x 74.3 cm high x 76.8 cm length. Lights were turned on at 0700 h and off at 1600 h which provided a 9:15 Light: Dark cycle respectively. Farm personnel observed all pigs twice daily at 0700 and 1530. Each pen contained one stainless steel nipple-cup drinker that measured 12.7 cm deep x 30.5 cm high x 20.3 cm wide.

Treatments: Eight pens containing 23 pigs / pen (four barrow and four gilt pens) were used during the trial. Two treatments were compared; treatment one; withheld (WH; $n = 4$), defined as pigs in a pen having no access to water for 15-h. Water was prevented from flowing to the nipple bowl drinker using a two way 1.9 cm polyvinyl chloride butterfly valve attached to the water line supplying each pen. Treatment two, control, (CONT; $n = 4$) defined as a pen where pigs had continuous ad libitum access to water. Pigs were randomly assigned to pens and blocked by sex. A cross over design of treatments was utilized where by all pens were both a treatment and a control at different periods during the trial.

Behavioral measures: One day prior to visual recording of drinking behavior, all pigs in a pen were identified with an individual number placed between the scapulas using an animal safe crayon (Raidez™ Animal Marking Crayons, Otterbach Company, Germany). One 12

V black and white CCTV camera (Model WV-CP484, Panasonic® Matsushita Co Ltd., Japan) was positioned over each nipple-cup drinker (Figure One) and recordings were made over two consecutive days from 0700 to 1300 h onto a DVR (RECO-204) Darim Vision®, USA) at 1 frame per second. A pig was considered to be drinking when its head was in the nipple-cup drinker for 5 s or longer. The acquisition of drinking behavior was collected by one experienced observer who viewed the DVD's using a 24-h mode (1 frame / s) and recorded observational data using Observer software (The Observer, Ver. 5.0.25 Noldus® Information Technology, Wageningen, The Netherlands). Drinking behavior was expressed on an hourly basis. Therefore, for 0700 this equates to a recorded time beginning at 0700 and ending at 07:59:59 respectively.

Figure One: Screen print of pigs visiting the water bowl drinker.



Statistical Analysis: The experimental unit was the nursery pen. The number of visits and the duration of visits made by each individual pig were evaluated through Observer. Any visit less than 5 s in duration was not included in the final analysis. The data was sorted by day, pig and hour and the total number of visits to the cup nipple drinker and the total time spent drinking for each individual pig over each hour was calculated. Data was analyzed using the GLM MIXED procedure of SAS (2007; SAS® Inst. Inc., Cary, NC) software for parametric data on a pen basis. The model included day (one or two) treatment (control or water withholding), sex (barrows or gilts) and all interactions. All pigs in a pen were weighed the day before the trial began and this body weight (kg) was used as a linear covariate. Pen nested within treatment and day was included as a random effect in the model. Non-significant ($P > 0.05$) main effects (sex and day) and interactions were removed from the final model.

Results and Discussion

All pigs in the pens took at least one 5 second or longer visit to the drinker over both days (Table 1). Number of drinking visits spent at the nipple cup drinker per hour differed ($P = 0.0001$) for the first hour (0700) after water

was made available between WH and CONT treatments respectively (Table 2). For all other hours there were no ($P > 0.05$) differences. Total length of time spent at the nipple cup drinker differed ($P = 0.0001$) at 0700 with WH spending longer than their CONT counterparts. For all other time periods there were no ($P > 0.05$) differences (Table 3).

Table 1. Descriptive percentages of the time (hours) for 7 week old pigs to make a first visit of 5 s or longer to the nipple cup drinker after undergoing a water withholding period of 15-h or having ad libitum access to water from 0700 to 12:59:59 over two consecutive days in May 2006.

Day	TRT	Hour					
		7	8	9	10	11	12
1	CONT	78	91	96	96	96	100
	WH	100	100	100	100	100	100
	WH	96	100	100	100	100	100
	CONT	92	100	100	100	100	100
	CONT	56	87	100	100	100	100
	WH	100	100	100	100	100	100
	WH	92	100	100	100	100	100
	CONT	76	92	100	100	100	100
2	WH	91	100	100	100	100	100
	WH	84	100	100	100	100	100
	CONT	63	79	83	100	100	100
	WH	96	100	100	100	100	100
	WH	96	100	100	100	100	100
	CONT	79	96	100	100	100	100
	CONT	100	100	100	100	100	100
	WH	96	96	96	96	96	100

Table 2. Least squares means and standard errors for the number of drinking visits to a nipple cup drinker of 5 s or longer over a 6 h observational period for CONT vs. WH

Hour	Treatment		P-values
	CONT	WH	
0700	1.96 ± 0.26	4.46 ± 0.26	0.0001
0800	2.38 ± 0.39	3.53 ± 0.39	0.06
0900	1.08 ± 0.14	1.33 ± 0.14	0.20
1000	1.16 ± 0.16	1.28 ± 0.16	0.57
1100	1.66 ± 0.22	2.08 ± 0.22	0.20

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1200 1.85 ± 0.25 2.2 ± 0.25 0.32

Table 3. Least squares means and standard errors for the length of drinking visits to a nipple cup drinker of 5 s or longer over a 6 h observational period for CONT vs. WH

Hour	Treatment		P-values
	CONT	WH	
0700	18.08 ± 4.04	64.44 ± 4.02	0.0001
0800	26.49 ± 6.20	40.31 ± 6.19	0.14
0900	12.42 ± 2.52	15.16 ± 2.51	0.46
1000	12.16 ± 2.55	14.19 ± 2.55	0.24
1100	16.81 ± 2.44	20.25 ± 2.43	0.34
1200	20.68 ± 4.37	21.43 ± 4.36	0.10

Recently, questions have arisen on the administration of oral vaccines through the animal's drinking water by swine veterinarians, pig health companies and producers. These questions center on how long (hours) oral vaccines need to be administered to the pig and if manipulation of the water resource changes the drinking behavior of the nursery pig. From the present study, the first hour following pen water supply restoration resulted in an increased number of visits and duration of time spent at the nipple cup drinker. After that first hour there were no differences. All pigs in the pens

regardless of treatment took at least one 5 second visits to the drinker.

In addition to the management strategies of manipulating water, the well-being of the individual pig must be considered, in regards to withholding a vital resource. Although no peer review studies have addressed how long a seven week old nursery pig can have water withheld before this impacts their well-being it is a question that should be addressed. Furthermore, when reviewing the behavior of the individual pig for visits and length of time spent at the drinking resources, it was noted that the activity level for the water with-held pigs (i.e. climbing onto co-specifics) and displacement behaviors appeared to be more intense than for those pigs that had ad libitum access to water. Caution needs to be noted with such behaviors as this was not scientifically collected or analyzed in this study. However, such questions should be addressed in a scientific manner to add more information to the use of such a management strategy. In conclusion, withholding water over the 15 hour period to make sure all pigs receive sufficient vaccine is not needed.

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