

CANNIBALISM IN GROWING PIGS: EFFECTS OF TAIL DOCKING AND HOUSING SYSTEM ON BEHAVIOR, PERFORMANCE AND IMMUNE FUNCTION

J. J. McGlone, J. Sells, S. Harris and R. J. Hurst

SUMMARY

One hundred and twenty pigs were used to evaluate the effects of housing indoors on concrete slats or outside in dirt lots on tail biting, weight gains, behavior and immune function for pigs with intact tails or with tails docked. Pig performance was largely not influenced by treatments, even when cannibalism was found. When pigs began biting tails in particular pens, many pigs' tails were not curled and up against their body. Cannibalism was found both in dirt lots and in confinement, however the incidence of cannibalism was greater among confined pigs. Some immune measures indicated pigs with tails (regardless of housing system) were immunosuppressed. At this time, pig well being is predicted to be the greatest if their tails are docked.

INTRODUCTION

Tail docking became a standard practice when pig housing systems moved from extensive dirt lots to confined buildings. With the move to confinement, the incidence of tail biting (cannibalism) seemed to increase. Consequently, today most pigs housed in confinement facilities have their tails docked. At the same time, reasons for cannibalistic behavior remain a mystery.

Modern confinement buildings differ from dirt lot pens in that in confinement: space is reduced, gases are at a higher concentration, sun light is less intense or absent, floors are often slatted and pigs experience a less-varied thermal environment. Further study is required to determine which of these factors or which other factors may predispose pigs to cannibalism.

Field data collected in Europe suggested that pigs are more likely to become cannibalistic when housed on concrete slats. Other authors have suggested that feeding a grainbased, high energy diet in a mechanically-ventilated building would predispose pigs to cannibalism.

The objectives of this study were to determine if we could induce cannibalism among pigs in our facilities and to see if the rate of tail biting differed for pigs housed in different types of buildings. We also sought to discover relationships among behavior, performance and immune function for pigs engaged in tail biting.

PROCEDURES

One hundred and twenty crossbred pigs were assigned to two treatments at birth and to four treatments at the end of the nursery phase (about 9 wk of age). At birth, one-half of the pigs within each litter had their tails docked. The remaining pigs were not

treated (tails intact). Tails were trimmed with a disinfected side-cutting pliers at a length of 1 to 2 in. from the body. Tail docking was performed on the first day of life when the piglets were expected to experience minimal pain.

Pigs remained in litter groups from birth until the end of the nursery phase. The farrowing barn had either partial concrete slats or plastic-coated expanded metal flooring and standard straight-bar farrowing stalls. The nursery pens provided more than four square feet per pig and had woven wire flooring. Pigs were fed and watered ad libitum.

At the end of the nursery phase (the start of the grower phase), pigs were randomly assigned to be housed in confinement or on dirt lots. Thus, at the start of the grower phase, pigs were assigned to one of four factorially-arranged treatments: tails in confinement, tails on dirt, docked in confinement or docked on dirt. Three pens of 10 pigs each were evaluated on each treatment.

Body weights were taken at birth, weaning and at an average of 165.6 pounds. Tails were examined on weigh days for bites, wounds, scars or scabs. Tails were given a score of 1.0 if the tail was free from damage and a score of 3.0 if the tail had an open wound. Scores were given in .5 units from severe wounding to no wounds.

On six days, in the am and pm (12 observations), each pig was examined from the aisle. A record was made of the number of pigs in each pen with tails fully up (and curled), fully down (tucked under its legs) or in an intermediate position.

Near the final weigh day, a 60 ml blood sample was drawn over sodium heparin from 20 pigs. Selected pigs were the five pigs with the greatest tail wounds and five littermate controls from each of the other treatment groups. Blood was brought to the immunology laboratory for the following assays: numbers of white blood cells, differential white cell counts, percentage of B-lymphocytes, T4-lymphocytes, T8-lymphocytes (lymphocyte types determined by flow cytometry), lymphocyte proliferation induced by three mitogens (concanavalin A, phytohemagglutinin and pokeweed mitogen using the tritiated thymidine uptake assay), natural killer cell assay, lymphokine-activated (IL-2) killer cell assay (using ⁵¹Cr release from labeled viral-infected tumor cells), neutrophil chemokinesis and chemotaxis assays. All assays were run in triplicate.

RESULTS

All measures of body weight gain were not influenced by treatments. However, final body weight

Table 1. Housing and Tail Docking Effect on Pig Performance, Tail Wounds and Tail Postures

Measure	Confinement		On dirt lots		SE
	Tails	Docked	Tails	Docked	
Birth weight, lb	3.66	3.37			.301
Weaning weight, lb	14.80	15.59			1.009
Final weight, lb	165.5	158.0	154.6	184.1	6.31
Tail Score ^{a,b}	1.62		1.15		.157
Tail Score ^{2,a,c}	1.47		1.06		.054
<i>Tail Posture</i> ^d					
Tails up	30.4		100		
Tails intermediate	45.5		0		
Tails down	24.1		0		

^a Tail score of 1.0 = no wounds, bites or scabs. A score of 3.0 was severe cannibalism (.5 unit scores).

^b Taken on 5-17-90, (P = .10).

^c Taken on 6-12-90, (P < .01).

^d Tail posture refers to the % of pigs with tails either up (fully curled) or down or in an intermediate position.

was influenced (P < .05) by the interaction between housing system and tail length. Pigs with their tails docked and housed on dirt lots were heavier on the final weigh date than pigs of the other treatments. This effect was viewed as a random fluctuation. However, future studies will be conducted to determine if the effect is repeatable.

Pigs with their tails docked showed no wounding on their tail stubs. Pigs with tails intact and housed in confinement had a tendency towards more wounding in May and had greater (P < .05) wounding on the June weigh date.

Tail posture data were collected when pigs housed outside were not showing tail biting. Among pigs housed outside, all tails were up and curled (see Table 1). Inside, where pigs were tail biting, only 30.4% of the pigs had tails up and curled. Later in the study, when tail biting was observed among pigs housed outside, those pigs' tails were held down.

Immune measures should be viewed with caution due to low sample sizes and large variation. Many

traits showed trends, but only significant effects will be reported here. Pigs with tails had more (P < .05) circulating neutrophils (in their blood) than pigs with tails docked. Pigs with tails intact also had a greater (P < .05) number of T8-lymphocytes and total T-lymphocytes (of both types) in circulation than did pigs without tails. Housing system (labeled "Envt" in Table 1) had a significant influence on the ratio of T4:T8 lymphocytes. Pigs housed outside had more (P < .05) T4 relative to T8 lymphocytes.

DISCUSSION

Performance data were largely inconclusive. All measures of weight gain were not influenced by treatments. Of interest and to our surprise, a post-hoc analysis of the body weight of pigs with bitten tails compared with those that were not bitten in the same treatment groups revealed no significant effect. That is, pigs with tails bitten were of the same average body weight as those penmates who were not bitten.

Tail postures seemed correlated with outbreaks of cannibalism. When pigs in particular pens had open tail wounds, the typical tail posture was for about one third of the pigs to not have curled tails (tails were flacid). Prior to periods of cannibalism, tails were curled and up on their backs.

Tail posture may provide communication among pigs. Also, tails being down and between their legs may provide some protection from being bitten. With tails tucked between their legs after an outbreak of cannibalism, pigs showed an apparent, chronic fear response.

Neutrophils are normally released from attachment on blood vessels when animals are stressed. An elevated number of T8 lymphocytes (also called suppressor or cytotoxic cells) can be viewed as detrimental. Thus, one might conclude that pigs with intact tails (and in many cases with tails wounded) showed specific symptoms of immunosuppression. More numbers of animals and an experiment-wise replication would make such a conclusion stronger.

Table 2. Immune Measures of Pigs Housing in Confinement or Outside either With Tails or With Tails Docked

Measure	Confinement		On dirt lots		SE	P-Values		
	Tails	Docked	Tails	Docked		Tail ^a	Envt ^b	TxE ^c
Lymphocytes, no/ μ l	11.08	10.55	8.57	9.75	1.456	.83	.27	.56
Neutrophils, no/ μ l	6.99	5.00	6.66	4.31	0.957	.04	.60	.85
Total WBC, no/ μ l	19.3	17.5	17.5	15.7	1.55	.22	.24	.99
B Cells, %	27.42	29.58	21.12	21.65	6.073	.83	.27	.90
T4, %	23.16	21.44	31.24	20.12	3.595	.10	.38	.22
T8, %	33.24	26.26	28.40	18.70	3.637	.04	.12	.72
T4+T8,%	56.40	47.70	59.64	38.82	6.537	.04	.68	.38
T4:T8	0.67	0.84	1.16	1.14	0.144	.61	.02	.54

^a Tail refers to effect of tail vs docked tail.

^b Envt refers to effect of housing system.

^c TxE refers to interaction between tail and envt effects.

Outbreaks of cannibalism started and stopped for unknown reasons. During one period when the weather was hot, pigs began to bite tails. As the weather became cooler, the outbreak stopped. Later as it became warm, we were determined to obtain detailed video tape records of the tail biting. However, at this next bout of hot weather, cannibalism did not increase.

We were able to induce cannibalism in our facilities.

The behavior was unpredictable and remains poorly understood. Pigs with intact tails had a large number of wounds and had signs of immunosuppression. Following outbreaks of cannibalism, pigs had changes in tail posture that could be interpreted as fear responses. Pig well being seemed greatest if tails were docked, regardless of the housing system.