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## EFFECT OF ENVIRONMENT ENRICHMENT TO AGGRESSIVE BEHAVIOUR IN PIGLETS

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### Abstract

Aim of the paper was to evaluate the effect of various types of environment enrichment to aggressive behavior in piglets. Two types of pen were involved in tests - the pen with concrete floor covered by straw (CFS) and the pen with slatted floor (SF). The CFS pen was enriched by temporary dividing to two parts by barrier with gap stuffed by straw (CFSD). Barrier was placed to the pen before shifting and mingling litters, two litters were placed each to another side. The gap was cleared from straw by the piglets during the pen exploration and mingling was unforced. The SF pen was enriched by plastic tube (SFT), PET bottle (SFB) and with anise smell (SFS). The number of attacks during 1st hour after shifting (NA1H) and total number of attacks during 8 hours after shifting to the new pen (TNA) and mean of attacks per 20 minutes intervals (MA20) have been evaluated. The CFSD modification significantly decreased MA20 ( $P < 0.001$ ), TNA and NA1H were decreased too, difference was not significant. Modifications of SF pen had no significant effect. SFT led to decrease NA1H, TNA and MA20 were increased. SFS and SFB led to increasing all evaluated traits. The most effective seem to be space modification (CFSD). Moreover, Spearman correlation showed importance of space allocation per piglet. Higher space allowance leads to decrease of aggressive behavior -area per pig negatively correlated with NA1H ( $-4.19, P > 0.05$ ), TNA and MA20 ( $\rho = -0.636, P < 0.05$ ).

**Keywords:** environmental enrichment, aggression, behavior, pig

### Introduction

The term “environmental enrichment” has no exact and precise definition but is increasingly considered as important factor of improvement of husbandry conditions and welfare in farm animals. Generally, enrichment refer to enhancement in physical or social environment. Environmental enrichment has been reported to have wide range physiological and behavioral effects and can be particularly effective in reduction of undesirable or abnormal behavior as well as beneficiary for productivity and welfare (Young, 2003, Averós et al., 2010, Bolt and George, 2019).

One of the main problems in pig breeding is unequal size and live weight of piglets in litter and consecutive batch creation from different litters. The mixing of different litters induces social stress and might increase the level of aggression. The consequences are higher number of injuries and/or cannibalism. There are various enrichment techniques published for solving problems in pig breeding: intense odors, pheromones, tranquilizers, light intensity changes, dividing the pen by diagonal wall with junctions, boards with holes to hide and protect head, box for hiding, objects for manipulation e.g. (Petheric and Blackshaw, 1987, Deschamps and Nicks, 1989, Christinson 1996, Olesen et al., 1996, Ayo, Oladele and Fayomi, 1998, Ishiwata, Uetake and Tanaka, 2002, Rhim, et al., 2015, Buijs and Muns, 2019).

Aim of this study was to assess the impact of four types of environmental enrichment to aggressive behavior of piglets after mingling groups.

## Material and Methods

The environment enrichment was tested in two types of pen: pen with concrete floor and straw bedding (CFS) and in pen with slatted floor (SF). Three types of enrichment were tested: physical (partitioning), occupational (PET bottle, plastic tube) and sensory (smell).

### *Enrichment in CFS pen*

Experiment was held at Breeding farm of Slovak University of Agriculture in Nitra. Pen dimensions (length×width) were 3650 mm x 2010 mm. Pen was equipped with two feeding racks and watering point. Pen is regularly used for mixing 2 litters after weaning. CFS pen was enriched by partitioning. Pen was divided to two parts by 500 mm high wooden barrier in middle of pen, from wall to opposite wall– CFSD pen. Near wall was in barrier gap stuffed with straw. Each litter was after weaning placed to separated area. The gap in barrier was step by step opened by the piglets during environment exploration and mingling was spontaneous. The barrier was removed 24 hours after weaning and shifting litters to new pen (CFS or CFSD). Weaning and mingling was three times repeated (three group, 6 litters were used) in CFS as well as CFSD pen.

### *Enrichment in SF pen*

Experiment was held in Experimental Centre for Farm Animals of Slovak University of Agriculture in Nitra. Pen has size 2380 x 1840, was equipped with one feeding place and watering point. Along longer side was placed 600 mm wide nest for piglets with two heating lamps. Piglets are weaned without mingling. Two types of enrichment were used for SF pen. First enrichment was occupational enrichment by PET bottle (SFB) or plastic tube with length 825 mm and diameter 315 mm (SFT). The SFB enrichment offer PET bottle as toy for manipulation and play. The plastic tube in SFT enrichment was object for play, explore and shelter for submissive ones during attacks. Weaning in SF pen was repeated three times (three group each from siblings from litter). Test in SFT and SFB pen was repeated once, because high increase of attacks in comparison with SF pen.

Second enrichment was sensory by anise smell (SFS pen). Anise dilution was painted to the back of pregnant sow 7 days before expected day of farrowing. The farrowing pen was treated with anise dilution on 10-th and 20-th day after farrowing by painting walls with dilution. The pen for weaning was treated by same dilution at morning on day of weaning. Each time was used dilution with same concentration – 2 ml of the anise oil dissolved in 400 ml water. We have expected familiar odor of anise evokes piglets “home” environment in farrowing pen and make animals

calmer after shifting to the new pen and weaning. Test with anise smell was repeated three times (three group each from siblings from litter).

All procedures related to animals were performed in accordance with guidelines of the Slovak University of Agriculture Ethics Committee. Processes with animals were managed in daily routine as common at commercial farms. The animals were kept under close veterinary attention and treated where necessary.

### Animals

In testing were used piglets Large White, total number animals in tests was 156, the average weight  $9.79 \pm 4.72$  kg. Number of animals in particular tests was different, because of different litter size in farrowing. Detailed data about piglets are in Table 1.

### Data collection

Behavior of the piglets after shifting to the new pen was observed and recorded by means of video-surveillance CCTV system. In each pen one camera was mounted at ceiling. Behavior in duration 8 hour after shifting was analysed by software for behavior analysis The Noldus Observer XT 11.5. Aggressive behavior was scored (number of attacks) by continuous sampling, attack was scored as point event. Like aggressive behavior was considered physical confrontation between at least two pigs including head to head contact, head to shoulder contact, with and without biting another pig, pushing or knocking another pig with the head (Hessel et al., 2006).

**Table 1: Number of piglets in tests, average weight, weight range and average floor area per piglet**

Pen	Group	AW [kg]	$\Delta$ AW [kg]	N	AFA [m <sup>2</sup> ]
Concrete floor with straw bedding (CFS)	Group 1	9,79	5,42	15	0,477
	Group 2	11,13	5,50	12	0,596
	Group 3	25,00	12,00	12	0,596
Concrete floor with straw bedding divided (CFSD)	Group 1	7,84	3,27	13	0,550
	Group 2	6,60	3,41	11	0,651
	Group 3	7,32	3,30	12	0,596
Slatted floor (SF)	Group 1	7,98	3,75	10	0,438
	Group 2	7,94	5,80	6	0,730
	Group 3	9,20	6,08	11	0,398
Slatted floor PET bottle (SFB)	Group 1	9,67	6,71	10	0,438
Slatted floor plastic tube (SFT)	Group 1	6,11	3,18	12	0,365
Slatted floor and anise smell (SFS)	Group 1	11,47	10,50	10	0,438
	Group 2	10,68	4,11	9	0,487
	Group 3	6,29	2,85	13	0,337

AW – average weight

$\Delta$ AW –weight range

N – number of piglets in group

AFA – average floor area per pig in pen

### Statistical analysis

Evaluated were average total number of attacks per piglet during 1<sup>st</sup> hour after shifting (NA8H), average total number of attacks for 8 hours per piglet (TNA) and mean of attacks in 20 minutes intervals per piglet (MA20). Relationship among behavior traits (NA1H, TNA and MA20) and piglets data (AW,  $\Delta$ AW, N, AFA) was evaluated by Spearman rank correlation.

Evaluation changes in MA20 in partition enrichment (CFS x CFSD) was performed by t-test for independent samples. Comparison of TNA and NA8H between CFS and CFSD was done by Mann-Whitney test.

Evaluation changes in MA20 in occupational and sensory enrichment was performed by One Way ANOVA (SF x SFB x SFT x SFS). Comparison of TNA and NA8H was performed by Mann-Whitney test only for SF and SFS pens. Enrichment SFB and SFT was omitted because small number of tests.

Statistical analysis was performed with IBM SPSS version 20.

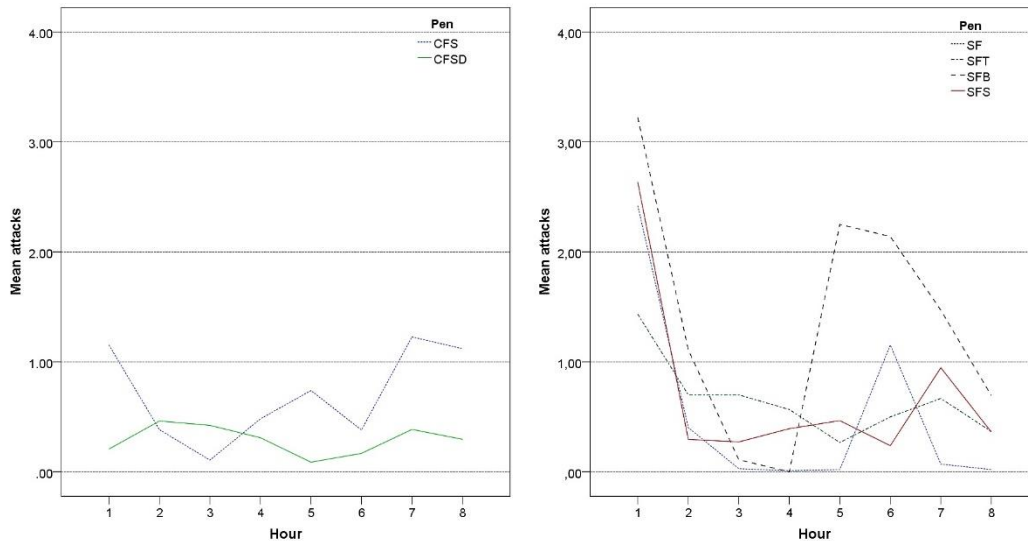
## Results and Discussion

In all tests and treatments, the highest number of attacks piglets shown during first hour after regrouping and mingling. Next peak of number of attacks is related to first feeding after weaning and shifting to new pen (*Figure 1*). Same behavior describes *Christison* (1996).

The effect of enrichment to decrease of aggressive behavior was recorded only in partitioning. The number of attacks was lower in CFS than in SF, probably because possibility to manipulate with straw. The partitioning decreased all evaluated trait for more than 60%. Difference in MA20 was significant ( $P < 0.001$ ), difference in NA1H and TNA was not significant probably for small number repeats (3). The sensory and occupation occupational enrichment in SF pen has no effect to decrease attacks. The SFB had increased all evaluated traits, SFT only MA20 and TNA. SFS has no effect. *Christison* (1996), *Amstutz et al.* (2005), *Stukenborg et al.* (2011,) *Clark and D'Eath* (2013) presented similar number of attacks after weaning and shifting to new pen. *Ishiwata, Uetake and Tanaka* (2002) reported decreasing number of attacks by enrichment with box for hiding, to less than 10 attacks in first day after weaning. The partitioning in presented paper decreased number of attacks to 7.01 in first 8 hours. The piglets in CFSD pen explored the new environment in group of sibs. *Table 2.* shows basic descriptive statistics of measured traits in all tested environments. During exploration decrease the excitation from loss of mother and shifting to new environment, so in moment of opening are piglets calmer. Piglets from one litter can join the group of unfamiliar piglets from second litter when they “desire”. The next advantage of partitioning is possibility of escape to other side of barrier after attack. During observation we have recorded that attacked piglet during escaped through gap to other side of barrier, to adjacent part of pen. Aggressor does not chase it to other side. This is similar behavior like in natural condition fight runs – loser must escape away from winner. *Olesen et al.* (1996) concluded partitioning has no effect to aggressive behavior. But she did partition in pen with slatted floor and barrier has two open gates from start of shifting piglets to pen. Piglets can move to other side and meet unfamiliar ones immediately after regrouping, without calming period of exploration. The effect of escape to other side when attack occurred was recorded described too. In our opinion the PET bottle in SFB pen triggers the highest number of attacks because the competition for movable toy. The plastic tube in SFT enrichment probably decreased number of attacks in first hour by means of novelty effect (*Trickett et al.*, 2009). Correlation analysis showed importance of area per pig effect to attacks for TNA and MA20 traits ( $\rho = -0.636$ ,  $P < 0.05$ ). Other traits (average weight, weight range) has no effect to number of

attacks. Number of piglets in pen negatively correlated with number of attacks ( $\rho = -0.423$ ) but tie is not significant.

**Figure 1: Mean number of attacks per piglet in first 8 hours after weaning shifting to new pen**



**Table 2: The basic descriptive statistics of measured traits in tested environments**

		CFS	CFSD	SF	SFS	SFB	SFT
	N	3	3	3	3	1	1
NA1H	Mean	3.46	1.53	7.26	7.91	9.67	4.30
	s.d.	3.13	1.27	0.43	3.13	-	-
TNA	Mean	16.78	7.01	12.38	16.82	32.99	15.6
	s.d.	12.55	2.82	1.82	4.4	-	-
MA20	Mean	0.70 <sup>a+++</sup>	0.29 <sup>b+++</sup>	0.51 <sup>c+</sup>	0.70 <sup>d+</sup>	1.37 <sup>e+</sup>	0.65
	s.d.	0.52	0.12	0.07	0.18	-	-

a+++, b+++ -  $P < 0.001$ , c+, d+, e+ -  $P < 0.05$

## Conclusion

Results show the role of environment enrichment in piglets aggressive behavior in period of weaning and shifting to new environment. The analysis of behavior points out importance of room area and its division. Partitioning as environmental enrichment influences the aggressive behavior and can decrease the number of attacks. Litters should be separated at moment of shifting to new environment and mingling should be voluntary after calming of excitation from environment change. Occupational enrichment influences behavior too. But if small movable objects are in use, more than one should be offered to distract attention and eliminate competition. Object should be changed after habituation piglets and disappearance novelty effect.



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