COMMUNICATION

Influence of housing systems on stillbirth and mortality rate in preweaning pigs farrowed by different gilt breeds

Boris Antunović[1], Mirjana Baban[1], Vesna Dobranić[2], Vladimir Margeta[1], Pero Mijić[1], Bela Njari[2], Željko Pavičić[2], Vedran Poljak[3], Zvonimir Steiner[1], Wiebke Wellbrock[4]

[1]Department of Animal Husbandry. University of J.J. Strossmayer, Osijek, Croatia

[2]Department of Animal hygiene and Ethology. University of Zagreb, Croatia

[3]Croatian National Institute of Public Health. Zagreb, Croatia

[4]Rural Sociology Group. Wageningen University, Netherlands

Corresponding author: Prof. Boris Antunovic, Department of Animal Husbandry. University of J.J. Strossmayer. Trg svetog Trojstva 3, 31 000 Osijek, Croatia – Tel. +385 31 224 285 – Fax +385 31 207 017 – Email: bantun@pfos.hr

ABSTRACT - The aim of this paper was to investigate the influence of housing systems on stillbirth and mortality rate in preweaning pigs farrowed by different gilt breeds. The investigation included first farrowings of 225 Large White (LW) gilts, 297 Swedish Landrace (SL) gilts and 260 crossbreed gilts (LWxSL) in the period of five years. Despite of positive influence of straw through decreased number of stillborn pigs, especially in LW gilts, in further process of production until weaning, less appropriate microclimatic conditions developed in farrowing houses with straw, especially if accompanied with poor ventilation, can result with higher number of perished pigs and lower number of weaned pigs. Most sensible to unsuitable microclimatic conditions in straw bedded farrowing houses, according to the number of perished pigs before weaning, were the pigs from SL gilts, while the pigs from crossbreed gilts LWxSL were the most resistant. These results suggest that adding straw requires special attention on influence of such production on microclimate conditions in pigs' biozone in order to maintain its initial benefits in the time of farrowing through the whole preweaning period, especially in pure breeds of gilts.

Key words: Housing, Stillborn pigs, Preweaning pigs' mortality, Gilts' breed.

Introduction – Swine housing conditions in Croatia are currently being adjusted to EU member countries legislation (Antunović *et al.*, 2004). However, high preweaning mortality and low piglet weight at weaning, like in many other countries, still implies a loss of income for the farmer and might influence the welfare of the affected animals negatively. Several factors in combination determine the mortality and weight gain of the pig between birth and weaning: (1) the herd/sow; (2) the pen; (3) the litter and (4) the piglet (Johansen *et al.*, 2004). However, concerns about the welfare implications of confining sows in farrowing

crates may limit the use of improving the farrowing environment in the future and change the focus towards genetic selection for characteristics in both the dam and offspring which promote survival (Edwards, 2002). The aim of this paper was to investigate the influence of housing systems on stillbirth and mortality rate in preweaning pigs farrowed by different gilt breeds.

Table 1. Reproductive performances of different gilt breeds and crossbreeds in different housing systems.

Trait	Stat. val.	Large White (LW)			Swedish Landrace (SL)			Large White x Swedish Landrace (LWxSL)		
		Housing system[1]								
		FhA	FhB	*P*	FhA	FhB	*P*	FhA	FhB	*P*
	n	76	149		112	185		133	127	
Farrowed pigs (per litter)	$\bar{x}$	9.13	9.58	ns	10.30	10.43	ns	9.27	9.20	ns
	SD	2.17	2.26		2.36	2.30		2.46	2.48	
Stillborn pigs (per litter)		0.45	0.78	*	0.62	0.84	ns	0.67	0.59	ns
	SD	0.80	1.35		1.01	1.30		1.12	0.93	
	%	5.26	7.51	*	5.35	7.23	ns	7.23	6.41	ns
	SD	11.77	12.6		8.58	10.26		11.21	10.03	
Pigs added to other mothers' litter (per litter)	$\bar{x}$	1.46	1.38	ns	0.84	0.72	ns	1.85	1.71	ns
	SD	2.11	2.08		1.16	1.22		2.32	2.42	
Pigs deducted from their mothers' litter (per litter)	$\bar{x}$	0.42	0.36	ns	0.56	0.50	ns	0.68	0.48	ns
	SD	1.78	1.07		1.13	0.95		1.63	1.38	
Litter weight 21 days after farrowing (kg)	$\bar{x}$	42.04	44.32	ns	43.46	44.77	ns	44.92	45.44	ns
	SD	8.91	8.21		10.54	8.54		9.71	8.81	
Pigs perished before weaning (per litter)	$\bar{x}$	1.78	1.34	*	1.87	1.29	**	1.50	1.28	ns
	SD	1.60	1.37		1.86	1.38		1.75	1.67	
	%	17.80	13.13	*	18.27	12.79	**	14.73	12.32	ns
	SD	15.53	13.22		17.22	13.69		11.21	15.38	
Weaned pigs 30 days after farrowing (per litter)	$\bar{x}$	7.93	8.46	**	8.11	8.52	*	8.27	8.51	ns
	SD	1.52	1.39		1.83	1.43		1.58	1.48	
	%	82.03	86.53	*	81.90	87.21	**	85.27	87.20	ns
	SD	15.28	13.22		17.65	13.69		16.13	15.71	

*ns=non significant, **P<0.01, *P<0.05; [1]FhA=farrowing houses capacity 37 swine, with straw bedded solid floor and negative pressure ventilation; FhB=farrowing houses capacity 60 swine, with partially slatted floor and combined positive and negative pressure ventilation.*

Material and methods – The investigation was carried out on an intensive swine farm located in Croatia and has included first farrowings of 225 Large White (LW) gilts, 297 Swedish Landrace (SL) gilts and 260 crossbreed gilts (LWxSL) in the period of five years. LW and SL gilts were inseminated by the boars of the same breed, while LWxSL crossbreed gilts were inseminated by Duroc boars. Data for different breeds were monitored separately in two housing systems: FhA=four farrowing houses capacity 37 swine, with straw bedded solid floor and negative pressure ventilation; FhB=five farrowing houses capacity 60 swine, with partially slatted floor and combined positive and negative pressure ventilation. Both systems were based on "all in – all out" principle and all the gilts were kept in the same standard type farrowing crates and were housed together with other swine on the farm. Following microclimatic conditions were monitored during preweaning period: relative humidity, NH_3 concentration and air bacteria concentration. T-test was used to calculate differences between production indicators of different breeds of gilts by the meanings of SPSS statistical software package (SPSS 10.0 for Windows, 1999).

Results and conclusions – Stillbirth rate in pigs per litter was lower in LW gilts ($P<0.05$) and in SL gilts ($P<0.1$) kept on straw (FhA) compared to those kept on partially slatted floor (FhB), while no significant differences were found in LWxSL crossbreed gilts (Table 1). This phase (days of farrowing) was characterised by similar and desirable microclimatic conditions in both systems.

Contrary to the time of farrowing, the preweaning period in FhA was characterised by in average 12.4% higher relative humidity, 2.3 times higher NH_3 concentration and 27% higher air bacteria concentration compared to FhB (74.6 *vs.* 62.2%; 11.2 *vs.* 4.8 ppm; 128 000 *vs.* 94 000/m^2/min., respectively). Consequently, despite of positive influence of straw through decreased number of stillborn pigs from pure breeds, less appropriate microclimatic conditions developed in the preweaning period in straw bedded farrowing crates (FhA) resulted with higher number of perished pigs and lower number of weaned pigs compared to pigs kept on partially slated floor with no bedding (FhB). Most sensible to unsuitable microclimatic conditions (higher number of pigs perished before weaning in FhA) were pigs from SL gilts ($P<0.01$), slightly less pigs from LW gilts ($P<0.05$), while pigs from crossbreed gilts LWxSL were the most resistant. Furthermore, both, pure gilt breeds (LW and SL), as well as their crossbreeds (LWxSL), revealed tendency of higher frequency of situations when pigs from different litters had to be mixed (low milkiness, aggression in their mother, small number of farrowed or liveborn pigs), produced lower litter weight 21 days after farrowing and weaned less pigs on straw bedded solid floor (FhA). These results suggest that adding straw requires special attention on influence of such production on microclimate conditions in pigs' biozone in order to maintain its initial benefits in the time of farrowing through the whole preweaning period, especially in pure breeds of gilts.

REFERENCES – Antunović, B., Kralik, G., Margeta, V., 2004. Adjustment of swine housing conditions to EU member countries legislation. Krmiva, 46: 313-320. **Edwards**, S.A., 2002. Perinatal mortality in the pig: environmental or physiological solutions? Livest. Prod. Sci. 78: 3-12. **Johansen**, M., Alban, L., Dodensig Kjærsgård, H., Bækbo, P., 2004. Factors associated with suckling piglet average daily gain. Prev. Vet. Med. 63: 91-102. **SPSS for Windows**, 1999. Version 10.0, Copyright SPSS Inc.