

The Growth Environment and Behavioral Response of Fattening Pigs based Eco-economy

V. Andronie, M. Pârnu, V. Simion, and I. Andronie

Abstract—The aim of this study was to trace the effects of growth environment on the behaviour of fattening pigs in the farm and outside it. Behavioral manifestations of pigs reared in pens with enriched environment (A lot, n: 22) were different from those of pigs reared in pens with arid environment (B lot, n: 17) in shelter and when the movement to be loaded. Pigs of B lot spent more time on the move (31%) compared to group A pigs (13%), and manifested more aggressive behavior when they were loaded. Salivary cortisol levels also showed high values for pigs in B lot after being removed from their growth environment, as compared to its concentration for A lot pigs. The enriched environment for pigs may determine different responses of behavior. Pigs raised in arid environment, were easier to loaded than pigs reared in enriched environment, but they responded to mixing and loading stress, through increases in cortisol concentrations and impaired behavioral manifestations.

Keywords— environment shelter, pig, behavior

I. INTRODUCTION

THE vigorous growth of the livestock sector, its importance for income generation, food security, human nutrition and health, and its impact on various public goods and services require careful attention by the international community. The livestock sector plays a crucial role in the provision of global public goods and services [3].

Animal welfare quality levels depend on the housing place and especially on the resting area, on the quality of microclimate factors, on the animal health condition, feeding and watering manner as well as on being able to manifest their natural behaviour [4,10]. Physiological and behavioural welfare indicators may suffer obvious modifications subsequent to raising factors and especially to box environment [5]. Pigs raised in a dry, bare environment exhibit a more aggressive, less social behaviour [2] compared to the ones raised in enriched environment boxes. Following research, Hauser and Mayer in 2001 remarked that alternative farming systems in which the pigs have outdoor access offer more beneficial raising conditions regarding the animal

V.A. Author is with the „Spiru Haret” University, Faculty of Veterinary, 021127 Bucharest, ROMANIA (phone: 0040-21-3163060; fax: 0040-21-3119311; e-mail: viorelandronie@yahoo.com).

M.P. Author is with the Animal Breeding Department „Spiru Haret” University, Faculty of Veterinary Medicine, 021127 Bucharest, ROMANIA (phone: 0040-21-2421576; fax: 0040-21-2421575; e-mail: monica_parvu@yahoo.com).

V.S. Author is with the „Spiru Haret” University, Faculty of Veterinary Medicine, 021127 Bucharest, ROMANIA ((phone: 0040-21-2421576; fax: 0040-21-2421575; e-mail: ushmv_simion.violeta@spiruharet.ro).

I.A. Author is with the Animal welfare Department, „Spiru Haret” University, Faculty of Veterinary Medicine, 021127 Bucharest, ROMANIA ((phone: 0040-21-2421576; fax: 0040-21-2421575; e-mail: ioanaandronie@yahoo.com)

welfare than conventional farming systems as well as more economically productive output. This is due to pigs’ physiological and morphological adaptation mechanisms to the environment they live in, which react by means of behavioural manifestations [1]. Movement, mixing and transport of pigs to the slaughterhouse may determine physiological stress and the induced response of some indicators such as plasmatic and saliva cortisol [7].

II. MATERIAL AND METHOD

Research was carried out in an intensive farming system unit, on 39 fattening pigs (n: 39) of Mangalitzza breed of similar weight (50-140kg) and age until their slaughtering moment in the slaughterhouse. The animals were not taken out of the production cycle and were identified by means of a marker spray for easy observation.

The pigs were placed in two shelters similar as construction and organization. Pigs accommodation was performed differently: A lot, in collective pens with continuous flooring on 75% of the surface, 25% discontinuous out of metal bars, environment was enriched with various materials (plastic/wooden sticks, straw) and B lot, collective pens with discontinuous flooring of the surface (plastic material), whereas no enriching material. The animals were fed age and weight specific recipes and all pigs had free access to water.

Pigs were transported to the slaughterhouse with specialized truck, and the journey lasted three hours. All the manoeuvres were performed according to applicable legislation concerning animal protection during transport.

Animal behaviour (table I) was monitored the entire period by direct observation of behaviour manifestations for 30 minutes, 3 times/day (8am, 1pm, 18 pm) weekly, three month, and after transport in slaughterhouse.

TABLE I
THE BEHAVIOUR OF PIGS PARTICIPANT TO THE RESEARCH, MONITORED THROUGHOUT THE PERIOD

Observed behavior	Description of behaviour manifestations
walking	Movement around the box
investigation	Examination of box walls and flooring
rest	Lying down, eyes closed
aggressiveness	Fight between two animals from the same box
other manifestations	Short interactions with other congeners, watering, etc.

III. RESULTS AND DISCUSSIONS

The research carried out has demonstrated the influence of raising conditions on pigs' welfare by different behavioural and physiological modifications recorded in the animals.

In the enriched environment pens, the manipulation of objects (wooden, plastic objects, and straw) have led to a higher percentage of investigative behavioural (39.2%) and socializing display (9.4%) in the first week following mixing, compared to only (4.7%) display of environment investigation and (5.3%) socializing behaviour in the pens that had no occupational materials, Fig. 1.

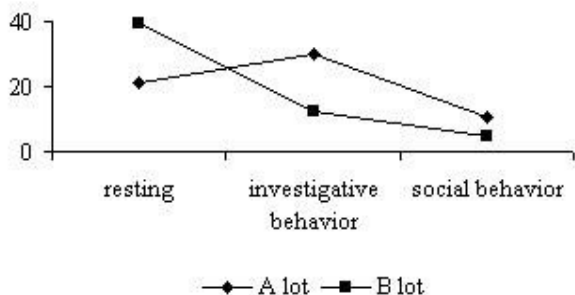


Fig.1 Behavioral manifestations (%) of pigs in the different environmental enrichment

The data obtained showed that welfare was affected when pigs was no opportunity to explore the environment or to manipulate the materials. We correlated the above data with the level of cortisol.

In pigs raised in enriched environment pens (A lot), the level of saliva cortisol was higher (11.2 nmol/L), compared to only 6.5 nmol/L in the pigs raised in non-enriched environment pens B lot, Fig. 2.

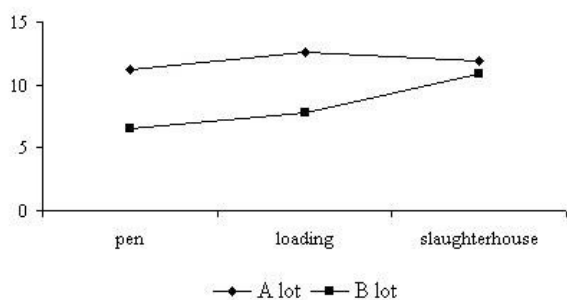


Fig. 2 Cortisol level (nmol/L) of pigs during the study

Following loading onto vehicle, saliva cortisol level stayed within the same trends both for group A and B. Upon unloading, transport related stress induced higher responses in B group pigs (10.9 nmol/L) compared to the level recorded in raising pen, but lower than those in group A pigs (11.9 nmol/L).

This indicates the fact that hypothalamus-hypophysis-

adrenal glands axis was more reactive in B lot than in A lot pigs.

Following research De Jong et al. (1998, 2000), showed that pigs raised in a non-enriched environment responded by a low cortisol level compared to pigs raised in an enriched environment, as confirmed in our study. Additionally pigs responses were different regardless of the materials used to enrich the environment. The level of saliva cortisol was therefore lower in pigs whose pen environment was enriched with plastic/wooden sticks compared to the one enriched by straw in other pens.

Parrott et al. remarked in 1989, that fodder deprivation prior to slaughtering might lead to an increase in cortisol levels. De Jong et al. in 2000, consider that enriching box environment for pigs prior to their loading onto transport vehicles may also lead to an increase in saliva cortisol levels as a result of behavioural display enhancement such as straw consumption following fodder deprivation to which the pigs had been subjected to. Geverink et al. (1996), have shown that cortisol levels increases in direct relation with the intensity of pigs mixing activity and aggressive behaviour display during mixing, while in 1999, the same author did not find behavioural differences during transport of animals that had not been previously mixed.

Our research indicates that pigs have displayed different behaviours depending on the environment they were raised in. The methods used to handle the animals towards loading – although in compliance with Regulations – constituted a stress factor especially in pigs raised in a bare, non-enriched environment compared to the group A pigs. Thus, group B pigs showed a tendency to spend more time to investigate the pen environment and even aggressing other pigs (a few cases) in the slaughterhouse, Fig. 3, compared to group A pigs who

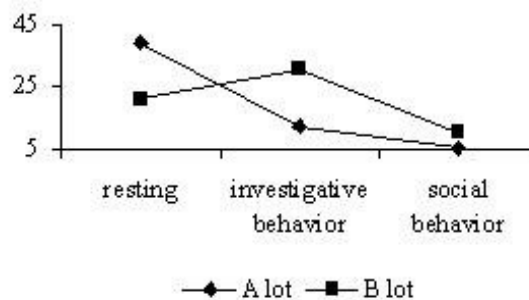


Fig.3 Behavioral manifestations (%) of pigs in slaughterhouse

preferred to lying down from arrival.

This aspect determined an even greater anxiety in group B as opposed to group A. Pigs raised in a non-enriched environment were more active and spent more time investigating the new environment after transport compared to the pigs raised in an enriched environment.

Previous research has shown that an enriched raising environment facilitates the enhancement of pigs social behaviour, as they display a reduced to virtually non-existent

aggressive behaviour towards pigs raised in a bare, non-enriched environment, [2].

Increased sustainable livestock production is dependent on up-to-date, relevant, comprehensive and reliable, gender-sensitive information to underpin the rural development process and to ensure that it is supported by effective policies.

IV. CONCLUSIONS

Results have proved that various enriched raising conditions impacted the pig's physiological and behavioural responses during their transport to slaughterhouse. Different levels of saliva cortisol and behavioural displays between the two groups were due to the fact that pigs raised in a bare, non-enriched environment could experience more stress during mixing and loading procedures than those raised in an enriched environment.

Study results indicate mixing and loading related stress in all pigs transported to the slaughterhouse regardless of the raising conditions, thus impacting their welfare.

Research has shown that in a shelter whose box environment has been enriched, pig's behavioural displays were more numerous and various compared to those of the pigs raised in a bare, non-enriched environment.

ACKNOWLEDGMENT

This paper was co-financed from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/89/1.5/S/63258 "Postdoctoral school for livestock biodiversity and food biotechnology based on the eco-economy and the bio-economy required by eco-sano-genesys". The author would like to thank Prof. Alexandru T. Bogdan which start the Prof. G. K. Constantinescu concept regarding the More Animal Production in Romanian Agriculture, linked with the basic paradigms on Bioeconomy and Eco-Economy scientifically applied to the rural economy, in the context of a sustainable rural development.

REFERENCES

- [1] Andersen, I.L., K.E.Boe, K.Hove, Cold housing of pregnant sows. In: Processing of International Conference on Agricultural Engineering, pp.1-8, 1998.
- [2] Beattie, V.E., N.E. O'Connell, B.W. Moss Influence of environmental enrichment on the behaviour, performance and meat quality of domestic pigs. *Livest. Prod. Sci.* 65:71-79, 2000.
- [3] Bogdan A.T., Brîndușa Covaci, Violeta Simion, Diaconescu D.L., Țepuș D., Chelmu S., Gabor D., Amalia-Geanina Strateanu, E-banking products and services for agribusiness based eco-economy, with ways "from the farm to the fork" in forecasting the developed and developing countries on period 2020-2050-2100. *Recent Researches in Business Administration, Finance and Product Management*, 100-105, 2010.
- [4] De Jong, I.C., Ekkel, E.D., van de Burgwal, J.A., Lambooij, E., Korte, S.M., Ruis, M.A.W., Koolhaas, J.M., Blokhuis, H.J., Effects of strawbedding on physiological responses to stressors and behaviour in growing pigs. *Physiol. Behav.* 64, 303-310, 1998.
- [5] De Jong, I.C., Prelle, I.T., van de Burgwal, J.A., Lambooij, E., Korte, S.M., Blokhuis, H.J., Koolhaas, J.M., Effects of rearing conditions on behavioural and physiological responses of pigs to preslaughter handling and mixing at transport. *Can.J. Anim. Sci.* 80, 451-458, 2000b.
- [6] Geverink, N.A., Engel, B., Lambooij, E., Wiegant, V.M., Observations on behaviour and skin damage of slaughter pigs and treatment during lairage. *App. Anim. Behav. Sci.* 50: 1-13, 1996.
- [7] Grandin T., - Progress and Challenges in Animal Handling and Slaughter in the U.S. *Applied Animal Behaviour Science*, 100, 129-139, 2006.
- [8] Hauser, R., Mayer C., Klimaeinflüsse in der Schweinemast. *FAT Bericht*, 563:116 [Title translation: Climatic effects on pig fattening], 2001.
- [9] Parrott, R.F., Misson, B.H., Baldwin, B.A., Salivary cortisol in pigs following adrenocorticotropin stimulation: comparison with plasma levels. *Br. Vet. J.* 145:362-366, 1989.
- [10] Parvu Monica, Ioana C. Andronie, Violeta E. Simion, Corina Zugravu, Carmen Bergheș Adriana Amfim, Energy Efficiency of the Diets at the Fattening Pigs Exposed at Heat Stress, *Bulletin UASVM Animal Science and Biotechnologies*, 67(1-2): 296-299, 2010.
- [11] Council Regulation (EC) No 1/2005, on the protection of animals during transport and related operations and amending Directives 64/432EEC and 93/119EC and Regulation (EC) No. 1255/97.
- [12]