The impact of chronic environmental stressors on the social behaviour of growing pigs, *Sus scrofa*

M Parker, E O'Connor, M McLeman, T Demmers, J Lowe, R Owen, E Davey, C Wathes, S Abeyesinghe
Royal Veterinary College, Hertfordshire, United Kingdom
Email: mparker@rvc.ac.uk

Introduction The effects of common and current environmental stressors on the social behaviour of farm animals are poorly understood and have never before been tested in controlled conditions. Here, we report the results of a longitudinal, multi-factorial experiment designed specifically to examine the individual, additive or interactive effects of elevated ammonia, noise and dim light levels on the social behaviour of growing pigs under strictly controlled environmental conditions.

Material and methods Two batches of 126 4-week-old hybrid gilts (50% Pietrain, 25% white Duroc, 12.5% Large White, 12.5% Landrace) were obtained at weaning. Eight rooms were allocated to eight experimental treatments in a 2^3 multi-factorial design. Each treatment comprised elevated or low levels of light intensity (nominally 200 vs. 40 lux), atmospheric ammonia concentration (nominally < 5 ppm vs. 20 ppm) and broadband noise, (nominal level < 60 dB(A) vs. 80 dB(A)). Social behaviour was measured in terms of the nature, frequency and duration of both initiated and respondent behaviours for four weeks following mixing of the groups according to an established ethogram (Jensen 1980). This was achieved by using a mixture of scan and continuous sampling. General activity patterns, group cohesion and social discrimination were also examined as a function of the environmental treatments. Frequency, nature and bout-duration were analysed using a mixture of general and generalised linear mixed models. The models were constructed with room* batch entered as a random factor to control for inter-room variation. The fixed effects were ammonia, light and noise, as well as all two- and three-way interactions between these factors. In models where we were interested in change over time, week was entered as a covariate. Wald-type adjusted *F* statistics were used to test null hypotheses and least squares (LS) means output from the models was used to examine interactions.

Results Elevated concentrations of atmospheric ammonia (~20 ppm) and dim light intensity (~40 lux) had the most significant effects, particularly on the nature of social interactions, with pigs under these conditions showing more aggression in the early stages of the experiment. In addition, pigs exposed to a high level of mechanical noise representative of artificial ventilation (~80 dB (A)) were less submissive to aggressive acts, while pigs in ~20 ppm ammonia showed more reciprocated aggression when in coincident dim light (<5 lux).

Table 1 Summary of Main Effects for Ammonia, Noise and Light Conditions

	Ammonia			Light			Noise		
	High (SEM)	Low (SEM)	*P*	High (SEM)	Low (SEM)	*P*	High (SEM)	Low (SEM)	*P*
Aggressive interactions (prop total acts)	0.09 (.01)	0.08 (.01)	< .01	0.08 (.01)	0.10 (.01)	< .01	0.08 (.04)	0.08 (.04)	> .05
Submissiveness (prop of responses to aggression)	0.40 (.04)	0.45 (.04)	> .05	0.41 (.04)	0.45 (.04)	> .05	0.52 (.03)	0.36 (.03)	< .05

Conclusion In conclusion, there is now evidence that commonly experienced concentrations of ammonia (≥20 ppm) and dim light intensities (≤40 lux) can affect aggression in pigs. Aggression in pigs is signalled with odour and visual cues. Group-mate recognition can be olfactory, and odour cues may be masked by the ammonia, affecting perception and modulating the formation of stability in the group. The findings reported here may have implications for the welfare of farmed pigs in the UK. Ventilation systems should be designed further to minimise the aerial ammonia concentrations to avoid potential exacerbation of aggressive acts early in the development of the pigs. In addition, it seems that dim lighting may increase aggressive acts, again, early in the development of the pigs, and the industry should take account of this when designing facilities in the future.

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References

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