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Can outdoor rearing and increased weaning age compensate for the removal of in-feed antibiotic growth promoters and zinc oxide?

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ABSTRACT

This experiment determined whether delayed weaning and outdoor rearing could compensate for the removal of antimicrobials from piglet diets. One hundred and sixty litters of Large White (75%) × Landrace (25%) pigs on the same unit were reared either indoors (In) or outdoors (Out) and weaned at either 4 or 6 weeks of age into flat deck accommodation onto diets supplemented with either no antibiotic growth promoters and no zinc oxide (Un) or 40 mg avilamycin and 3.1 g zinc oxide/kg diet (S). Piglet performance was monitored to 8 weeks of age. A proportion of litters (25%) were sampled to investigate the effect of the different treatments on gut development. Mortality was higher in the first 24 h of life for Out piglets which subsequently grew faster to weaning. This was not simply due to smaller litter size as total litter gain was higher in outdoor litters. All piglets responded positively to antimicrobial supplementation post weaning regardless of rearing environment and weaning age and this was the biggest influence on post weaning performance. Outdoor piglets grew faster than indoor piglets post weaning (295 versus 242 ± 8.6 g/pig/day for the first 2 weeks post weaning, $P<0.001$) and over the same period 6 week weaned piglets grew faster than 4 week weaned (324 versus 213 ± 8.6 g/pig/day, $P<0.001$), however, when compared at similar age, 6 week weaning was detrimental to piglet growth with average daily gain (adg) from 4 to 8 weeks of age 310 g/pig/day versus 329 for 4 week weaned piglets ($P=0.001$). At 8 weeks of age the outdoor 6 week weaned unsupplemented piglets had similar average weight to the indoor 4 week weaned supplemented piglets indicating the potential of this combination to counteract the need for antimicrobials, however the benefit was due to enhanced weaning weight not to improved post weaning performance.

1. Introduction

Newly weaned piglets are susceptible to post weaning colibacillosis (PWC) which results in reduced performance, diarrhea, loss of condition and, in severe cases, death. Until the end of 2005 it was common practice to include in-feed antibiotic growth promoters and zinc oxide in piglet diets to prevent/control the occurrence of PWC, however routine use of in-feed antibiotic growth promoters (AGPs) became illegal in the European Union from the start of 2006. Whilst zinc oxide continues to be used in some of the EU under veterinary prescription its continued usage is regularly reviewed due to concerns regarding heavy metal contamination of agricultural land fertilised with the resulting slurry. Alternatives to the use of AGPs and ZnO may lie in revising management practices. Current European practice usually involves weaning piglets at around 4 weeks of age (woa). At this age, the piglet is still reliant upon its mother's milk as the primary source of nutrients and immune protection. Experience of eating dry feed is highly variable and the piglet's digestive and immune systems are not yet fully geared to an independent life. The classic piglet response to weaning; namely low feed intake, use of body reserves, weight stasis and susceptibility to gastrointestinal disease, has been well documented (e.g. Pluske et al., 1995). However the level of this response varies

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widely between individuals and may be affected by management of the piglet and choice of weaning age. Piglets weaned from outdoor herds are reported to cope with weaning more successfully than those weaned from indoor herds (Gentry et al., 2002; Payne et al., 2003). Older piglets adapt more readily to weaning (Colson et al., 2006); they have a more mature digestive tract at weaning (Miller et al., 2007) and are also immunologically more advanced than younger ones (Miller and Stokes, 1994), and hence should be better equipped to cope with weaning.

Wulbers-Mindermann et al. (2002) observed that outdoor sows lost more body reserves during lactation than indoor sows. Extended lactation may also result in greater loss of sow body reserves which in turn might adversely affect subsequent performance (Zak et al., 1998; Belstra et al., 2002). However in a retrospective study investigating lactation lengths of between 4 and 8 weeks, Tummaruk et al. (2000) observed that longer lactations were associated with shorter weaning to oestrus intervals and larger subsequent litter sizes.

This paper reports the results of an experiment conducted during 2005 which investigated whether outdoor rearing and increased weaning age could compensate for the removal of AGPs and zinc oxide from piglet weaning diets. The experiment utilised the unique opportunity provided at the University of Leeds Research Unit to rear pigs either indoors or outdoors from the same production herd, with the same location, genotype, management team, health status, piglet handling regimes, feeds and feeding systems. The hypotheses were;

- Outdoor sows would lose more body reserves than indoor sows during similar length lactation periods.
- Sows would lose more body reserves in a six week than in a four week lactation.
- Increased loss of body reserves would delay weaning to oestrus interval.
- Outdoor reared piglets would perform better in the immediate post-weaning period than indoor reared piglets.
- Six week weaned piglets would perform better in the immediate post-weaning period than four week weaned piglets.
- Outdoor reared pigs weaned at 6 weeks of age would not respond to antimicrobial supplementation of their diet.
- Outdoor-reared, six-week weaned, unsupplemented piglets would perform equally to indoor-reared, four-week weaned, antimicrobial-supplemented piglets.

2. Materials and methods

2.1. Experimental design

This experiment had a 2×2×2 factorial design. Factors were as follows:

1. Rearing environment — piglets were born and reared through to weaning either indoors (In) or outdoors (Out). As far as possible, all other factors including feeding, genotype and health status were kept constant.
2. Weaning age — piglets were weaned at either four (4) or six (6) woa.
3. Post weaning diet — piglets received a post weaning diet which was supplemented with either no AGPs and no zinc oxide (Un) or 40 mg avilamycin and 3.1 g zinc oxide/kg diet (S).

Under the farm conditions the indoor and outdoor pig units were adjacent, separated only by a narrow road. Genotype and health status of sows were identical, the same staff ran both units, sows were served together and housed together throughout most of gestation but farrowed either indoors in farrowing crates or outdoors in individual farrowing paddocks each containing a farrowing arc.

2.2. Animals and management

One hundred and sixty litters were used in this experiment, equally divided across the two rearing environments and, within environment, across the two weaning ages. Sows (Large White×Landrace) were allocated to treatment ($n=40$) on the basis of liveweight, parity, P2 backfat thickness and previous farrowing history such that these were similar across treatments (see Table 2). Sows were housed together indoors in 20 groups of eight until late gestation. Sows were farrowed and weaned in groups of 8 as indicated in Fig. 1. It is apparent that, once the trial was established, in any particular week two sows were weaned onto each of the 4 treatment combinations. Within the main experimental design described above, litters from the same treatment were combined post-weaning to produce 2 pens per treatment, with equal representation from each litter, hence allowing comparison of post-weaning diets without further increase in the number of litters on trial. All piglets were weaned into commercial flat deck pens.

One group of 8 sows farrowed every two weeks until all 20 groups had farrowed. Two weeks prior to due farrowing date,

week	INDOOR								OUTDOOR							
1	F	F	F	F					F	F	F	F				
2																
3					F	F	F	F					F	F	F	F
4																
5	W	W							W	W						
6																
7			W	W	W	W					W	W	W	W		

Fig. 1. Plan of farrowing and weaning timetable.