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Risks associated with preweaning mortality in 855 litters on 39 commercial outdoor pig farms in England

A.L. KilBride[a], M. Mendl[b], P. Statham[b], S. Held[b], M. Harris[b,1], J.N. Marchant-Forde[c], H. Booth[a], L.E. Green[a,*]

[a] School of Life Sciences, University of Warwick, Coventry CV4 7AL, United Kingdom
[b] School of Veterinary Science, University of Bristol, Langford House, Langford, Bristol BS40 5DU, United Kingdom
[c] USDA-ARS, Livestock Behavior Research Unit, Purdue University, 125 South Russell Street, West Lafayette, IN 47907, USA

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ABSTRACT

A prospective longitudinal study was carried out on 39 outdoor breeding pig farms in England in 2003 and 2004 to investigate the risks associated with mortality in liveborn preweaning piglets. Researchers visited each farm and completed a questionnaire with the farmer and made observations of the paddocks, huts and pigs. The farmer recorded the number of piglets born alive and stillborn, fostered on and off and the number of piglets that died before weaning for 20 litters born after the visit. Data were analysed from a cohort of 9424 liveborn piglets from 855 litters. Overall 1274 liveborn piglets (13.5%) died before weaning. A mixed effect binomial model was used to investigate the associations between preweaning mortality and farm and litter level factors, controlling for litter size and number of piglets stillborn and fostered. Increased risk of mortality was associated with fostering piglets over 24 h of age, organic certification or membership of an assurance scheme with higher welfare standards, farmer's perception that there was a problem with pest birds, use of medication to treat coccidiosis and presence of lame sows on the farm. Reduced mortality was associated with insulated farrowing huts and door flaps, women working on the farm and the farmer reporting a problem with foxes.

1. Introduction

Preweaning mortality is a major cause of economic loss and poor welfare in the pig industry (Mellor and Stafford, 2004). In all farrowing systems, piglet mortality is affected by litter size (Wolf et al., 2008), fostering practice (Robert and Martineau, 2001), sow parity (Tubbs et al., 1993), disease, treatment and vaccination regimes (Wittum et al., 1995). Provision of assistance by farm workers to new born piglets, such as drying the piglet or moving it to the teat, has also been reported to reduce preweaning piglet mortality (Andersen et al., 2009).

In England, approximately 43% of piglets are born and reared outdoors to weaning (Defra, 2010). Outdoor piglet production offers the possibility of higher welfare because sows and piglets have greater opportunities to express natural behaviours than those housed indoors. Outdoors, sows are typically kept individually or in groups in paddocks. Each sow has a hut in which to farrow. Huts are bedded with deep straw and have sloping sides to provide a space for piglets to avoid being crushed as the sow lies

* Corresponding author.
E-mail address: laura.green@warwick.ac.uk (L.E. Green).
[1] Current address: Department of Animal Production, Welfare and Veterinary Sciences, Harper Adams University, Newport, Shropshire, TF10 8NB, United Kindom.

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down. Despite this, crushing, predation and hypothermia are potential risks for preweaning piglets born and reared outdoors (Edwards et al., 1994; KilBride et al., 2012).

In a cross sectional postal study of 67 British pig herds there was a trend for higher mortality in outdoor systems (14%) compared with indoor systems where sows were kept in farrowing crates (10%), although the difference was not statistically significant (O'Reilly et al., 2006). In a cohort study of 112 English pig farms there was again a non-significant difference in preweaning mortality in liveborn piglets by system (KilBride et al., 2012); mortality was 11.7% in piglets born to sows housed in crates and 12.8% in piglets housed outdoors. There was, however, a higher risk of crushing of healthy liveborn piglets and a lower risk of death from other causes in outdoor housed piglets compared with piglets born to sows housed in farrowing crates indoors.

Researchers have reported that insulated farrowing huts reduce fluctuations in internal hut temperature by keeping the interior of huts warmer in winter and cooler in summer compared with non-insulated huts (Edwards et al., 1995; Randolph et al., 2005). This has mixed effects on preweaning piglet mortality. Randolph et al. (2005) reported lower mortality levels in insulated huts compared with non-insulated huts on one English farm, particularly in winter. However, a study carried out in the USA by Johnson and McGlone (2003) and a study in the UK (Edwards et al., 1995) reported no association between preweaning mortality and whether or not farrowing huts were insulated.

In this paper we present the largest study to date of factors associated with preweaning piglet mortality in liveborn piglets on 39 outdoor commercial pig farms in England.

2. Materials and methods

2.1. Development of data collection tools

A Delphi study was conducted to identify factors that might affect preweaning piglet mortality in piglets born and reared outdoors. Questionnaires were sent to 72 veterinarians, scientists, farm workers and other pig industry experts, asking for their opinions about important factors contributing to piglet mortality and stillbirths. Twenty-five (35%) questionnaires were returned. Answers were collated and summarised, and the ranked answers were returned to the experts to allow them to confirm their top five factors associated with piglet mortality; 24 of the 25 experts returned the questionnaires for the second phase. Wherever possible, factors suggested by experts as associated with piglet mortality were incorporated into the data collection tools. Published literature was also reviewed and data on significant factors were incorporated into the data collection tools.

2.2. Selection of farms

The sample was recruited as part of a larger study comparing preweaning piglet mortality across farrowing systems (KilBride et al., 2012). The study farms were convenience sampled using industry contacts, word of mouth and advertising in the farming press.

2.3. Data collection

Each farm was visited once during 2003 or 2004 by two researchers. During the farm visit, the researcher completed a structured questionnaire with the farmer. Questions covered farm type, size and location, disease, vaccination and biosecurity, paddock and farrowing hut management, breeding, dry sow, farrowing and piglet management, feed and water, demographics and training of farm workers. Data collection sheets are available on request from the corresponding author.

During the visit researchers recorded observations of the dry and lactating sow paddocks and each type of farrowing hut used on the farm. A paddock of dry sows was randomly selected and a 'walk through' test was performed to assess the sows' fear of humans. The test consisted of the researcher walking slowly and calmly across the paddock and the number of sows in the paddock alert, approaching and withdrawing from the researcher was recorded. In addition, ten lactating sows were randomly selected and observations on their locomotion (according to Main et al. (2000)) and body condition (according to (DEFRA, 1998)) were made as farm level estimates of lameness and body condition. The lactating and dry sows were not necessarily the mothers of the piglets in the cohort (see below). This was not possible because at the time of the visit the cohort sows had not been identified.

Farmers were asked to record data on a cohort comprised of the next 20 litters born after the farm visit. They recorded the parity of the sow, date of farrowing, number of piglets born alive, born dead, fostered onto and off the sow and date of weaning. Farmers were provided with a decision tree to assist with differentiation between stillborn and liveborn dead piglets. Piglets were not individually identified and fostering occurred, therefore some piglets in the study were not the offspring of the sow that reared them and no data were available on the birth sow of fostered piglets. Farmers posted data collection sheets back to the researchers once complete.

2.4. Data checking

Data were entered into Microsoft Access 2003 databases. The data were checked for errors and outliers and obviously incorrect codes were re-checked against the raw data and impossible values ($n = 9$) were coded as missing. Variables with more than 90% of the data in one category were excluded from further analyses.

2.5. Statistical analysis

The outcome was the proportion of liveborn piglets per litter that died before weaning.

A binomial mixed effects model was used to account for the clustering of piglets within litters and litters within farms. Paddock was not included as a random effect because some sows were housed individually. All analyses