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Management routines influencing piglet survival in loose-housed sow herds

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ABSTRACT

Piglet mortality is still a significant welfare and ethical matter in pig production, as well as an economical challenge for the farmer. Most of the mortality occurs early after farrowing, and previous studies have shown that the farm's management routines, especially around farrowing, are important factors to reduce it. When sows are loose-housed at farrowing and in the following lactation period, it puts higher demands on management input from the farmer to keep piglet mortality low. The objective of this study was to assess the importance of different management routines around the time of farrowing, and other farm qualities for piglet survival in loose-housed herds. To study risk factors for herd piglet mortality, a cross-sectional field survey was carried out in Norway in the year 2013, and included 52 commercial herds with hybrid LY sows (Norwegian Landrace x Swedish Yorkshire). The farms were visited once, and the farmers answered a questionnaire about their management practices. The outcome was the average herd pre-weaning mortality in the years of 2012–2013. To include as many management factors as possible into the multivariable linear regression model, we generated a new variable based on 4 management routines: 3 routines at farrowing (presence at 80–100% of the farrowings, drying newborn piglets, and practice split suckling), and one concerning farmer´s contact with the sows. This variable was called "Management type" (M), and were divided into 4 categories with increasing effort; M1 herds without any of the 4 mentioned routines, M2 had contact with sows > 2 times per day, M3 performed the 3 routines at farrowing, and M4 combined the high sow contact and the 3 routines. The predicted values of mean herd piglet mortality for M1, M2, M3 and M4 were 20.1%, 17.0%, 16.2% and 13.3% respectively. The farmer's increased management effort was associated with lower piglet mortality ($P < 0.05$). The farmer's effort at critical times together with systematic and important routines, and having frequent contact with the sows, makes a huge difference for piglet survival. The farmers are credited for this work by having lower piglet mortality as a result.

1. Introduction

High piglet mortality is still an ethical and economical challenge in pig production. As much as 50–80% of the piglet mortality is caused by crushing and starvation (English and Morrison, 1984; Dyck and Swiestra, 1987; Marchant et al., 2000), and this mainly occurs within the first two or three days after farrowing (Dyck and Swiestra, 1987; Cronin et al., 2000; Marchant et al., 2000; Andersen et al., 2005; Westin et al., 2015). A field survey from Norwegian farms reported that the mortality of live born piglets ranged from 5% to 24%, and management was suggested to be an important factor (Andersen et al., 2007). In a review by Kirkden et al. (2013), it was concluded that piglet mortality can be reduced by a range of management routines, especially around farrowing. One important procedure is the supervision of farrowing by trained staff, and also attending sows a couple of days postpartum, which can reduce piglet mortality (Holyoake et al., 1995; White et al., 1996). While being present, the farmer could more easily detect animals that are in need of assistance, and for instance save piglets from near-crushing incidents. Some management routines, such as drying and placing piglets under a heat source immediately after birth can all reduce mortality (White et al., 1996; Christison et al., 1997; Andersen et al., 2009).

Rearing piglets in loose housing systems demands sows with good maternal abilities (Wechsler and Hegglin, 1997; Andersen et al., 2005; Johnson et al., 2007). But as litter size has increased over the years, and sows have a limited biological capacity related to number of

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functional teats and maternal investment, these larger litters demands more management input from the farmer to keep piglet mortality low (English, 1993). For instance, one experiment demonstrated that litters with more than 12 piglets, on average one piglet had no teat during a nursing bout in the first couple of days after farrowing, a factor that could lead to starvation (Rosvold, 2006). Management options when litters are large are for instance cross-fostering, split-suckling and nurse sow systems (Baxter et al., 2013). A good relationship between humans and animals is another factor important for welfare, health and production. For instance, in a study by Andersen et al. (2006), sows with low confidence that were positively handled the last two weeks prior farrowing, had increased confidence score, shorter farrowing duration, and also tended to give birth to fewer mummified or immature stillborn piglets compared to control sows. Ravel et al. (1996) found in their farm survey that the stockperson factors constitutes 26–27% of the variance in pre-weaning mortality.

The pre-weaning mortality of live born piglets on herd level is frequently used when evaluating a farms` production result from one year to another. This is a number that most pig farmers are familiar with, and refers to high survival rate among the piglets. A field survey was carried out to obtain information about pig farms, their management, especially around farrowing, and their production results. In this study we will investigate pre-weaning mortality of live born piglets (%) on herd level (HPM). All farm information are factors on herd level. The objective of this survey was to identify and assess the importance of systematic management routines around the time of farrowing for piglet survival in loose-housed sow herds.

2. Materials and methods

2.1. Farm selection and study population

This field survey was planned to include 60 commercial sow herds, with 20 farms representing each out of three major pig production regions in Norway (East, West and Middle). Inclusion criteria were breed (LY; sows of Norwegian Landrace x Swedish Yorkshire) and a consistent practice of keeping the sows loose during farrowing. The farms also had to keep regular recordings of production results to Ingris (The National Efficiency Control Database, administrated by Animalia (Norwegian Meat and Poultry Research Centre) and Norsvin (Norwegian Pig Breeding Association)). Information from Ingris concerning the numbers of litters born per year in each herd, gave us a possibility to select herds with a variety in size. Farmers were initially invited to participate in the study by letter in February 2013, followed by phone call for a second invitation. Fifty-two herds that complied with the inclusion criteria accepted to participate in the field survey. Before the onset of the study, the selected farmers were well prepared and we explained the importance of assessing the causes of death while they were present during farrowing.

2.2. Collecting of farm data

During spring and summer 2013, one of two trained researchers visited the farms once. The visit was carried out during the lactation period, with a compulsory tour in the pig house. Farmers answered questions about management practice and routines before, during and immediately after farrowing. Questions, categories and responses are presented in the results, including Tables 2–4. The farms' production results for 2012 and 2013 were extracted from Ingris, and are presented in Table 5 and Fig. 1. In 2013, there were 281 commercial herds in Ingris with registrations on LY sows and piglets, and the herds in the field survey (52) constitute 18.5% of these herds.

2.3. Data analysis

Data handling and statistical analyses were performed in Stata (Stata SE/11, Stata Corp., College Station, TX, USA) and SPSS (IMB SPSS Statistics Version 22, SPSS Inc. Chicago, USA).

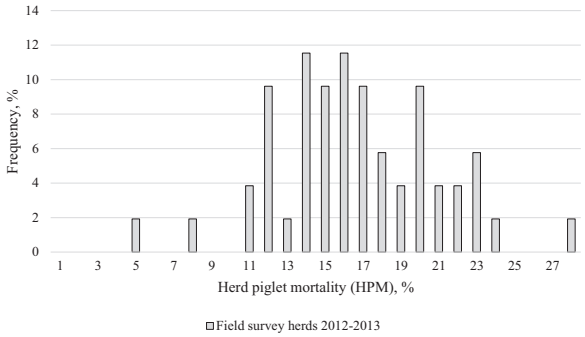

Fig. 1. Frequency of Herd live born piglet mortality (HPM) in the study herds (n=52).

For multiple choice questions distribution of the answers were calculated. Questions with answers given as continuous variables were reported by mean, standard error (S.E.) and range. The outcome were the average HPM in the years 2012 and 2013, and the average of two years was chosen to even out potential bad or good years. A multivariable linear regression model was used to evaluate which and how explanatory herd level factors were associated with HPM.

Descriptive statistics to assess the assumptions were made using a multivariable regression model, where evaluated using various techniques. Linearity between the continuous outcome and dichotomous variables was investigated with graphs using a “logit” function in Stata, creating a lowess line between the two variables. In addition, probability plots, best linear fit, and R2 were used to explore how continuous explanatory variables explained the variation in HPM.

Several management factors were recorded during the farm visit, i.e. split suckling, drying piglets (for more details see Tables 2–4). The challenge regarding the various managements registered, was that some farms had similar management routines, but several farms had their own unique routines. The regression analysis made many 2×2 tables, and we needed enough numbers in each box to give sensible estimates. Therefore, we had to cluster the farms into groups with similar management systems. After identifying management variables from the univariate analyses during the model building process, a new variable were generated using the Stata command “egen concat”, concatenate routines, categorizing farms based on four routines (concatenate commands are normally used to join two or more text strings into one string). This variable was called “Management type” (M), and was based on four management routines. Three of the management routines were conducted at farrowing (being present at 80–100% of the farrowings, drying and massaging newborn piglets, and performing split suckling), and the fourth routine was contact with the sows > 2 times per day (Table 1). Contact was defined as touching, talking to and/or being present near the sow in the farrowing pen. This new variable had four categories; M1 herds did not perform any of the four management routines displayed in Table 1. These herds had all unique combinations of the management routines from Tables 2–4, and could not be grouped. M2 herds had contact with sows > 2 times per day, M3

Table 1
Definition of four different management routines, number (n) and percentage (%) of farmers grouped within different types of management.

Management type (M)	n	%	Present at 80–100% of the farrowings	Drying and massaging	Split suckling	Contact with sows > 2 times per day
M1	28	53.8	–	–	–	–
M2	11	21.2	–	–	–	+
M3	9	17.3	+	+	+	–
M4	4	7.7	+	+	+	+