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Review article

Non-infectious factors associated with stillbirth in pigs: A review

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ABSTRACT

The main objective of this review is to provide current information regarding non-infectious risk factors associated with stillborn piglets. These factors can be roughly categorized as genetic, maternal, piglet and environmental factors, but also interactions exist between several factors. An understanding of this multifactorial problem should help practitioners and farmers implementing a more effective farrowing management to obtain a high reproductive efficiency. From the papers studied in this review, it can be concluded that litter size, parity, sow's body condition and farrowing supervision/birth assistance seems to be the most relevant risk factors associated with stillborn piglets.

Contents

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1. Introduction

During the last two decades, emphasis in pig production was placed on an increased number of total born piglets per litter through genetic selection (Roehe, 1991; Holl and Robison, 2003; Petry and Johnson, 2004). Concurrently, with this increased litter size, also the incidence of stillbirths has increased, reducing the reproductive efficiency (Hanenberg et al., 2001; Canario et al., 2006a; Rosendo et al., 2007). As reproductive efficiency is usually defined as the number of piglets weaned per sow per year (Dial et al., 1992), it is clear that each piglet lost at birth or during lactation implies an economical waste, a welfare problem and de-motivates pig producers. Stillbirths generally account for 3–8% of all pigs born (Borges et al., 2005; Cutler et al., 2006; Vanderhaeghe et al., 2010a). According to Sprecher et al. (1974), stillbirths can be classified into two distinct types based on the time of death: type I or deaths which includes fetuses that die before the end of gestation (antepartum or prepartum deaths), usually of infectious causes. Type II stillbirths are animals that die during parturition (intra-partum deaths) and are usually associated with non-infectious etiologies such as intrauterine asphyxia and dystocia (Sprecher et al., 1974). Of all stillborn piglets, 10% dies shortly before farrowing, 75% during farrowing and the remaining 15% immediately after farrowing (Leenhouwers et al., 1999). Only a thorough post mortem investigation can elucidate to which category a piglet belongs and distinguish between stillborn piglets and piglets died just after being expulsed (van der Lende and van Rens, 2003). Yet, necropsy of dead piglets is not routinely performed under practical circumstances and a stillborn piglet is generally defined as a piglet found dead behind the sow at the first check up after parturition with no sign of decomposition (Leenhouwers et al., 2003; Vanderhaeghe et al., 2010b). Although concerns have been raised regarding the reliability of producer-recorded causes of mortality, with incorrect diagnosis of stillbirths (Vaillancourt et al., 1990), results from another study indicate that general conclusions derived from producer recorded databases are valid (Riart et al., 2000, cited by Edwards, 2002). In many cases the different mortality groups (like stillbirths type II or piglets died immediately after birth) do not represent separate disease entities but are different clinical manifestations of the same basis condition, namely the extent of asphyxiation during parturition. Fetal hypoxia is most related to piglet survival at farrowing and even temporary hypoxia during birth may cause permanent brain damage and reduce the survival of liveborn pigs (Svendsen, 1992; Edwards, 2002).

Table one gives an overview of significant factors included in the references used in this review. The papers are divided in observational studies, which identify associations between risk factors and stillborn piglets or prospective studies, which indicate a real causal relationship. It should be noticed that in this review paper non-significant factors are excluded or mentioned as having no relationship with stillborn piglets. Also, detailed information is given regarding the stillbirth variable calculation. The stillbirth variable is primarily studied with three different calculations: as a proportion (number of stillborn piglets divided by total born piglets) as a binomial variable (litter with no stillborn or litter with at least one stillborn) or as a single data (number of stillborn piglets in a litter) (Table 1).

A schematic representation of the most relevant non-infectious factors is given in Fig. 1. They can be divided into four major classes, more specifically genetic, maternal, piglet and environmental factors and are discussed in detail in the present review paper.

2. Genetic factors

There is a significant genetic influence on stillbirth rate, although the reported heritability is rather small, between 0.02 and 0.05 for number of stillborn piglets (Hanenberg et al., 2001; Holm et al., 2004). Nevertheless, Leenhouwers et al. (1999) mentioned that purebred lines have more stillbirths (+0.5 to 1 piglet) per litter than crossbred lines and that the line differences in number of stillborn piglets may depend on the litter size or parity considered. Genetic selection for number of total born piglets results in a noticeable increase in stillbirths, longer farrowing duration and more need for birth assistance, whereas selection for number of piglets born alive accelerates the farrowing process and has a limited impact on farrowing duration and birth assistance (Canario et al., 2006b). Indeed, it seems that breed of the sow significantly influences the farrowing duration (van Dijk et al., 2005). Canario et al. (2006a) mentioned that piglets born from Meishan sows have a lower risk of stillbirth, probably due to a shorter farrowing duration and birth interval as opposed to European breeds (van Dijk et al., 2005). These observations suggest that both the sow and the piglets have a genetic influence on the occurrence of stillbirth. Leenhouwers et al. (2003) reported that the sow had a genetic influence on the probability of mortality during farrowing, whereas the piglets have a genetic influence on the mortality before and immediately after farrowing.

A recent study showed a significant difference in the mean % of stillbirths between different crossbred lines, ranging from 5.8 to 13.5% (Vanderhaeghe et al., 2010a) and identified interactions between farrowing management and type of breed regarding the stillbirth risk. This suggests that different breeds have a varying degree of sensitivity toward management practices around farrowing. Similar, Boulot et al. (2009) found that with the transition