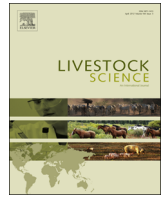




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## Review article

## Non-infectious causes of pre-weaning mortality in piglets



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## ABSTRACT

Piglet pre-weaning mortality (PWM) is one of the major reproductive components that affects herd productivity in the swine industry. Knowledge of factors that influence piglet PWM are important to improve animal welfare, to reduce production loss and to raise profits in commercial herds. The main objective of the present work was to review the most important non-infectious causes of piglet PWM and to present the main factors influencing them under commercial conditions. Piglet pre-weaning mortality is a multifactorial process, the small size of piglets at birth, together with their low body energy storage and their immature immune system, make them prone to chilling, starving, or being crushed by the sow. In general, factors causing piglet PWM are usually classified into three major groups: piglet (i.e., birth weight, vitality, and gender), sow (i.e., colostrum, parity, maternal stress, and sow nutrition), and environmental factors (i.e., season and temperature, housing, and management). Birth weight is the most determinant factor for piglet survival with direct impact on thermoregulatory capacity and growth; piglet vitality is also correlated with survival and growth and is strongly influenced by the degree of intra-partum hypoxia suffered by the piglet; additionally, piglet PWM appears to be sex-biased, with males showing greater susceptibility to causal mortality factors. Newborn piglets are highly dependent on colostrum to use it as energy substrate for thermoregulation and growth, and also to acquire passive immunity crucial for their future survival; however, sows' parity is a factor with contradictory effect on PWM which requires further research; a proper sows' comfort is also important for maternal stress around farrowing might have a negative impact on offsprings development and also increases the risk of crushing; sows' nutrition will influence foetal development and piglet birth weight, and is determinant to ensure a proper colostrum/milk production. Finally, ambient temperature has an important impact on piglet survival because piglets are very sensitive to cold stress. The housing system used in the farrowing room seems to influence the incidence of crushing. Promising results have been obtained using recent designs that combine initial confinement of the sow with the subsequent ability to move within the same pen. Different management strategies to deal with PWM are usually performed by producers around farrowing. However, there is a lack of scientific evidence on techniques, such as oral supplementation of piglets, cross-fostering, nurse sow systems, or artificial rearing of piglets, and further research should be of interest.

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**1. Introduction**

The production target in modern commercial swine herds nowadays is close to 30 pigs weaned per sow per year (Knox, 2005). This target has been achieved in two ways: by improving the number of piglets born alive and reducing the farrowing interval (Fig. 1). Litter size in sows has been dramatically improved in recent decades by genetic selection for highly prolific sows (Marantidis et al., 2013).

Despite the improvements in litter size acquired through genetic selection, the mean piglet pre-weaning mortality (PWM) rate in commercial swine herds ranges between 10% and 20% in major pig-producing countries (KilBride et al., 2010; Kirkden et al., 2013a; Koketsu et al., 2006; Tuchscherer et al., 2000). Indeed, recent reports showed a mean piglet PWM rate of 12.9% in the European Union (EU), 9.4% in the Philippines, and 12.2% in Thailand (Interpigs reports, 2014; Bureau of Agricultural Statistical of Philippine, 2012; Nuntapaitoon and Tummaruk, 2013b, 2015). On the other hand, the mortality rate in the nursery and finishing phases usually reaches 2.6% and 2.5%, respectively (EU averages, Interpigs reports, 2014). Considering these mortality values, reducing the PWM from 11.5% to 9.0% in a farm with a mean of 13 live-born piglets per sow, would result in an increase of 65 kg of live body weight (BW) at slaughter per sow per year (assuming 2.30 farrowings per year). Therefore, mortality in the suckling period remains a major welfare and economic problem in swine industries, which still needs to be properly addressed.

To address PWM, it is essential to differentiate between prenatal and postnatal piglet mortality. A proper distinction between stillbirths and live-born piglets that died immediately after birth is needed to properly address PWM in farm conditions. A stillborn piglet did not breathe (lung tissue will not float in water) and has also the periople on the claws (Baxter et al., 2009). In the present review, only piglet PWM calculated from live-born piglets will be

considered. The etiology of piglet PWM includes non-infectious and infectious causes. Infectious causes are mainly respiratory and diarrhea problems (Chrisensen and Svensmark, 1997). However, the present review will focus on the non-infectious causes of PWM.

On average, 50–80% of piglet deaths occur during the first week after birth, with the most critical period being the first 72 h of life (Koketsu et al., 2006; Shankar et al., 2009). Many factors determine the incidence of PWM under field conditions, including piglet birth BW, litter size, birth order, gender, parity, farrowing duration, maternal behaviour, sow nutritional status, and environmental temperature (Baxter et al., 2009; Muns et al., 2013; Panzardi et al., 2013). It is important for veterinarians to understand the possible causes underlying piglet PWM and to perform a multifactorial approach of PWM in farm situations, to increase the number of healthy piglets at weaning. Therefore, the aim of the present work was to review current knowledge concerning important non-infectious causes of piglet PWM focusing on the main factors found under commercial conditions. Furthermore, the review aims to highlight the most common management interventions performed around farrowing and their impact on piglet PWM.

**2. Causes of pre-weaning mortality in piglets**

There is a general agreement that crushing is the principal cause of piglet pre-weaning death, with chilling and starvation as underlying causes (Alonso-Spilsbury et al., 2007; Edwards, 2002; Herpin et al., 2002). Vaillancourt et al. (1990) found that the causes of death for pigs before weaning were crushing (33.8%), low viability (29.7%), scours (12.2%), infection (8.1%), deformity (5.5%), and others (10.7%) in the USA. Similarly, Koketsu et al. (2006) reported that crushing and a low viability of piglets at birth were the main

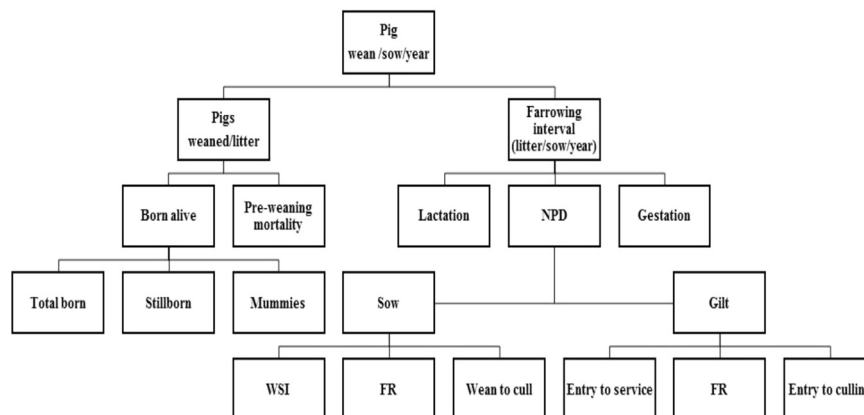


Fig. 1. Pig production diagram (NPD: non-productive days; WSI: weaned-to-service interval; FR: farrowing rate) (modified after Dial et al., 1992).

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