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Review Article

Managemental Interventions to Reduce Pre-Weaning Mortality in Piglets

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Abstract

Pig rearing plays an important role for improvement of socio-economic condition of poor farmers in India and other developing countries. The swine industry in India, currently in its infancy, i.e. in the hands of people having little or no awareness about pig farming. Pig mortality is an important factor affecting the economic viability and profitability of swine industry. The profitability of swine farm largely depends on the survival of piglets up to the weaning age. Immunity for the piglet is not obtained through placental transfer of antibodies during gestation and therefore it is born with very limited immune protection. Piglet born with low energy reserves and without immune protection therefore early and adequate intake of colostrum is major determinant of piglet survival during the early suckling period. New born piglets are highly dependent upon the sow for food and protection from disease, cold and predators. The death of suckling piglets adversely affects the productivity of farms; therefore, implementing an effective management regime until 3 d after birth could decrease the occurrence of piglet deaths. The first and foremost target of an ideal farm is to reduce the morbidity and mortality rate. Several managemental interventions are adopted to reduce the pre-weaning mortality like selection of animals having good mothering ability, modification of farrowing pen, provision of guard rail, farrowing crate, crush reducing device, ensure colostrum intake, measures to prevent hypothermia, cross-fostering, supplementation of iron, provision of creep feeding etc.

Keyword: Farrowing Pen; Colostrum Intake; Supplementation of Iron; Creep Feeding.

Introduction

Pig rearing is one of the most important occupations of rural society, especially the tribal masses of India. Majority of the pig population is maintained by marginal and small farmers, who rear pigs under nomadic or scavenging system or both as a source of income and a choice of meat for consumption. They are important for farmers as a major source of family income or as a 'savings bank' (Steinfeld 1998). According to 19th Livestock census, India's pig population is 10.29 million and it constitute 1.47% of world pig population. In Uttar Pradesh its population is 0.193 million and highest pig meat (0.173 MT) producing state.

Mortality pattern in organized swine herd serves as a useful indicator for assessing the status of herd health and management programme and their efficacy. The first and foremost target of an ideal farm is to reduce the morbidity and mortality rate. Often, there is considerable loss due to the seasonal and routine changes in management, which could be avoided by adopting standard

management practices and avoiding unnecessary and abrupt changes in the routine management activities. The farrowing crate is predicated on reducing sow mobility and reduce the number of piglet that killed by crushing treading on or overlying by sow. It also reduce the amount of disturbance, completion and fighting between the sow for feed and nest sites. With less restriction in loose housing, the maternal behaviour of the sow is likely to have a greater impact on piglet survival.

Managemental Practices to Reduce Pre-weaning Mortality

1. Selection of animals having good mothering ability
2. Modification of farrowing pen
   i. Provision of Guard rail
   ii. Provision of farrowing crate at pen
   iii. Provision of crush-reducing device
3. Ensure colostrum intake
4. Measures to prevent hypothermia
   i. Farrowing mat
   ii. Heat mat
5. Provision of heated creep area
6. Cross-fostering
7. Supplementation of iron
8. Provision of creep feeding

Selection of Animals having Good Mothering Ability

Patterns of maternal behaviour are strongly related to reproductive abilities in sows. Prenatal behaviour of sows is mainly characterised by nest-building activities, resulting in a nest that provides shelter for the piglets. In the course of domestication, sows have not lost their instinctive behaviour to nest-build, but perform at least elements of it when appropriate space and materials are available. Within 24 hours of farrowing, sows in farrowing pens and crates are highly motivated, even without nesting material, to perform nest-building behaviour such as rooting, nosing, and pawing (Jensen, 1986). However, sow behaviour can be negatively affected when there is no nesting material available compared with sows with access to bedding; more oral-nasal stereotypes, greater heart rate (Damm et al., 2003), greater concentrations of cortisol before farrowing (Lawrence et al., 1994), longer duration of parturition (Cronin *et al.*, 1993), shorter nursing duration (Herskin *et al.*, 1999), and more postural changes the first 24 hours post-farrowing. The onset and performance of nest-building is both stimulated internally via hormones and externally via feedback from the environment. With this environmental influence, the possibilities to perform nest-building can be restricted to different extents in commercially farmed pigs.

Modification of Farrowing Pen

• *Guard rail*

A guard rail around the farrowed pen is an effective means of preventing sows from crushing their pigs. The importance of this simple protective measure may be best emphasised by pointing out that approximately one-half of young pig losses are accounted for by those pigs that are laid on by their mothers. The rail should be raised 8 to 10 inches from the floor and should be 8 to 12 inches from the wall.

• *Farrowing crate*

The farrowing crate was introduced in the 1960s to decrease piglet mortality, especially the crushing of piglets by the sow, to make routine sow and piglet management easier for the stockperson, and to allow a greater number of animals to be kept per unit (Edwards, 2002). They are designed to restrict gross body movements of the sow and to make the floor area outside the crate safe for the piglets.

• *Crush reducing device*

Crushing occurs most frequently when sows lie down from a standing position therefore, the crush-reducing device was developed to obstruct the access of suckling piglets to the sows. This was done by ejecting compressed air beneath the sows' bellies when the sows were standing or sitting (Fig. 1). The photo sensor, which is fixed to the upper shoulder of the sow, detects behaviour such as standing and sitting that may crush piglets, and sends a signal to the controller. The controller then turns on the solenoid valve, and air from the compressor is released through the air rejection hose. The air prevents suckling piglets, which are sensitive to wind velocity, from remaining underneath the sow's belly and prevents sows from breeching, thereby decreasing the incidence of crushing.

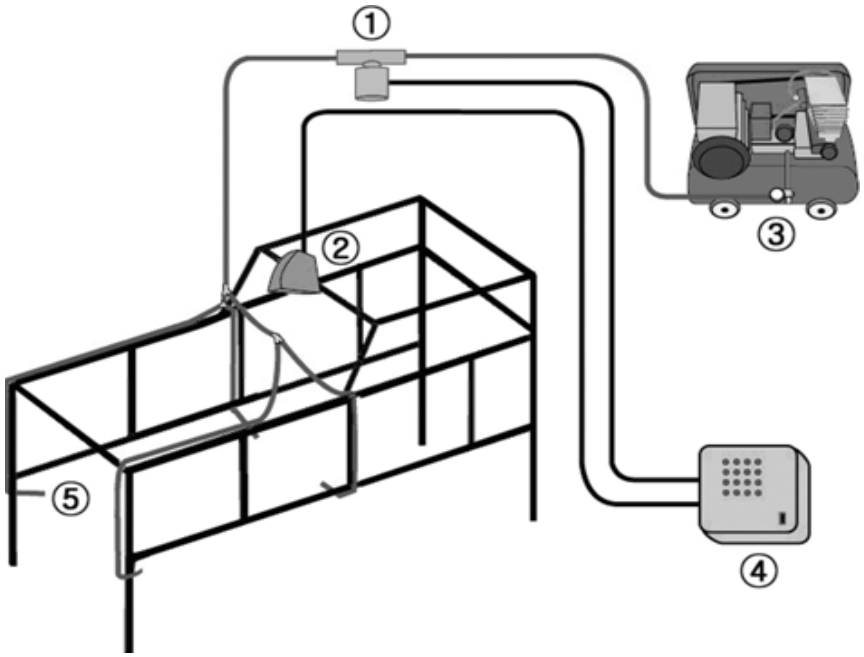

Fig. 1: Overall schematic of the crush-reducing device. The 1) photo sensor, which is fixed to the shoulder of the sow, detects behavior that may crush piglets (such as standing and sitting) and sends a signal to the 2) controller. The controller then turns on the 3) solenoid valve, and air from the 4) compressor is released through the 5) air ejection hose in back-and-forth and right-to-left directions.

Ensure Colostrum Intake

Sow have epitheliochorial placenta which does not allow maternal antibody to cross, therefore piglets are not provided with passive immunity and prone to get sick or die. The main causes of early piglet mortality include reduced vitality due to hypoxia during farrowing, hypothermia and lack of adequate colostrum intake (Malmkvist et al. 2006).

Therefore, an early and adequate intake of colostrum is a major determinant of piglet survival during the early suckling period. The most critical period for the survival of piglets is during the first two days of life. The piglet is born with low energy reserves and without immune protection and relies strictly on the sow's colostrum to obtain them in the defence against bacteria and viruses.

To ensure adequate colostrum intake, collect colostrum from the sow or obtain cow colostrum and give it to piglets via a stomach tube or a syringe. In newborn piglets, cow colostrum and infant formula differ from sow colostrum feeding regarding some intestinal functions (enzyme activities, nutrient absorption) but both formula and colostrum diets are well tolerated and induce normal intestinal mucosal growth with absence of intestinal atrophy or inflammation.

Measures to Prevent Hypothermia

• *Farrowing Mats*

The mat is biodegradable, eliminating the labour issue of cleaning up and bacterial contamination with rubber mats. The advantage with these mats is that it does not require to wash and clean, the disadvantage is the high cost of the mat. Pigs break up the mats by 10-14 days of age, by which time they no longer need them to keep warm and dry. When pigs have scours from *E. coli* or clostridium infections, or strep or staph infections, biodegradable mats become very attractive because of their one-time use.

• *Heat Mats*

Heat mats, i.e., solid or flexible boards with embedded heating elements, have been considered by the swine industry in North America and Europe as a means of localized surface heating. Heat lamps have been commonly used as creep heat source while electrical heat mats are increasingly promoted as an energy-efficient alternative. From the viewpoint of heat transfer, overhead radiant heating with lamps is more effective in providing heat to piglets than underneath conductive heating with mat. This is because heat loss by convection and radiation

modes account for the majority of the sensible heat loss of the piglets. However, heating with heat lamps has several drawbacks such as higher energy use and limited area of thermal comfort zone for the piglets, as compared with heating with heat mats. Xin and Zhang (1999) examined the preference of lamp heat vs. mat heat by piglets. They found that the preference of mat or lamp heat for small piglets (< 1.7 kg or 3.7 lb.) was influenced by the original heat source the piglets had been exposed to, except for drafty conditions where lamp heat was preferred. As piglets grew (2.4 to 5.3 kg or 5.3 to 11.7 lb.), they showed a similar preference for lamp and mat heat. Further increase in body size (7.1 kg or 15.6 lb.) shifted the preference to mat heat. The study by Xin and Zhang (1999) used two pigs kept in a small environment-controlled wind tunnel for a relatively short time period.

Xin and Zhang (1999) examined the preference of heat lamp or heat mat by piglets (birth to weaning) under various environmental conditions and revealed that heat mat was generally preferred by larger piglets. The thermal performance of heat mats, as measured by uniformity and controllability of the mat temperature, can vary considerably depending on the mat design. When operated without adequate temperature controllers, mats may produce excessively hot regions around the heating elements that prevent piglets from using the mats. Furthermore, when piglets are resting on a mat, heat balance between the mat and the ambient environment changes. Consequently, mat temperature changes with the pig-resting behaviour. These dynamic characteristics of heat mats have not been considered in the design of most, if not all, commercial mats because of the lack of information in the literature.

Provision of Heated Creep Area

Preweaning mortality can be reduced by providing a heated creep area for the baby pig. This supplementary source of heat encourages the piglets to lie away from the sow and therefore reduces their chances of being crushed when the sow moves. Unfortunately, the new born pig tends to lie against the sow's udder for the first 2 to 3 days of life even when heated creep areas are provided (Petherick, 1983) and it is during these first 3 days that the majority of mortalities occurs.

Cross-fostering

It is common to find a sow having difficulty rearing a large litter, while nearby another sow is suckling only a few pigs. If this occurs, the litters can be balanced by taking a few pigs from the large litter and placing them on the sow with the small litter. Piglets of low birth weight have a low chance of survival when their littermates are much larger. But these small piglets have a good chance to survive and grow rapidly when their littermates are of similar size.

Cross-fostering is a standard management practice to minimise the variation in piglet birth weights within a litter in order to decrease piglet mortality. Pigs can be moved from large to smaller litters to equalize litter numbers, and pigs can also be transferred between litters to improve uniformity of body size (Gardner *et al.*, 1990).

Supplementation of Iron

There are numerous ways in which supplemental iron may be administered to baby pigs either orally or parenterally to meet their needs for iron (Cutler *et al.*, 2006). The chemical form of the iron used in an oral iron source is very important. Ferric oxide and ferrous carbonate have frequently been used in commercial trace mineral mixes for young pigs, but they are very poorly available forms of iron. Ferrous sulphate is the most frequently used form because it is quite available and economical. The monohydrate form of ferrous sulfate ($FeSO_4.H_20$) has physical properties which make it suitable for mixing with other dietary ingredients, and the iron is equally as available to the pig for hemoglobin formation as that from the heptahydrate form ($FeSO_4.7H_20$). Cost of iron from either commercial source is similar. Indirectly from feed and feces of sows fed high levels of iron. Supplemental iron may be administered orally through (a) placing soil in the farrowing pen, (b) swabbing the sow's udder with an iron solution, (c) dosing the pig with iron pills, paste or liquids, (d) placing liquid, moss, meal, pellet or block preparations in the creep area, or (e) feeding high levels of iron in the sow's diet and allowing pigs access to sow's feed and faeces.

Parenteral administration is the most commonly used method and to be effective, must use a proper form (Iron-dextran and iron-dextrin), amount and method. Iron injections may be given intramuscularly, intra-peritoneally or subcutaneously, the preferred method is intramuscularly. Iron injections may be made any time within the first 3 to 4 days of life. Neck or ham is the better site for

iron injection and it may leave a permanent stain in the muscle. Intramuscular injection into gluteal muscles (thigh) can cause damage to nervous fibularis and nervous tibialis resulting in transient lameness of piglets. The most common method is associated with some side effects like acute toxicosis in antioxidant deficient piglets, myopathy in piglets deficient in vitamin E, etc. the required dose is 100 mg, in case weaning is done before 3 weeks and 150 to 200 mg, in case weaning is done after 3 weeks.

Provision of Creep Feeding

Creep feeding tended to improve litter weaning weights due to improved survivability. Creep feed consumption was related to piglet maturity rather than the induction of creep feeding. Creep feeding that focuses in encouraging more suckling piglets to eat is beneficial in producing weanling pigs that are better adapted to weaning, which improves post-weaning performance. Providing dry diets to piglets during lactation or 'creep feeding' continues to be one the most popular methods. This is especially true in pig producing countries where weaning is performed at older ages (4 weeks or older).

One of the major reasons for providing creep feed is to augment sow milk production, which often becomes limiting during early- to mid-lactation (Le Dividich and Sève, 2001). Boyd *et al.* (1995) estimated that lactating sows need to produce at least 18 kg of milk per day to meet the energy requirements of a 10-pig litter at 21 d, which is greater than the typical production of 10 to 12 kg of milk produced in modern sows. Thus, milk production may limit piglet growth as lactation advances, especially in large litters. In addition, Le Dividich and Seve (2001) contend that the protein content of sow milk may also be a limiting factor. Noblet and Etienne (1987) suggested that the protein to energy ratio in sow milk is lower than the level that is needed to maximize neonatal pig growth. Therefore, creep feeding may help supplement the deficiencies in sow milk supply and composition to positively impact preweaning growth.

Creep feeding was also thought to reduce the nutritional load in lactating sows especially those with large litters, which may have corollary effects in reducing lactation weight loss and weaning-to-estrus interval. The impact of creep feeding in reducing nutritional requirements of the sow may potentially be greater with older weaning ages, it does not appear to have any effects in a 21-d lactation period.

Creep feed consumption is also thought to help initiate and promote gut and digestive enzyme development that may help pigs to utilize alternative food sources once milk is removed (Nabuurs et al., 1993). These physiological factors including familiarity with solid food is speculated to stimulate postweaning feed intake, which may help maintain villus integrity and digestive function (Pluske and Williams, 1996) and reduce occurrence of postweaning disorders (Carstensen et al., 2005). Eventually, these benefits may lead to a reduction in postweaning growth check and potential improvements in overall nursery performance. Dried bread waste can be supplemented to the piglet ration without affecting feed intake and feed utilisation up to 50 per cent level in growing crossbred pigs ration (Ajay et al., 2016). Feeding of bread waste significantly reduce the cost of feeding in rearing of growing crossbred pigs.

Conclusion

During the past decades, considerable number of research papers has been conducted to reduce mortality of piglets. These have been mainly directed towards (i) provision of an adequate thermal environment to the litter based on the thermoregulatory ability of piglets and (or) providing the weak piglets with an energy source because of the high energy requirement during the first days of life, (ii) management practices to reduce competition among siblings, and (iii) studies of the behaviour of the sow (a component of the maternal quality of the sow) and her litter around parturition. The pig industry has been constantly developing more prolific genotypes with the ensuing increased proportion of larger litter sizes along with provision of protective mechanism to reduce the piglets mortality.

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