Optimal nutrition for weaning
A struggle for survival

The stress of losing a mother followed by entering a crowded pen of complete strangers whose natural behaviour is to fight for supremacy will cause an upset to any animal. In addition the piglets experience a dramatic reduction in maternal immunity and a digestive change from a liquid (milk) diet to a solid feed, making it quite clear why so many weaned pigs struggle to maintain their feed intake and in turn will succumb to gastrointestinal disorders.

Breeding companies continue to select for larger litter sizes which has been found to correlate positively to smaller birth weight of piglets. Survival of piglets with a lower birth weight is reduced, emphasising the increasing importance of management throughout the farrowing and post weaning period (Van Heugten, 2007). Many pork producers set weaning weights of 8kg per piglet at three weeks of age, however as these targets continue to increase, failure to achieve these could be due to diet composition, housing system, environment, genetics and health. Pre- and post weaning growth is clearly essential for achieving market weight target as indicated by Figure 1. A high feed intake during the first week post weaning promotes growth and health during the entire growing-finishing period (Riemensperger, 2012). While genetics, as well as the environment and health may influence feed intake, few pigs are fed diets that allow full expression of genetic potential because the digestibility, palatability and/or nutrient density of the diet is limiting for both practical and economic reasons (Patience et al. 1995).

Creep feed requirements

The goal of creep feeding is to achieve adequate feed intake by the time of weaning to acclimatise and develop the piglets’ digestive system to solid feed. Highly digestible and palatable feed is essential for utilising the very high feed efficiency of piglets. Getting the pig to consume feed quickly is extremely important in getting off to a good start. This is a result of the levels of digestive enzymes responsible for the breakdown of starches, proteins and fats increasing as more feed is consumed (Van Heugten, 2007). Typically creep feeds will contain highly palatable and digestible dairy products, namely high quality whey and skin milk powders, providing 15-30% lactose through the diet. This helps stimulate feed intake and growth performance (Patience et al. 1995; Van Heugten, 2007). Dietary lactose concentrations can be rapidly decreased in the diet after the initial two weeks post weaning. This is due to the lactase enzyme activity declining and maltase and sucrose enzyme activity increasing, allowing improved digestibility of cereal grains until digestive maturity is reached at ten weeks of age (Kelly and King, 2000).

High quality protein sources are essential for supplying the correct level and balance of amino acids without supplying an oversupply of crude protein (Mavromichalis, 2006). An early weaning diet generally will contain 1.5-1.7% total lysine. Undigested nutrients that reach the large intestine will create a beneficial environment for potentially harmful bacteria, increasing the prevalence of digestive disorders. For these reasons fish meal (3-8%), milk proteins, animal proteins (3-8%), and synthetic amino acids have found a place in piglet feed formulation. The risk of transmitting Bovine spongiform encephalopathy (BSE) has resulted in the European ban of the animal protein source, plasma in diets (Mavromichalis, 2006). Omitting fish meal from creep formulations is often disadvantageous due to the decrease in crude protein digestibility even at extremely high ingredient cost. The potential of eliciting an immune response and the anti-nutritional factors of soybean meal, results in its’ low inclusion level to creep feeds. However, limited quantities of soybean meal are necessary during creep formulation as this helps transition the piglets in developing sufficient immunological tolerance for the ingredient. Soybean meal and most other plant proteins are rich in anti-nutritional factors, making it essential for strict raw material processing regulations and monitoring (Mavromichalis, 2006). A significant difference between sow’s milk and creep feed is the high fat percentage in sow’s milk (very digestible, high energy source) as opposed to the creep feed, as this level practically cannot be obtained during formulation. Oils are generally favoured due to their higher digestibility as opposed to animal fats. As the pig ages its’ ability to digest vegetable and animal fats increases, allowing for increased dietary inclusions (Patience et al. 1995).

Many studies have shown an improved digestibility and decreased feed wastage when comparing pellets to meal. A good feed conversion ratio for the entire nursery period of 1.45 or less makes the extra cost of these diets worthwhile (Mavromichalis, 2006). Dietary requirements change rapidly post weaning not only due to nutrient requirements, but also the ingredients most suited in a three week old pig differs significantly to the ingredients most suited in a six to eight week old pig (Patience et al. 1995).

Figure 1. The effect of average daily gain during the first week after weaning on the number of days it took pigs to reach market weight (Patience et al. 1995).

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Making use of feed additives
The correct choice of raw materials is not only important for dietary digestibility but enzyme (i.e. phytase and non-starch polysaccharides) and feed additive supplementation also play a vital role. Preventative inclusions of antibiotic growth promoters and metal trace minerals (copper and zinc) have contributed to alleviating post weaning problems in the past. However, alternative product research and utilisation has increased dramatically in recent years due to the scope for partial and complete bans on antibiotic inclusions to pig feeds in more and more countries worldwide (Lalle’s, 2008). Organic acids reduce the gastrointestinal pH creating unfavourable conditions for pathogenic bacteria and have shown anti-microbial effects, resulting in their inclusions not only to starter diets but also grower diets (Heo et al. 2013). An increasing number of studies on probiotics and prebiotics have shown improvements in beneficial microbial growth in the gastrointestinal tract and improved resistance to colonisation of pathogenic bacteria (Lalle’s, 2008). Inconsistent results of probiotics and prebiotics have led to a slower growth in their usage in the pig industry (Heo et al. 2013). Other products receiving research for controlling post weaning disorders in recent years include live yeasts, nucleotides, plant extracts and organic trace minerals. A nucleotide is one of the building blocks of DNA and RNA. Supplementing nucleotides is reported to reduce the incidence of diarrhoea and the aggravating causes of undigested protein by improving the growth and development of the digestive tract, providing enhanced immunity and favourable intestinal microflora (Mateo, 2005).

Minimising stress around weaning through management
Management plays a great role in providing the piglets the best opportunity for a smooth transition and the best possible weight gains. The periods immediately pre- and post weaning offer the best opportunity to help the piglet adapt and make it through this stressful transition period. The following will enable the farmer to minimise stresses to the piglets enabling a smooth transition through weaning:
- Farrowing management: Each piglet should drink at least 250-300mL of colostrum for a maternal immunity to be developed. Identify the later born and/or weaker piglets and make sure they are placed on a front teat within the first few hours of farrowing so that these vulnerable piglets are protected against environmental pathogens and less likely to infect others through scouring.
- Minimise environmental stresses (e.g. temperature variation, drafts, and damp conditions), limited co-mingling, and using an all in/all out system with a good sanitation programme. The lower critical temperature for piglets weighing 5kg or less is considered to be 29°C. Cleanliness should be a priority in farrowing and weaner pens.
- Think ahead: Make sure pens are completely dry, correct room temperature and ventilation is achieved before placing weaned pigs. Ensure feeders and drinkers are in good working condition. The social feeding behaviour of piglets continues post weaning and therefore multiple space feeders are essential for improved feed intakes. Dish type drinkers during the first few days post weaning allows piglets better access to water, favouring improved early water intake which will assist piglets in the transition period (Patience et al. 1995). Process piglets early within the first week of birth so as not to be near the time of weaning.

Optimising weaning weights through feeding the sow
Weaning weights are highly correlated to the nutrition and performance of the sow. Providing a head start in life to your piglets, not only entails the feeding of the sow during lactation, but also during gestation. Many trials have demonstrated the benefits on piglet vitality when an increase in feed allowance is achieved during the last three weeks of gestation (Quiniou, 2005). Increasing sow feed intake during lactation has a direct correlation with weaning weight (Eissen et al. 2003). In order to achieve high intakes a nutrient dense, digestible and palatable lactation feed is required. Boyd et al (2000) showed that increasing the Lysine content of the lactation diet resulted in a direct increase in litter growth; however overfeeding of lysine can also result in the sow losing body. A total lysine intake of 69 grams per day was calculated to support milk production without mobilisation of any body protein reserves (Boyd et al. 2000). However, the feed intake of the sows in relation to the litter growth is required in order to determine the required dietary lysine inclusion.

Summary
Reducing pre- and post weaning morbidity and mortality is of great economic significance to any piggery and ways of reducing these should never be overlooked. Improving piglet performance during the weaning period is complex and requires a multi-factorial approach. The process begins as early as feeding the gestating sow. Improving dietary specifications cannot overcome the effects of a poor environment, just as providing an ideal environment will not compensate for a poor diet. A high feed intake during the first week post weaning promotes growth and health during the entire growing and finishing periods.

References