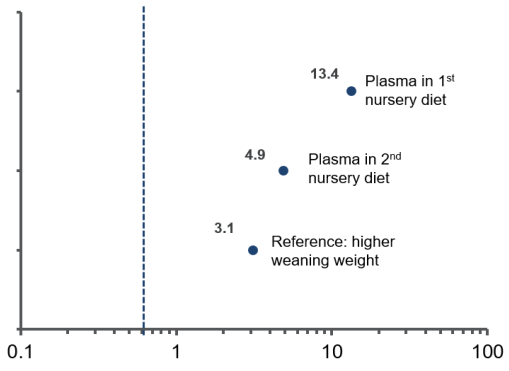
PROFITABILITY AND PERFORMANCE IN SWINE FARMS

SWINE

Improving production efficiency and reducing cost of production are two key factors for profitability because producers have little control over feed raw materials cost and market price of hogs. When comparing cost of production between USA and China (which represents similar conditions in SE Asian countries) China generally has higher weaned pig purchase price and higher feed cost. This is partly due to lower sow farm productivity and higher cost of imported feed raw materials from other regions. In addition, variable costs in medication and biosecurity measures are also higher in China compared to the USA. Death loss is also one of the major factors that reduces profitability.

A holistic approach is needed to ensure optimal health status and production efficiency of the farm. An epidemiological study of commercial nurseries in Canada (1) reported that herd health status and survivability were determined by farm biosecurity practices, disease status, farm management, and proper nursery nutrition (Figure 1). Inclusion of Spray Dried Plasma (SDP) in nursery diets significantly increased the odds ratio for improving nursery survivability, even more than the standard reference of heavier piglet body weight at weaning.

Figure 1. Postweaning Mortality in Manitoba Swine



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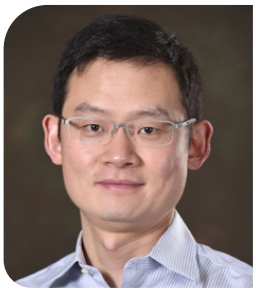
Adapted from Dewey, et al. 2006. Postweaning Mortality in Manitoba Swine. The Canadian Journal of Veterinary Research.70:161-167

Management of Nursery Health: The sow farm has a profound impact on the health of weaned piglets. A farm-specific vaccination protocol for sows and pigs is needed to build herd immunity. Colostrum management is crucial to make sure each piglet receives a minimum of 250-300 g of colostrum within 1 day of age to ensure adequate immunity can be transferred to the piglets, especially for hyper-prolific sows with 14-16 pigs per litter. Biosecurity measures for the nursery, such as receiving pigs from a single sow farm (no mixing of unfamiliar piglets) and all-in-all-out practice are recommended. Management on weaning day should be as stress-free as possible. Getting the barn dried and warm before piglets arrives. For nursery nutrition management it is important to ensure a successful shift from milk to dry solid feed without compromising pig health and survivability. Getting weaned pigs started on feed as soon as possible improves their chance to survive and endure the challenges of weaned stress.

A Case Study Of How the US Swine Industry Is Using A Holistic Approach To Address The Resurgence Of Pathogenic E. Coli Affecting Nursery Pigs: Recent data from the Iowa State University Veterinary Diagnostic Laboratory reported that there has been a 460% increase of pathogenic E.coli cases in 2021 compared to 2020 causing 100% morbidity with a drastic increase of 2-3% mortality overnight, and up to 20% death loss in some nurseries. Some pronounced clinical signs are loose stools, sunken eyes, gut edema, sudden death, and ataxic pigs. Antimicrobial sensitivity testing by the Iowa State University diagnostic lab reported an increased antimicrobial resistance over the past few years.



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In 2021, E.coli resistance to enrofloxacin, gentamicin, neomycin, and trimethoprim sulfamethoxazole was at 74.1%, 62.4%, 76.5%, and 72.9% respectively. In some cases, 100% resistance to all available antibiotics were reported.

To overcome these challenges several management practices have been recommended, starting with farm hygiene and sanitation. A clean and dry environment is required to reduce the bacterial load of E.coli. Getting pigs started eating feed as soon as possible after weaning is important for maintaining better gut health and function. Feed management practices including mat feeding for the first week, gruel feeding for fall-behind pigs and offering only fresh feed should be done to stimulate feed intake. Providing supplemental heating (30-32°C) and maintaining optimal humidity (50-60%) is recommended. Pigs should be closely monitored to ensure their comfort.

Another condition that favors growth of pathogenic E. coli is undigested proteins reaching the hind gut. Fermentation of undigested protein by microbes in the hind gut propagates growth of pathogenic bacteria. Research by the University of Illinois Urbana-Champaign reported that vegetable proteins (soybean meal, fermented soybean meal) are less digestible by weaned pigs compared to older grower pigs *(2)*. Therefore, nutritionists should use feed ingredients that are highly digestible by weaned pigs to ensure the complete feed is well digested and minimal undigested protein is passed on the hind gut. Some well proven feed ingredients and additives used to reduce incidence of E.coli are plasma, zinc oxide, rolled oats, and acidifiers. The impact of plasma in feed for pigs experimentally challenged with various strains of pathogenic E. coli have been published *(3-11)* and are summarized in Figure 2. Overall, feeding plasma to pigs challenged with E. coli improves average daily gain (ADG) and reduces diarrhea, inflammation, and mortality. These benefits were consistently observed across the various strains of E. coli.

Figure 2. Summary of E. coli challenge studies

ETEC CHALLENGE	SDP IMPACT	AUTHOR
E. coli, F18	↑ ADG, ↓ diarrhea	Borg et al.
E. coli, K88	↑ ADG, ↓ mortality	Bosi et al.
E. coli, K88	↑ ADG, ↓ Inflammation	Bosi et al.
E. coli, K99	↑ ADG	Torrallordona et al.
E. coli, K99	↑ ADG	Campbell et al.
E. coli, K99	↑ ADG, lactobacilli	Torrallordona et al.
E. coli, F18	↓ diarrhea	Nollet et al.
E. coli, O139:K82	↑ ADG, ↓ diarrhea	Van Dijk et al.
E. coli, K88	↓ diarrhea	Owusu-Asiedu

#6 PLASMA RANKED #6 IN TOP 10 DISCOVERIES IN SWINE NUTRITION

Recently a digestibility study using nursery pigs *(12)* reported that 6% SDP in complete diets, using different types of grain and protein sources as ingredients that are typically used in various global regions, improved the standardized ileal digestibility of crude protein (SID CP) of the diet. For Asian diets based on rice, corn, fish meal and fermented soy protein, the SID CP of the complete diet was increased from 84.2% to 86.6% SID CP for the diet containing 6% SDP. The improved SID CP of the SDP diets may be partially explained by the beneficial functional protein profile of SDP, which is like that of colostrum and milk. Functional proteins in SDP include: transferrin (binds iron required for E.coli growth), lysozyme (attacks bacteria), growth factors (stem cell repair and growth, improves gut health and digestibility), cytokines (regulates inflammation), and immunoglobulin G (binds toxins and pathogens).

The biological functionality of SDP provides benefits beyond its calculated nutritional contribution to the diet. Numerous studies using SDP in feed for animals under challenge with E.coli, Salmonella, Rotavirus, PRRSV, or PCVAD demonstrated the health benefits of SDP showing improved feed efficiency, survival rate, growth rate, and reduced fecal score (less diarrhea). Nursery pigs that were PRRSV positive and fed diets with SDP were 0.8 kg heavier at 69 days of age and had 40% lower mortality compared to an alternative feed regimen *(13)*. Another study done in Brazil with PCVAD pigs *(14)* reported that pigs fed nursery diets with SDP were 2 kg heavier at the end of the 41-day nursery phase with less clinical symptoms compared to a control group fed fish meal-based diets. The Schothorst Feed Research (SFR) of the Netherlands recommends the use of milk protein and plasma protein in nursery feed because both contain immunoglobulins which are known to benefit nursery pig health *(15)*.

The beneficial effects of SDP are more pronounced on farms with sub-optimal conditions with low performance, poor health status, and disease outbreaks. Higher inclusion rates of plasma (4-6%) in feed should be considered in nursery diets without antibiotics or without high levels of zinc oxide and at farms with poor health status even when feed medications are allowed.

Improvement of Sow Farm Productivity. Production costs of the sow farm can be reduced by improving pigs weaned/sow/year (PSY) and managing input cost (including feed, medication, semen, fixed and variable costs). Strategies to increase PSY by increasing total born, reducing stillborn, reducing pre-weaning mortality, and improving sow farm management and biosecurity can incrementally enhance profitability. At a PRRS positive farm with 5,500 sows, providing 0.5% plasma (5 kg/ton) in both gestation and lactation feed significantly improved farrowing rate from 81% to 86%, reduced repeat matings from 11% to 7.8%, and increased pigs weaned per 1,000 sows mated by 400 more pigs compared to historical production records before SDP was added to sow feed *(16)*. When 0.5% SDP was supplied in sow feed during the transition period (5 days before and after farrowing), the percentage and number of stillborn pigs per litter was significantly reduced resulting in 0.4 more live born pigs per litter compared to a control transition sow diet *(17)*. A past internal study by APC reported that sows had better feed intake during lactation and less back fat loss in both primiparous and multiparous sows supplemented with plasma, suggesting a better sow body condition.

Table 1 summarizes results from 5 lactation studies using 0.5% SDP in lactation feed *(18-19)*. Sows fed SDP consumed +0.42 kg/d more feed, had 1.23 less wean-to-estrus interval days with 9.6% more sows in estrus day 4 to 6, a 5.5% increase in farrowing rate to next litter, +1.8 kg heavier litter weight at weaning, and +0.32 kg average pig weight at weaning. The economic benefit (margin over total cost) was calculated at US$ 1.77 per pig weaned or US$44.25 per sow per year.

Table 1. Summary of results from 5 lactation studies, adjusted to an 18-day lactation period.

Variable	Parity	Control	Plasma	Variance [1]
Sow feed intake, kg/d	1 & 2	4.76	5.18	+ 0.42
Wean to estrus interval, d	1	9.18	7.95	- 1.23
Sows in estrus d 4 to 6, %	1	61.4	71.0	+ 9.6
Farrow rate to next litter, %	Multiparous	86.8	92.3	+ 5.5
Litter weight at weaning, kg	Multiparous	46.6	48.4	+ 1.8
Average pig weight at weaning, kg	Multiparous	5.16	5.48	+ 0.32
Full value pigs weaned, n/litter	Multiparous	8.94	9.32	+ 0.38

Weighted averages of data from 5 lactation experiments (2,723 sows)

SUMMARY

In conclusion, the key to profitability is to reduce cost of production which is mainly comprised of feed, medication, and death loss. As part of a holistic approach, nutrition can influence herd health and therefore reduce mortality. Supplementation of plasma improves animal health, reduces mortality and cost of production, and consequently improves overall profitability of pig production.

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