INTRODUCTION

Throughout the period from 1990 to 2004 Ontario pork producers enjoyed and endured, by turn, the usual economic ‘highs’ and ‘lows’ of the hog cycle. In general, though, the entire period was marked by three relative advantages that favoured Canadian producers: a North American free trade agreement; an advantageous currency exchange rate; and a relative health advantage over the two pork powerhouse regions in the USA – North Carolina and Iowa. Since 2004 the ‘tables have turned’: rapid currency exchange movement towards ‘parity’; new and severely debilitating strains of PRRS and PCV-2; and challenges to free trade (e.g. mCOOL).

So at the start of 2012 the Ontario producer finds himself in a new production environment of narrow margins and very little room for error. The authors hope that this paper will effectively review some of the important factors that can promote profitability in the nursery and grow-finish barns.

1. CONTROL PRRS VIRUS INFECTION IN THE NURSERY

Porcine Reproductive and Respiratory Syndrome virus (PRRSv) is an economically devastating disease in swine production. Recent epidemiological information from Quebec indicates that 75% of all herds are infected with PRRS virus (Lambert et al., 2012). In the nursery, PRRS virus infection is especially problematic because many weaned pigs become infected shortly after weaning (Cuatero et al., 2002). They are therefore sick at a critical time, when they are adapting to different feeds in a new environment, and are often required to respond effectively to vaccines for PCV-2 and *M. hyopneumoniae*. PRRSv infection causes typical clinical signs of failure-to-thrive, respiratory signs, and elevated mortality. PRRSv can ‘potentiate’ co-pathogen infections; for example, *Streptococcus suis* type-II mortality has been reported as five time higher in PRRSv-positive pigs relative to PRRSv-negative (Feng et al., 2001). The cost of PRRSv infection in the nursery was calculated to be $6.01 per pig based on reduced feed efficiency, decreased gain, and increased mortality (Johnson et al., 2004).

The key to controlling nursery PRRSv infection is PRRSv control and eradication in the sow herd. Eradication has been repeatedly achieved through the process of herd closure in the sow herd, although other techniques also can be employed (Corzo, 2010). Once the flow of weaned pigs is verified to be 100% PRRSv-free, the infection can often be eradicated from the nursery through complete depopulation and thorough cleaning, washing, disinfecting and drying.

If PRRSv eradication is not possible in the nursery (e.g. a large continuous flow nursery) the goal should be to increase the age at which piglets become infected after weaning. Older pigs clear PRRSv infection more quickly than younger pigs (Klinge et al., 2009).
2. PROVIDE OPTIMAL RESOURCES TO THE WEANED PIG

Floor space allowance

Allowing adequate space means that if we keep pigs in a nursery up to 25kg body weight then 2.85-3.0 square feet is ideal. If raising pigs into the 30kg range then target at least 3.0 square feet, and maybe closer to 3.5 square feet. This will depend on the housing cost and the farm’s measurement of improved performance of the pig. Leaving pigs in nurseries to a heavier weight can be hard on the hardware of the nursery (especially plastic flooring), but if exit weights can be managed to allow ‘All-In, All-Out’ pig flow, this is the best way to manage flow and segregation between groups of pigs.

Thermal environment

It should be noted that the optimal temperature for different groups of weaned pigs ranges from a low of 22.9ºC to a high of 29.8ºC depending on age and size. Reduction of temperature can begin after 2-3 days after weaning, and after three weeks into the nursery period, begin to lower (slightly) on a daily basis until the pigs leave the nursery. If we lower the temperature but keep the pig comfortable we will be able to provide the conditions for optimum feed intake. Many current recommendations tend to keep our nurseries slightly warmer than necessary, resulting in lowered feed intakes and poorer growth. In studies, piglets preferred cooler temperatures at night. Between 10:00 pm and 6:00 am, piglets selected temperatures that were about 3ºC to 4ºC lower than during the daytime. A larger daily temperature variation is undesirable.

3. PROVIDE THE STOCKMANSHIP TO GIVE WEANED PIGS A GOOD START

While environmental management and proper nutrition are critical to success in the nursery, piglet management is the most important of all. Following is an abbreviated list of key management practices to achieve success in weaned piglet management:

- The room, including all equipment, must be thoroughly cleaned and disinfected. This includes fans and blades, air inlets, feeders, penning and flooring. Any attention paid to proper cleaning is likely to pay significant dividends in piglet performance and health after placement.
- Prior to arrival, the room air and all equipment in the room should be warmed to receiving temperature. The recommended receiving temperature will depend on piglet size and initial feed intake, but an average of 28ºC is a reasonable starting point. Piglet behaviour will reveal if the temperature is too high or too low.
- Adjust the feeder gate so that about 40% of the feed tray is covered with feed. Anything less than this will impair pig performance, and greater coverage provides no benefit but increases the risk of wastage.
- Check all drinkers to ensure they are functioning correctly. If nipple drinkers are used, they should be adjusted so they are at shoulder height of the smallest pig in the pen. Additional waterers are recommended for pens with smaller pigs, to ensure dehydration does not occur.
- Pigs should be placed in pens according to bodyweight; this is not to improve uniformity of growth (because it will not!), but because it facilitates more effective feeding and water management. In other words, the pens of smaller piglets will probably require more attention than the pens of larger pigs.
By about 36 hours post-weaning, piglets not eating or drinking can generally be easily identified. The management of such pigs will depend on individual units, but hand feeding, offering ‘gruel’, or other personal attention will reduce mortality and “pulls.” If weaning has occurred on Thursday, unfortunately this critical time will fall on Friday night or Saturday morning, a time when labour could be in short supply. Nonetheless, this is the time when potential non-viable pigs can be turned into healthy productive animals.

4. DEVELOP AN OPTIMIZED NURSERY FEED BUDGET

It is critical to practice strict discipline when using a feed budget, to prevent overfeeding of the more expensive nursery diets past the desired weight range. Often this is the cause of high feed costs in the nursery. However, limiting piglets of complex diets in the first 2 weeks can also affect end financial numbers.

Switch from complex to simple diets as quick as possible

Diet formulation for feeding weaned pigs should be designed with certain key considerations in mind:

- Feed intake drives growth performance.
- Complex diets with specialty ingredients are beneficial during the first few weeks after weaning, because they increase feed intake.
- Diet complexity must be reduced rapidly as feed intake increases, and economic benefit declines rapidly.

Feed budget

The following 3 weight ranges are the most typical with a fourth diet being either added or splitting up the 11-25 kg range, depending on the days in nursery and desired pig weight:

1. WEANING TO 7 KG: An effective nursery feed program aims to transition pigs to a low cost, corn-soybean meal-based diet as quickly as possible after weaning, without sacrificing growth performance regardless of the number of diet phases used. This stage is where the most attention should be paid to pig weight and amount of phase to reach goals. With variance from pen to pen and week to week, both over and under feeding at this time are major contributors to poor financial outcome!

2. 7 TO 11 KG: At this weight, the diet is typically a corn-soybean meal based diet with about 7% to 10% high-quality lactose, and a small amount of specialty protein source, such as plasma or high-quality fishmeal. Again, if a great job of assessing the first stage is done there is limited assessment needed here. However, if variance in pig weight is observed the budget should be observed to fit the end goal and weight range.

3. 11 TO 25 KG: This diet will be a simple corn-soybean meal diet with limited specialty protein products or lactose sources, resembling a grow-finish diet. The digestive capacity of pigs at this weight means that specialty products are unnecessary, and including them will only increase the feed cost per pig with limited benefits. This is the lowest-cost diet in the nursery program, but since consumption is the greatest at this stage, it accounts for
more than half of the total feed cost from weaning to 25 kg. Typically, 20 to 25 kg of feed is budgeted for pigs during this last phase.

Factors that can reduce the effectiveness of the feed budget

1. Weaning weight. There is a linear relationship between birth weights and wean weights, affecting nursery production. However, most farmers only have the wean weight so it is the most common predictor of nursery budget success. Make sure you are monitoring your wean weights regularly, to assure you are maximizing nursery performance and validating your program. If wean weights fluctuate so should your nursery budget, to maximize your program.

2. Water and Feed availability. Limiting water or feed will always affect your budget. Water will affect feed intake and is easy to measure if limiting. The best way to know if feed intake is being obstructed is to manage feeders and measure average daily feed intake. 650g per day is very attainable, if the conditions are right.

3. Environment. Air quality, flow and temperature play a major role in the effectiveness of your budget. If the room is cold, efficiency will go down, and if the room is hot, efficiency will go down. Environment must be assessed daily to assure the optimum is achievable.

4. Management. Pigs that need extra care and assessing disease are crucial to knowing if the budget is going to fail or succeed. The faster we can get on this the better chance we have of reaching our nursery budget goals.

5. Measuring. Once water, feed allowance, management and environment are assessed, measuring is going to be the key to objectively following a budget. In many cases early diets are very easy to manage due to low amounts needed. Wean weight is probably the largest teller of success or not in the nursery. This means that we should be always assessing our budget to wean weight. Ideally, each phase should be monitored to assure weight ranges are being achieved. If not, every crop or room can be measured, then make sure you get some quarterly numbers or verify your data every time a change is made to medications and ingredients.

If simple measurements such as weight in, weight out, avg. daily gain, feed conversion and cost per kg of gain are not regularly being assessed, there is no real way of knowing if your budget is working. Nursery programs can vary $5 per pig and go unnoticed, unless you combine measurements with management, feed, water and environment, they all can be fairly limiting in what they tell you.

5. CONTROL OTHER COMMON NURSERY PATHOGENS

Clinical signs for a great variety of diseases may be seen in the nursery because this period occurs at the intersection of two biological processes: 1) decrease in maternally-derived immunity in weaned pigs, and 2) increase in contact rate and pathogen transmission between pigs after weaning. Some common diseases are due to infections with *Streptococcus suis*, *Haemophilus parasuis*, influenza A, and enterotoxigenic *E. coli*. These diseases are not generally regarded as ‘major’ contributors to poor productivity (Holtkamp, 2008) and can often be limited to an increase in 1.0-1.5% per pathogen when present without co-pathogens (Holtkamp et al., 2007). However, occasional severe outbreaks of disease do occur, and
medication programs designed to control these pathogens add to cost. Several of the pathogens (e.g. influenza A) have zoonotic potential as well, causing concern for occupational health and safety for farm workers.

Control of the ‘minor’ pathogens can be attained by various means such as: 1) vaccination of sows for pathogens such as influenza A and Haemophilus parasuis (Baumann, 2002) 2) medication programs 3) nursery depopulation.

6. SET UP THE FINISHING BARN TO SUCCESSFULLY RECEIVE NEW FEEDER PIGS

Make sure:

- The controller is reset to meet minimum ventilation requirements.
- Pig temperature requirements are determined based on size and health.
- All fans are clean and completely operational.
- All building curtains are functional, level and without holes.
- The curtain drops are fully operational.
- All air inlets are working, clean and open.
- The heaters are set correctly on the controller and prepared to operate.
- Backup thermometers are reset to meet new group needs.
- Soffit attic inlets are clean and open.
- Alarms are set and tested.

The critical component to early finishing barn management is that a ventilation plan is reviewed and the barn is set up correctly to meet the immediate needs of the incoming group. To test the equipment grab a temperature probe and hold it in your hand for one minute. The change in temperature should increase fan speeds and different stages coming on and inlets or curtains responding. Arrival time is a critical stress point in the life of a pig. Waiting to correct ventilation settings after the group has been placed in the finishing barn for several days can have serious consequences.

During the downtime between finishing groups, when the barn is being washed, cleaned and disinfected, make sure the water lines and nipples get cleaned with chlorine and rinsed out. Prior to pigs arriving, each individual water nipple should be checked for flow. Flow rate is critical as it affects the pigs' ability to consume the correct amount of water each day.

Any moist surface is a candidate for bacteria and viruses to persist and infect the next set of pigs: get the barn dry!

It sounds like such a simple statement that pigs need feed in order to grow, but it is common to see empty feeders when walking finishing barns. In today’s production systems, since many finishing barns are not on the “home farm,” it is not as easy to hear the feed system running empty. ‘Out of Feed’ situations must be avoided at all times because of the negative impact on health and productivity.

7. CONTROL LATE FINISHING COMPLEX RESPIRATORY DISEASE

Many groups of finisher pigs experience what we have called the “20-week wall”, a severe clinical outbreak of respiratory disease occurring shortly before pigs attain market weight. This
occurs at the peak time in pig density and as a result of multiple pathogens reaching high prevalence within the group. The most common primary pathogen is PRRSv. Contribution to complex respiratory disease is part of the estimated $7.67 cost of PRRSv infection in the finisher (Johnson et al., 2004). A Quebec study found PRRSv in 95% of lungs with severe pneumonia at slaughter (Drolet et al., 2003)

Other major pathogens that contribute to complex respiratory disease include influenza A, Mycoplasma and PCV-2. Vaccination programs must be properly designed and diligently followed to prevent these infections. Properly calibrated ventilation systems and appropriate pig density are both critically important in controlling finisher respiratory disease as well.

8. OPTIMIZE FINISHING BARN FEED BUDGETS

It is important to continuously monitor alternative ingredients and consider their possible use in diets. However, corn will likely be the major ingredient in swine diets. If we look at higher feed costs, as a whole, anything to improve feed efficiency can help maintain or improve profitability.

Feed conversion during the grower and finisher period is a key factor to monitor. This is the period of the animal’s life when the majority of feed is consumed. The efficiency of feed utilization can be dramatically influenced by factors such as; feed wastage, nutrient levels in diets, feed budgets, diet form (pellet or mash) and other environmental factors.

Why budget for finishing hogs?

Feed budgeting in the finishing barn allows you to accurately feed to the daily required energy level, which is needed to maximize gains economically. As the animal grows, the feed intake increases, and as the intake increases, a lesser concentration of energy is needed to maximize gains. Budgeting allows you to minimize over- and under-feeding pigs, therefore allowing you to feed the pig more economically.

Both your genetics supplier and nutrition team should be consulted when a budget is being set up, and should have input about what potential savings would be realized if phases were added, taken away, or weight ranges moved up or down.

Trials in finishing pigs show that the first 28 days have the greatest effect on different feed budgets. This coincides very similarly to feeding nursery pigs; the better start you get in the first 2 stages, the more efficient the pigs will be in later stages.

Feeder wastage and management are the most critical factors in feed:gain ratios, but other factors that must be taken into consideration are: environment, diet form (pellet vs. mash) and nutrient levels. Feed budgets are part of this equation to monitor. Like the nursery, all of the above must be observed to make any true assessment of your feed program. The correct diets may be fed, but if we are using feed budgets we need to be sure we are feeding the appropriate budget for the appropriate stage of production. There are many metrics to observe in the finishing pig (average daily gain, feed:gain ratio, feed cost per kg gain). Table 1 shows the economic effects of feed:gain ratio for different ration costs.

Grower-finisher feeds represent the largest share of feed cost in a farrow-to-finish operation. Therefore, decisions to change or modify finishing diets must be made based on economics. Modern production systems have resulted in large groups of similar age and weight pigs, which allow for more efficient feed deliveries, phase feeding, and split-sex feeding. Some simple tools
to allow farm specific diet formulation and feed budgeting are available, to more efficiently reduce feed cost and improve growth performance in the grower-finisher phase of production.

Table 1. Feed cost/pig (50 to 260 lb.) at various feed prices and feed:gain ratios.\(^1\)

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9. DO HIGH QUALITY DAILY CHORES

It is great to achieve good production closeout numbers for finishing: 2.6 feed conversion, 950 grams/day average daily gain and less than 2% mortality. But in order to brag about good production numbers, we must be able to continuously achieve them – and that requires excellent daily management. I often hear: “If you want me to get good finishing numbers, give me good pigs.” This is certainly a true statement. However, as this review will illustrate, there are many factors that can turn good pigs into average pigs by improper finishing management.

Walking the barns

To do high-quality daily chores, the producer must meet the individual needs of each pig in the barn on a daily basis. This includes feed, water, air and health management. The first and most important point to remember is – it is impossible to perform quality daily chores without being in the barn. Being in the finishing barn and focused on chores for a morning and an afternoon walk-through is critical. The morning walk-through is usually the more thorough, during which each individual pig should be carefully observed. The afternoon walk-through can be a quick visual observation to check for major problems in feed, water or ventilation areas.

Chores can be broken down into: observations at the barn level, the pen level, and the pig level.

At the barn level, it is important to step into the barn and spend a few seconds understanding what the barn is telling you. Let your observational skills go to work. What is the temperature? What is the humidity? Is the ventilation system working? Are the curtains operational? Is the feed system working? Are there abnormal noises? Are there abnormal smells?

At the pen level, be sure to check for individual items within the pen that affect pig production. Is there feed in the feeder? Is the feeder adjusted correctly? Is the water flow adequate? How are the pigs lying within the pen? Are pen floors wet? Is diarrhea present?

At the pig level, instead of seeing a sea of pigs, teach yourself to see every individual pig. It does not matter if there are 200 pigs or 2,000 pigs in the barn. Each pig must be observed. This

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process does not take long. When looking at each pig, note posture, position in the pen, respiration rate, attitude and even facial expression. If a pig is hurting it will show by how quick it can move or if they have a full stomach.

Initially, you think this process is going to take an unreasonable amount of time. However, I am quite confident that most individuals can walk a 1,000-head finishing barn, under normal disease conditions, and accomplish all of these evaluations in approximately one hour.

**Individual pig treatments**

Rate of success is much greater if sick animals are identified in the early stages of a disease. This is very intuitive, yet often not put into good barn practice. Early treatment of infectious disease can limit the spread of pathogens throughout the herd, and affect the disease level of the entire barn, not just the treated individuals. You can't find sick pigs early without looking at each pig every day.

A system of quality chores allows you to find the sick pig early, get a good individual treatment response, and have an impact on the overall disease experience in the barn by keeping pathogen levels below critical thresholds. I often hear: “It does no good to treat individual pigs because few recover.” To me, this comment should be translated into, “By the time I get the pig treated, it is too sick to get better!”

When seeking assistance from outside the barn have a policy that if there are multiple deaths in one day, or three days consecutive days of mortality, or increasing amount of individual treatments, then call someone (e.g. Farm Manager, System Manager, or Veterinarian).

**10. CONTROL GROWER DIARRHEA**

Thankfully, PCV-2 is no longer a common cause of grow-finish diarrhea. However, grower diarrhea continues to be a common syndrome observed in Ontario, and there are a few common culprits on the list of pathogens.

Ileitis caused by infection with *Lawsonia intracellularis* is very common and can be a significant profit-robber. Various recent papers from around the world have placed the cost of ileitis infection in the finisher in a remarkably similar window between $6.73-$8.92 per pig marketed (Morel Saives et al., 2008; Holyoake et al., 2010; Johnson and Lowe, 2008). Fortunately, control of *Lawsonia* can be reliably attained through use of feed medications or a commercially available modified-live vaccine.

Salmonella infection occurs with regularity in Ontario finishers and some risk factors, such as the use of pelleted feeds, are hard to avoid. Outbreaks of disease due to Salmonella are infrequent, but can contribute very significantly to mortality when they do occur. Sudden changes in grow-finish diarrhea prevalence or appearance should be promptly investigated with the herd veterinarian.

Finally, swine dysentery due to *Brachyspira hyodysenteriae* is making a comeback as a cause of grower diarrhea in western Canada and the Midwest. The clinical signs of this agent often include bloody diarrhea. Good biosecurity diligence is required by Ontario producers to keep this pathogen out of our farms, for it is has a very negative impact on productivity. A recent US system reported that dysentery-affected batches were 20 times more likely to be in the poorest
quartile for mortality, gain, feed efficiency and culls when compared to dysentery-negative batches (Harms, 2011)

LITERATURE CITED


