



## **"Paylean®: The Facts, Feeding and Influences on Performance"** **Tom Guthrie, MSU Swine AoE Agent, Jackson, MI**

### **Introduction**

Paylean® is the commercial name for ractopamine hydrochloride, a product of Elanco Animal Health. Ractopamine was approved for use in finishing swine diets on December 22, 1999 by the Food and Drug Administration (FDA). Paylean® is most likely one of the most talked about feed additives in the swine industry. However, there appears to be confusion and misconception on what Paylean® really is or how Paylean® actually functions. It is also apparent that there are many differing opinions on dosage regimens of ractopamine and handling pigs that have been fed ractopamine. In this article, I will attempt to address these issues.

*Bottom Line:* There are many differing opinions and plenty of confusion regarding this feed additive.

### **Ractopamine – What is it?**

Contrary to popular belief, Paylean® is NOT A HORMONE, STEROID OR ANTIBIOTIC. Ractopamine is scientifically classified as a member of a family of compounds called Phenethanolamines. Phenethanolamines such as ractopamine are chemical compounds that have beta-adrenergic agonist properties.

*Bottom Line:* Some may be under the impression

that Paylean® is magic dust that makes an average animal into an ideal animal. In reality, Paylean® may be viewed as a management tool that has the potential to enhance the genetic potential of pigs. There is no substitute for quality genetics and proper management.

### **Mode of Action**

Essentially, beta-agonists such as ractopamine stimulates beta receptors. In turn, these beta-receptors are responsible for a variety of functions throughout the sympathetic nervous system (Nelson and Cox, 2000). Ractopamine appears to work by stimulating these beta-receptors to increase nitrogen retention, which increases muscle mass (Anderson et al., 1987). Phenethanolamines such as ractopamine may speed up the rate in which fat cells are degraded and made available for energy as well as a decrease in the rate in which fat is deposited. This makes nutrients more available in the nutrient pool (Anderson et al., 1991). These nutrients then can be used for protein synthesis and muscle growth, creating less energy available for deposition of adipose tissue, resulting in improved leanness. Therefore, ractopamine acts as a repartitioning agent that directly affects the flow of nutrients from fat deposits to muscle accretion, in turn promoting lean tissue deposition (Watkins et al, 1990; Bergen et al., 1989).

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**Bottom Line:** Ractopamine acts as a repartitioning agent that directly affects the flow of nutrients from fat deposits to muscle accretion, in turn promoting lean tissue deposition.

### **Feeding Paylean®**

- Paylean can be fed from 4.5 to 18 grams/ton of complete feed.
- Paylean is labeled for use in pigs weighing from 150 to 240 lbs.
- Paylean should be fed in a diet containing at least 16% crude protein.
- Paylean does not require a withdrawal period prior to slaughter.
- Currently, no feed grade medications are approved to be fed in combination with Paylean®.
- Currently, Paylean® is not cleared for use in breeding animals.

**Bottom Line:** Extreme care should be taken to follow label directions completely ([www.elanco.com](http://www.elanco.com)).

### **Current Research Indications**

A majority of research involving feeding ractopamine was conducted prior to and throughout the 1990's. However, there continues to be a concentrated research interest in feeding ractopamine in an effort to expand previous knowledge. These concentrated efforts may be due to the changes in genetics and management practices within the swine industry.

**Bottom Line:** Changes within the swine industry have created further research interest regarding ractopamine.

### **Ractopamine Feeding Programs**

Currently, the preferred or recommended usage of ractopamine in a commercial setting is at the level of 4.5 to 9 grams/ton for the last four weeks of the finishing period. However, See et al. (2004) reported more consistent and desirable improvements when implementing a step-up (4.5 g/ton, wk 1 to 2; 9 g/ton, wk 3 to 4; 18 g/ton, wk 5 to 6) or constant (10.6 gm/ton, wk 1 to 6) feeding

regimen of ractopamine compared to the implementation of a step-down (18 g/ton, wk 1 to 2; 9 g/ton, wk 3 to 4; 4.5 g/ton, wk 5 to 6) feeding regimen.

Apple et al. (2004) indicated that 3.30 Mcal/kg of metabolizable energy (as-fed basis) is sufficient energy for optimal ADG, gain:feed, and lean tissue deposition in pigs fed ractopamine at the level of 9 grams/ton. In comparison, the metabolizable energy (ME) requirement of high-lean gain pigs during the finisher phase is 3.26 Mcal (NRC, 1998).

Carr et al. (2005) compared the effects of different cereal grains (corn, wheat and barley) and ractopamine hydrochloride on performance with or without the addition of 9 grams/ton of ractopamine during the last 28 days of finishing. Pigs fed all three cereal-based diets responded to ractopamine with an average improvement in gain:feed ratio of 17.2%. The percentage improvement reported for corn was 24.2% , while wheat based diets improved 10.9% and barley based diets improved 17.2% for feed efficiency, respectively (Carr et al., 2005). Data was separated into three time periods, pigs being fed ractopamine for 0 to 14 days; 14 to 28 days and overall from 0 to 28 days. Results indicated pigs fed ractopamine had numerically higher ADG for all three time periods compared to those pigs that were receiving diets containing no ractopamine (Carr et al. 2005).

Stoller et al., 2003 compared three diverse genetic lines (Berkshire, Duroc and high-lean commercial crossbreds) and reported that adding ractopamine to swine diets at the rate of 9 grams/ton when fed for the last 28 days to target a weight of 240 lbs., improved growth performance and carcass muscularity without affecting meat quality traits associated with visual, instrumental, and sensory attributes of pork.

The previous research trials are just a few examples of the many aspects of feeding ractopamine that have sparked research investigation.

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Bottom Line: Further research is necessary to determine an optimal ractopamine feeding regimen.

### *Behavior and Handling*

In a study comparing pigs fed ractopamine at the level of 9 grams/ton compared to pigs receiving no ractopamine, pigs receiving ractopamine were more difficult to handle and had elevated heart rates compared to pigs receiving no ractopamine (Marchant-Forde et al., 2003). Ractopamine fed pigs took 136% longer to remove from their home pen, 83% longer to handle into the weighing scale and needed 52% more pats, slaps, or pushes from the handler to enter the scales (Marchant-Forde et al., 2003). Therefore, as stated by Marchant-Forde and coworkers (2003) pigs that are more difficult to move are more likely to be subjected to rough handling and increased stress during transportation. However, as far as production is concerned, pigs that were fed ractopamine in this study had higher an average daily gain (ADG) and gain:feed ratios, and heavier hot carcass weights at slaughter than those pigs receiving no ractopamine.

Bottom Line: This study indicates that when handling pigs that have been fed ractopamine, a little patience and extra care may be required.

### **Implications**

Regardless of opinion, a multitude of research documentation reveals enhanced growth performance, efficiency and carcass characteristics associated with the feeding of ractopamine. However, this does not imply that Paylean® is appropriate for every respective situation. In conclusion, if or when evaluating the possibility of using Paylean® in your respective feeding program, careful evaluation of many factors should be taken into consideration such as management practices, genetic potential of your animals, handling methods, economics, desired carcass composition, and marketing scenarios. The consideration and evaluation of these factors and possibly many others will aid in determining if Paylean® will benefit your respective feeding program based upon your specified production goals.

Bottom Line: Everyone is entitled to their own opinion and decision making process. Therefore, it is absolutely crucial to evaluate your respective situation thoroughly which will aid in making a solid, informed decision regarding use of Paylean in finishing rations.

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### **"Hospital Corner: Lumps on Pigs"**

**Barbara Straw, DVM, Ph.D., Extension Swine Veterinarian,  
Michigan State University**

These pictures depict various questions that I receive regarding "lumps" found on pigs of various sizes and ages. Lumps are typically, abscesses, hygromas or pockets of blood.

#### **ABSCESSSES**



Distinct lumps the size of walnuts to oranges under the skin are usually abscesses. Typically they occur at sites where injections were given or areas that are damaged when pigs fight, such as the neck, ears, tail and vulva.

#### **HYGROMAS**



Lumps or swellings that occur over joints should not be disturbed. Often they are harmless hygromas. Inserting a needle into the swelling may introduce bacteria into the area and produce an infection. If the swelling is due to infection in the joint, trying to aspirate a sample will make the condition worse. Lumps at joints should be left alone.

These pictures with the short descriptions that follow may help pork producers better communicate with their veterinarian regarding what treatments may best be suited for these conditions.

#### **POCKETS OF BLOOD**



Occasionally a sharp blow will rupture a blood vessel and cause a pocket of the blood to accumulate just below the skin. When pigs were being placed in pens, the pig in this picture was dropped on its rump and a large blood vessel was damaged. The vessel bled until a large pocket of blood collected under the skin.

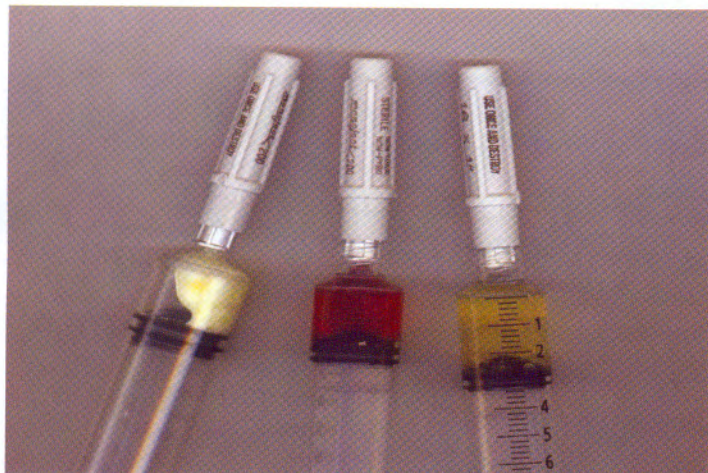
#### **Diagnosing a Lump**



If there is doubt about whether a lump is an abscess, it can be checked by drawing off some of the contents and examining the material. Use a 16 gauge needle attached to a 10 cc syringe. Insert it about 1/2 inch at the lowest, softest point of the swelling and withdraw fluid from the lump.

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If the material is a watery to cheesy consistency, and white to yellow to green in color, like the material in the syringe on the left, it is an abscess. Clear fluid that is red or yellow in color like the syringes in the middle and on the right is blood. This is because occasionally a sharp blow will rupture a blood vessel and cause a pocket of blood to accumulate just below the skin. If it is very fresh the fluid withdrawn will be red blood. In old pockets of blood the red cells will have clotted into a clump that is surrounded by serum or a clear yellow fluid. Withdrawal of red or clear yellow fluid indicates a blood pocket. Blood pockets do not require any treatment and will resolve on their own.

### Treating an Abscess

Abscesses contain bacteria and white blood cells which appear as pus. To prevent the infection from spreading to other areas the body builds a wall of fibrous scar tissue around the infection. This is effective in containing the abscess but the wall of scar tissue acts as a barrier to antibiotics so that antibiotics provided by injection are not able to reach the site of the infection. Also the thick fibrous capsule around the abscess isolates the rotten material in the center of the abscess so that the normal tissue regeneration processes are delayed. To speed healing the abscess should be lanced and the decaying material flushed out.



Restrain the pig - usually with a hog snare. Use a new scalpel blade so that it is very sharp. Insert the blade its full depth into the softest, lowest point of the abscess and make an upward cut so that you open up about 2/3 of the length of the lump. After the abscess is incised, press out much of the material inside. Then use povidone iodine to flush out the abscess capsule.

If the edges of the abscess are red and inflamed, give the pig procaine penicillin intramuscularly at a dose of 1 ml/25 lbs. You will need to get a prescription from your veterinarian to use this dose, and your veterinarian will provide a longer withdrawal time than described on the label. The pig does not need to be moved to the hospital pen, but make sure that you have recorded the treatment so that no pigs will be marketed from that pen before the withdrawal time is up.

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**“TOP TEN List”**  
**Dale W Rozeboom, MSU, Extension Swine Specialist**

If asked, “What do you think are the “TOP TEN” realities for the pork industry in the near future?” What would your answer be?

Many of you are familiar with David Letterman and his “TOP TEN” lists. Well this past fall, I asked students in my Advanced Swine Management class to answer this question, and develop their personal “TOP TEN” list as the last exam in the semester. I thought you might be interested in knowing how these young people answered. Here is a summary of the realities and rankings. More than one number reflects the different ranking by different students.

Ranking (s)	Reality
10	Enrollment in swine production classes nationally will decrease in post-secondary education.
10	Anti-meat sentiment will continue.
10	Individually-wrapped, pre-lubricated AI catheters will become more popular.
8	Small hog producers may want to consider raising dairy cattle instead of swine. According to the University of Minnesota (Hachfeld, 2003), a family could make the same living (\$51,794 per year) with 125 dairy cows in production or by raising 12,300 finishing hogs under contract
8	Animal identification will become mandatory in the near future.
8	Knowledge of the swine genome will become more beneficial.
7	People’s attitude about meat consumption has changed and they do not view meat as a hindrance to weight loss and good health.
7	Greater emphasis will be placed on meat quality, with greater penalty for PSE.
7, 9	Production will be increasingly influenced by urbanization and rural urbanites.
6	Pork has become too lean and some fat must be reintroduced.
6, 8	Auto-sort barns will grow in popularity, making it the “technology of the year.”
6	U.S. producers will continue to move operations overseas.
5, 9, 10	Other countries will become more competitive with the U.S., in particular Brazil.
5, 5, 9, 10	Small farmers will have to rely on niche markets to stay in business, or will be getting out.
5, 7	Loss of the Pork Checkoff would be detrimental to the industry.

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4	The pork industry will be negatively affected by the price of fuel.
4	Financial institutions must make it easier for young farmers to borrow money.
3	Sow longevity is a serious problem that must be addressed for welfare reasons.
3, 6	Pork exports must continue to grow; otherwise prices will fall in the U.S. We will become increasingly dependent on exporting.
3, 9, 10	Consumers will drive pork industry to adopt animal welfare approved production practices. The gestation crate may be outlawed in a few years.
2, 6	Cheap feed will keep even the marginal producer in business.
1, 2, 5, 2, 3	Air, water, and land quality will require more regulations.
1, 3, 4	The trade dispute with Canada will influence business greatly. The U.S. may regret having put the Canadian pork tariff in place.
1, 1, 2, 7, 8	The industry will become more consolidated and vertically-integrated.
1	Young people will make connections with established producers in order find a way to enter the pork business.

As David Letterman would say, “So there you have them folks. Your TOP TEN list of what the future of the pork industry will be, as seen through the eyes of soon-to-be college graduates.”

The very last requirement I made of students in my class was that each student had to defend their “TOP TEN” list before the rest of the class. It was great! I really enjoyed their enthusiasm for their convictions.

I think it is most exciting that we have young people attending and graduating from MSU that want to be part of pork production and greater agriculture. They are thinking seriously about the industry and searching for solutions to be ahead of the changes. It has been my pleasure to take these students on farm visits and introduce them to producers. It is important that young people like these get to know Michigan producers. As one student listed as his #1, young people will try to get started in the pork industry if they make connections to people already in the industry, who may be willing to help them get in too.

### **“Closed Breeding Systems”**

**Ronald O. Bates, State Swine Specialist, Michigan State University**

During the past few years, there has been more discussion on closing commercial herds to outside introduction of animals, primarily breeding stock. This issue has been driven by attempts to reduce or eliminate the impact of PRRS outbreaks in breeding herds. By closing the herd to outside introductions of animals and closely monitoring boar studs which supply semen, in a majority of cases, the impact of

PRRS can be mitigated and in some cases PRRS can be eliminated.

However, closing commercial herds dramatically reduces the options herd owners and managers have regarding what commercial breeding system can be implemented. In a by-gone era, the only

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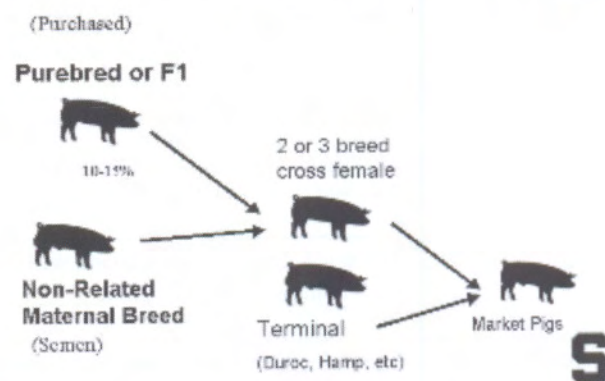
introduction of outside animals was boars to maintain a rotational breeding program and gilts were selected from animals raised on the farm. However, as technology has advanced more emphasis has been placed on the implementation of breeding programs that capitalize on the usage of crossbreeding systems that utilize specialized performance of maternal and terminal lines and breeds in specific crossing systems. This led to the routine and systematic introduction of outside breeding stock so to minimize a commercial farm's need to develop specialized crosses. However, the routine introduction of animals from outside herds has increased the risk of introduction of disease.

To improve overall herd health and reduce the exposure and impact of diseases like PRRS, farms have implemented a variety of strategies to reduce their health risk. Some farms have changed either their genetic source or animal introduction strategy but maintained their breeding program with regular introductions of outside animals. This is a viable solution as long as the disease monitoring system and biosecurity protocols don't allow infection to come into the swine farm. Other farms have changed breeding systems to reduce or eliminate the introduction of outside animals. This has caused them to implement a Grandparent, Great Grandparent or a Rotaterminal system to reduce or eliminate animal introductions. This article will discuss these three systems along with the author's thoughts on implementation.

**Grandparent (GP) Systems.** Grandparent systems are programs that require routine introductions of small numbers of females to produce parent females for the herd. Typically these females are either pure or  $F_1$  females. These females are bred to a maternal boar of another breed and their female offspring are bred to terminal boars for market pig production. A schematic representation is provided in Figure 1. Typically grandparent females make up approximately 10% of the herd but can vary from 7.5 to 15%, depending on productivity, durability etc. Even though a commercial herd is still routinely bringing in outside animals, due to

the smaller number needed to maintain this system, there is more control on introduction strategies to reduce health risk. This can be done through longer isolation periods, introducing weaned pigs or feeder pigs.

**Figure 1. Grandparent Breeding Systems**



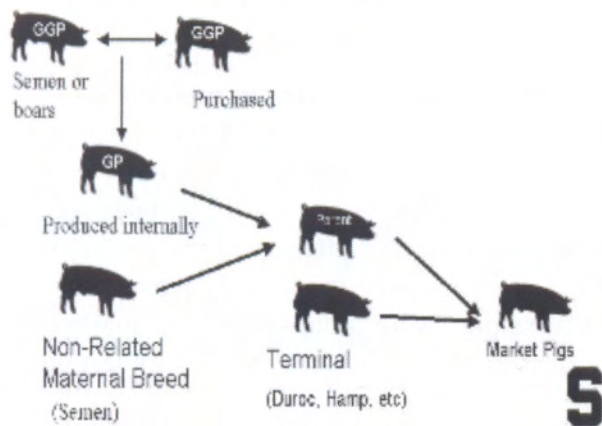
**Grandparent System Implementation.** This system does increase the management attention needed for the breeding herd. Grandparent females must be correctly identified and managed accordingly. These GP females may need to be managed somewhat differently than parent females, particularly regarding their nutrient needs. In addition GP females must be mated with the correct breed of boar or semen. This can cause confusion on some farms that are not used to matching semen to particular sows. However, there are many different ways this confusion can be reduced. Some farms will have Grandparent females with different color ear tags to easily distinguish them from the parent females. Others will have a different numbering system. In an effort to reduce confusion when mating sows, farms will have the maternal semen color-coded so to reduce any confusion about what semen should be bred to which sows. A further difficulty is internal tracking of farm produced replacement females. Females produced from grandparent sows must be identified at birth. A simple ear notching system can be effective and stays with the pig throughout its life. However, if these pigs are not identified at birth they will be “lost” within the system.

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**Great Grandparent (GGP) System.** This system is similar to the Grandparent system in that there is still a need to introduce outside animals. In a Great Grandparent system, the farm must produce Grandparent and Parent females. For example, a farm would introduce pure animals to produce either Grandparent pure animals or Grandparent F<sub>1</sub> females. The grandparent females would be mated to produce parent females. A GGP system requires that 2-3% of all sows (parent, grandparent and great grandparent females) be great grandparent females. Figure 2 is a schematic of this system. This system reduces health risk since a much smaller percentage of animals from outside sources are needed. All boar needs can be met through semen. The farm has a larger control over health risk.

**Figure 2. Great Grandparent Breeding System**



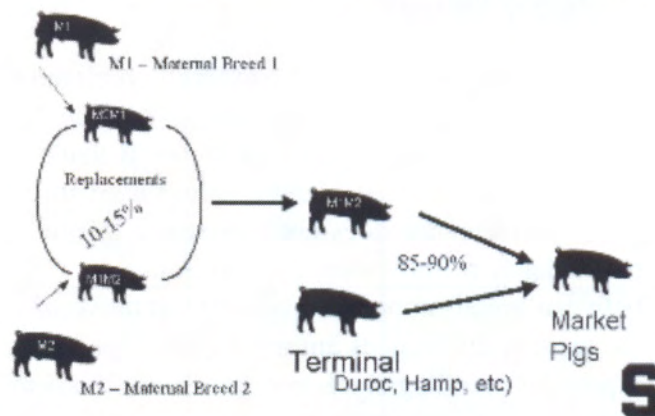
## Great Grandparent (GGP) System

**Implementation.** The management requirements are much greater for this system than for the GP system. GGP and GP females may have different management and nutritional needs than parent females. In addition, boar or semen needs for GGP and GP females will be different. If parent females are at the same location as GGP and GP females there will be a need to distinguish between two different maternal sources of semen or boars along with terminal semen or boars. The GGP

sows will be producing GP females. These GP gilts will need to distinguishable from the parent gilts produced from the GP sows if they are raised on the same farm. This system does fit well to a multi-site program within a production system so that different females are produced at different sites. However, it can be done within one site if appropriate management oversight is in place. Another option available for this system is that, depending on the GGP female used (pure or cross), the production system can be completely closed to outside introduction of breeding stock. All genetic introductions can be through semen, which can greatly reduce disease risk.

**Rota-Terminal (R-T) System.** This system is a hybrid system that combines elements from the GGP and GP systems along with elements from rotational systems. This system can be effectively run through no introduction of outside animals. This crossbreeding program allows for a maternal rotation to be conducted within a small portion of the sows herd (approximately 10%) with the bulk of the sows mated to terminal semen. Figure 3 is a schematic of this system. This system can greatly reduce a farm's health risk by eliminating the need to introduce outside females. Semen can come from farm based studs or third-party boar studs. If boars are introduced to the farm, the health monitoring and isolation protocol can be developed to dramatically reduce health risk.

**Figure 3. Rota-terminal Breeding System**



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### **Rota-Terminal (R-T) System Implementation.**

To effectively conduct this program either semen or boars for each maternal breed represented may need to be available during each breeding period (i.e. weekly, bi-weekly, monthly etc) along with terminal semen or boars. For example if the maternal rotation is a two breed rotation (e.g. Yorkshire and Landrace) females that were sired by Yorkshire boars will need to be bred Landrace and females that were sired by Landrace boars will need to be bred Yorkshire. This system does also differ from the GGP and GP systems in that sows that produce parent females can and do change. For example, a gilt may not be used to produce replacement females in her first litter but may later in her lifetime. There must be a system in place within the farm to identify which females will be mated to produce replacement females. This has been done in a variety of ways. Some farms use historic records and those females that have been high producers, using various record systems, are mated to produce replacement females. Other farms use return to estrus as a criteria for replacement gilt production. Females that have weaned a normal litter and return to estrus first are mated to produce replacement females. The R-T system does require more thought about which females will be mated for replacement gilt production. Replacement gilts produced must be identified so to track them through the finishing system. Like the GGP system, gilts from the different sire breeds used in the maternal rotation must be identified so to distinguish which breed of sire was their sire.

**System Comparisons.** The author completed a simulation to determine profit per sow for each of these systems. Animal performance is that listed in Table 1. The absolute values used for breed performance does not represent any one particular herd; however, the differences between breeds appears to be representative of the present differences among breeds. Genetic inputs for breeding stock and semen are listed in Table 2. All boar needs were met with

purchased semen. Pure females were simulated to have 1.9 litters per sow per year while  $F_1$  females were simulated to have 2.2 litters per sow per year. The financial analysis was completed using the MSUE Swine Budgets for farrow-to-finish production. The following is a description of that simulation.

**GGP:** The GGP system simulated maintained purebred Yorkshire females as both the GGP and GP females while a Yorkshire-Landrace  $F_1$  was the parent female. In the GGP scenario, GGP females were purchased and comprised 2.2% of the herd, GP females were produced internally and comprised 15% of the herd. Parent females were 82.5% of the herd. Parent females were mated to Duroc boars.

**GP:** The GP system purchased purebred Yorkshire females and these females comprised 15% of the herd. The GP females were mated to Landrace semen and produced Yorkshire-Landrace  $F_1$  parent gilts. Parent gilts were bred to Duroc semen.

**R-T:** The Rota-terminal program used a Yorkshire, Landrace two-breed rotation to produce replacement females. Maternal matings made up 15% of the total matings. Duroc semen was used as terminal semen. R-T females were simulated to have 2.2 litters per sow per year but had 0.3 less pigs per litter than  $F_1$  females. Backcross pigs were 5 days slower to market and 1.5% less percent lean than pigs with a terminal sire.

**Results.** In Table 3 are calculated estimates of gross profit per sow per year by system along with calculated genetic input costs per sow per year. As expected the grandparent system had the highest estimated gross profit per sow per year with the Rota-terminal system having the lowest. The GP system had the highest genetic input costs with the R-T system having the lowest. Subtracting the Genetic Input costs from gross profit per sow per year, changed the profit per sow rankings. The GGP system had the highest profit per sow with the R-T system becoming a close second.

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**Conclusions and Final Thoughts.** Simulation results are based on the assumptions that are used to construct them. Using breeds or lines with differing performance measures than what was used here could change the outcome. Before considering making a breeding program change you should work with someone that can complete this type of analysis to assist you in your decision-making. However, this scenario does show that R-T systems can be competitive and provides an option to completing closing your herd to outside introductions of breeding stock. If this provides the herd owner a viable option to reduce or eliminate a disease problem then it should be considered. There are estimates within the industry that suggest that a PRRS outbreak can cost \$5-\$10 per pig marketed. On a per litter basis, diminishing the impact of a disease like PRRS would overcome the lost profit potential of using a GP or GGP crossbreeding system. It should be again stated that a GGP system can be completely closed and would have the same disease mitigating features as a R-T system.

These systems can be further refined to include usage of Estimated Breeding Values (EBVs) or Expected Progeny Deviations (EPDs) in selection of purchased animals or semen. By better understanding these estimates of genetic merit, herd owners and managers can have more control over herd improvement over time. Using animals that rank within the top 10-25% of the line or breed can have dramatic impact

on herd performance compared to herds using animals that rank within the top 25-50% of the line or breed.

The author is often asked about what seedstock sources should be considered by commercial producers. There are many good seedstock options within the U.S. Some are national or multi-national in their structure while others serve a regional customer base. Regardless of size, a seedstock supplier should have the lines or breeds that you believe would best fit your farm business and marketing options. In addition they should have a genetic improvement program that yields documental genetic change and be able to provide that for you. A seedstock supplier should also be able to provide references on how their specific lines and crosses perform within commercial farms and slaughter markets. Furthermore, the health program and health level of multiplication farms and boar studs should meet your needs and expectations at the volume of animals that you need. There are several good national and multi-national breeding stock companies that meet these criteria within the U.S. In addition there are regional companies, which include traditional purebred sources that also meet these criteria. Too often regional and traditional purebred sources are eliminated from consideration because they do not have a national or international presence. However, these regional or traditional purebred sources often have industry competitive pigs and should be considered during an objective evaluation of possible seedstock sources.

**Table 1. Assumptions for Crossbreeding System Comparison**

	<b>Individual Heterosis (%)</b>	<b>Maternal Heterosis (%)</b>	<b>Yorkshire</b>	<b>Landrace</b>	<b>Duroc</b>
<b>Number Born Alive</b>	1.0	4.7	11.1	10.75	—
<b>Litter size at 21 days</b>	8.0	8.7	9.4	9.2	
<b>Postweaning Feed/Gain</b>	2.3	0.0	3.0	3.0	2.95
<b>Days to Market</b>	-6.5	-1.2	165	165	160
<b>Percent Lean</b>	0.0	0.0	Base	Base	3.0

(Continued on page 12)



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**All comments and  
suggestions  
should be directed to:**



**Table 2. Genetic Inputs for Crossbreeding Simulation**

Input	Price
Yorkshire Females (Used as GGP and GP females)	\$300
Maternal Semen	\$7.50 per dose over terminal semen

**Table 3. Profit Per Sow Per Year By System**

	Great Grandparent	Grandparent	Rota-terminal
Gross Profit Per Sow Per Year	264.68	272.83	253.38
Genetic Inputs per Sow Per Year	11.12	37.45	5.62
Net profit per Sow Per Year	253.56	235.39	247.46

## CORRECTION

In the MSU Quarterly Volume 9, Number 3, 2004 the article "Hog Outlook for 2005" was not written by the indicated authors. It was written by Dr. Ronald Plain, University of Missouri Agricultural Economist. We apologize for this error.