

**"Proper On-Farm Needle Handling Procedures"**  
*Gerald May, MSUE North Central Swine Agent, Ithaca*

One is too Many! The National Pork Board's campaign to eliminate broken needles from live hogs is a key component of the Pork Quality Assurance Program. During the MSU Extension PQA meetings in August, needle protocols were emphasized. Individual packers, realizing that one broken needle in a pork product is one too many, have instituted broken needle prevention programs of their own. Every farm should have a broken needle prevention program.

The key components of an on farm program to eliminate broken needles from live hogs according to the PQA Program are:

➤ **Prevention:**

Educate all employees, contract growers and family members on the proper use of needles. Be sure they understand how to choose the proper needle for each application and to change all needles based on use and cleanliness.

Retrieve all dropped needles. Dropped needles are vulnerable to being swallowed by pigs and then lodged in the esophagus.

**Never Straighten A Bent Needle.** Straightened needles will be weak at the hub. The next time in bends it will most likely break-off.

➤ **Identify at-risk animals:**

If a needle accidentally breaks off while giving an injection temporarily identify the animal. Next, restrain the animal and attempt to remove the needle. Most of the time a needle will break-off at the skin level. Restrain the hog and feel across the area of the injection. You should be able to feel the needle and then carefully remove it with a pair of needle nose pliers.

If you can't locate the needle and remove it, permanently identify the pig. All at-risk pigs must be permanently marked such that they may be followed through to slaughter.

➤ **Notify your packer of at-risk animals:**

Ask your packer what procedures you should follow when delivering an at-risk animal. Never deliver an at-risk animal without notifying the packer.

➤ **Communication:**

Communicate farm policy and procedures to all persons whose responsibility includes giving injections. Be sure they understand the need for prevention and the seriousness of maintaining identity of at-risk animals and notifying the responsible person.

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## Proper on Farm Disposal of Veterinary Wastes.

Used sharps (needles and sharp blades) after treating livestock are not considered a bio-hazard but should be treated with respect such that no one is injured while they are being stored or transferred to the landfill.



Store all sharps in plastic containers. Empty milk jugs are suitable, but small (about a gallon in size) hard plastic buckets are best. Clearly mark the container "Sharps - Animal Treatment" so everyone understands what is in the container. Cut a slot in the top of the container so that the sharp objects can be added without taking the top off. For added security,

as the container fills, take off the lid and add a thin layer of redi-mix concrete. When this container is full, all sharps will be incased in concrete, protected by a heavy plastic bucket. Seal the lid on the bucket with heavy tape and set it out with your normal trash pick-up.

All empty vaccine and antibiotic bottles should have the rubber stopper removed and be triple rinsed with tap water. Used disposable syringes should also be free of all liquids and have been rinsed clean. Rinsed bottles and clean syringes may then be placed with the regular trash pick-up.

Following proper used needle protocols protects farm employees, the environment and consumers.

## "Using Records to Investigate a Farrowing Rate Problem"

*Roy Kirkwood, DVM, Ph.D., Extension Swine Veterinarian, Michigan State University*

The maximum litter size is determined by the number of eggs ovulated during estrus (ovulation rate). The actual litter size produced is determined by how many of these eggs are fertilized (fertilization rate), and the proportion of fertilized eggs that survive to term (embryo and fetal survival). If fertilization rate is too low or very few embryos survive, the sows will return to estrus and farrowing rate will be reduced.

When farrowing rate is low, an examination of the records may give clues as to possible causes. It is necessary to determine when these bred sows are becoming non-pregnant. Returns to estrus can be early (< 18 days), regular (18 to 24 days and 38 to 45 days), irregular (25 to 37 days), or late (> 45 days). For simplicity, we usually refer to the regular returns as either 21-day or 42-day returns. Of the sows that return, very few (eg. 0 to 3%) should be early. The cause of early returns may be cystic ovaries. However, if there are many early returns, it is more likely to be an estrus detection problem. Sows returning early (eg. 12 to 15 days) may not be in estrus or, alternatively, they may be in estrus now but were not in estrus 12 to 15 days ago.

If a sow is in estrus when bred but then has a regular return, we consider this a failure of conception. In reality,

this may be due to a failure of fertilization or, possibly, a normal fertilization but then a total loss of the litter before about day 12 of pregnancy. The importance of day 12 is that about this time the embryos start sending signals to the sow that will prevent her returning to estrus. If the litter is lost before this signal for maternal recognition of pregnancy is sent, effectively the sow was not pregnant and a regular return occurs. However, if the embryos start sending the signal, pregnancy is confirmed. If the litter is lost thereafter, an irregular return will occur. If a sow has an irregular return, we consider this to be a failure of pregnancy. Irregular returns are usually the result of infection or some sort of stress. Causes of infection include poor breeding management. Stress will include fighting and the environment (eg. seasonal effects).

Regular returns due to failure of fertilization may be due to poor timing of breeding, with sperm being deposited more than 24 hours before ovulation, or after ovulation. Estrus detection management needs to be examined. Alternatively, the problem may be with the semen. With natural mating, semen problems may result from the use of subfertile boars, overworked boars, boars subjected to high temperatures (eg. seasonal) or boars recovering from an illness. To determine whether a boar is subfertile, use records to determine the fertility of sows estrus at

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weaning and subsequent returns to estrus. The farrowing rate can be expected to decrease with successive returns to estrus. However, if this decrease is too steep, it may indicate a problem of urogenital infection (see fig 1).

Effect of disease on farrowing rates to AI at successive returns-to-estrus

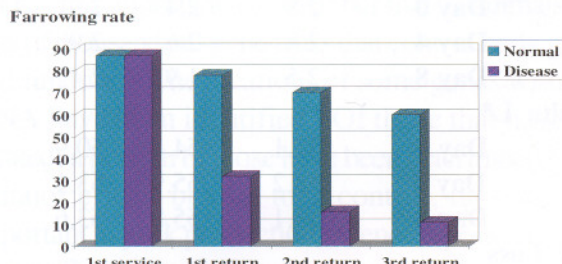


Figure 1

Computer records will also allow you to determine whether breeding on certain days of the week are a problem. If this is the case, one possibility is that the semen is too old (> 3 days) when inseminations are performed on these days. Semen delivery schedules need to be changed. If the data is recorded, the performance of sows when inseminated by different breeding technicians can be evaluated. It is possible that a technician performing many of the services requires additional training.

As can be seen, records can provide much useful information. They will allow you to measure the performance of your herd. Remember, if you cannot measure it, you cannot manage it.

### “Supplementing Vitamin C Through the Drinking Water. Does it Improve Pork Quality?”

*Sarah Pion, MSUE Southwest Swine Agent, Cassopolis*

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*Dr. Todd See, Associate Professor, North Carolina State University*

The subject of pork quality has become of increasing concern for today’s modern swine industry. The most prevalent pork quality problems reside in both color and water-holding capacity defects. These defects are often given acronyms such as PSE (pale, soft, and exudative) and/or DFD (dark, firm, and dry) pork. More specifically, Sonka et al. (1994) reported in the Pork Quality Chain Audit that PSE problems lead to a total industry loss of \$70 million. This estimate equals a \$0.79 per pig loss to the pork producer at a minimum. However, these figures may actually be an underestimate as many large pork processors report that as many as 40% of the hogs processed have PSE characteristics (Morgan et al., 1994). These figures become even more dramatic in the summer months. Consequently, addressing these meat quality concerns has become a high priority in order to effectively market today’s pork products and provide consumer’s with a desirable pork product.

Supplementing swine with vitamin C close to slaughter has been shown to improve meat quality characteristics such as, color and water-holding capacity, thus decreasing the incidence of PSE. Vitamin C supplementation is believed to be beneficial to pork quality through the modification of glucose and glycogen

metabolism (Mourot et al., 1990). In addition, it is believed that supplementation of vitamin C pre-slaughter may decrease the severity of a pre-slaughter stress response (Lauridsen et al., 1996). Both of these events are involved in an increase in lactic acid production within the carcass at slaughter, thus resulting in a rapid decline in muscle pH. This decline in pH combined with an elevated muscle temperature results in the denaturation of the muscle protein, consequently leading to the abnormal color and fluid loss characteristics of PSE pork. Therefore, the following experiment was conducted in an effort to determine the effects, if any, that vitamin C supplementation through the drinking water pre-slaughter would have on measurements of pork quality.

There were 30 finishing hogs (260 lbs) supplemented with vitamin C through the drinking water by individual water systems for 48 hours pre-slaughter. The pigs were randomly assigned to one of three treatments; 1) control (0 mg/L), 2) 500 mg/L, or 3) 1000 mg/L of vitamin C. At the conclusion of the 48 hour period, all pigs were transported to a commercial slaughter plant and slaughtered between 4 and 5 hours after vitamin C supplementation was ended. Loin samples were collected for measurement of pH, color, fluid loss, and

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oxidative stability (TBARS). Loin chops were then stored at refrigerated temperatures, similar to retail display, for 4 and 8 days for analysis of color, fluid loss, and oxidative stability (TBARS).

At the time that the pigs were slaughtered, no difference in blood (Figure 1) or muscle (Figure 2) ascorbic acid (vitamin C) concentrations were found in the pigs supplemented with vitamin C. In addition, no

Figure 1. Blood Ascorbic Acid Concentrations in Relation to Vitamin C Supplementation

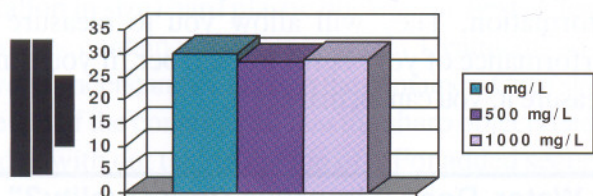
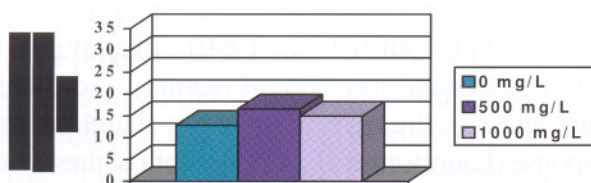


Figure 2. Muscle Ascorbic Acid Concentrations in Relation to Vitamin C Supplementation



improvements in muscle pH were found in those carcasses from the vitamin C supplemented pigs (Table 1). Finally, vitamin C supplementation failed to improve color, decrease fluid loss, or improve oxidative stability (Table 1).

In conclusion, vitamin C supplementation through the drinking water was unsuccessful in improving pork quality and decreasing the incidence of PSE in pork carcasses. However, the lack of elevated ascorbic acid (vitamin C) concentrations in both the blood and muscle from vitamin C supplemented pigs implies that timing of slaughter relative to vitamin C supplementation is critical in order to observe any improvements in pork quality. Therefore, it is believed that vitamin C supplementation through the drinking water on the farm may, in fact, be impractical. Supplying vitamin C through the drinking water directly at the slaughter plant may prove to be a more effective method towards improving pork quality and needs further investigation.

Table 1. Pork Quality Measurements in Relation to Vitamin C Supplementation

	Vitamin C Level (mg/L)		
	0	500	1000
Initial pH	6.0	5.9	6.0
24 hr. pH	5.4	5.4	5.5
Visual Color Score			
Day 0	2.8	2.4	2.9
Day 4	2.8	2.6	2.9
Day 8	2.5	1.9	2.4
Minolta L*			
Day 0	51.1	54.4	50.9
Day 4 <sup>ab</sup>	53.2	55.9	53.1
Day 8	53.1	55.8	53.6
Fluid Loss			
Day 0 <sup>b</sup> , mg	125.4	154.9	107.2
Day 4 <sup>a</sup> , %	2.3	3.9	2.9
Day 8 <sup>a</sup> , %	4.3	6.0	5.4
Oxidative Stability (mg/kg MDA)			
Day 0	.10	.11	.12
Day 4	.11	.11	.12
Day 8	.15	.13	.14

\*Minolta L\* measurement is a measure of the degree of lightness of pork (i.e. ↑L\* = Pale Chop)

<sup>a</sup> 500 mg/L vs. 0 mg/L differ at P < 0.05

<sup>b</sup> 500 mg/L vs. 1000 mg/L differ at P < 0.05

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## “Major Genes in Your Seedstock. Fad or Fashion?”

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

Most seedstock suppliers provide boars, semen and females to the commercial industry that have known status for a major gene(s) and or Quantitative Trait Locus (or Loci). These Quantitative Trait Loci are often called QTL. It is important to remember that all animals carry tens of thousands of gene pairs that control body growth and function. The locations of some genes within pig DNA have been identified. Of those that have been located, a portion of those have been determined to have a major effect, but not total control, on some traits important in pork production. Genes reported to have a major effect are called major genes.

These discoveries have changed the way the industry thinks about genetic improvement. In the past traits were measured and breeding values calculated on possible replacement boars and gilts. Animals that had a desirable set of breeding values were chosen either as replacement animal for nucleus herds or placed into multiplier or commercial herds. Ultimately the genetic change occurring within nucleus herds accumulate within commercial herds. However, knowing if an animal has 0, 1 or 2 copies of a favorable major gene does change how decisions are made about retaining replacement animals.

A variety of different selection schemes have been implemented to guide breeding stock suppliers on how best to use this information. However, selection cannot be exclusively for major genes while ignoring other traits that have economic importance. Selection for improvement of important traits that do not have an association with an identified major gene must continue so to improve total economic merit. Furthermore, it is important to remember that once most or all of the animals within a line or breed carry two copies of a desirable gene, methods to achieve further genetic progress for that particular trait revert back to selection for favorable estimated breeding values.

Another issue that must be addressed is the generality of the effect of a major gene. In other words, is the desirable effect of a major gene consistent across all breeds, lines and their crosses? The few cases where there has been knowledge of a major gene have suggested that the

genetic impact of a major gene in one line or breed is consistent across all lines or breeds. The most classic example is the Stress Gene. The Stress Gene (also known as HAL 1843™ gene or the ryanodine receptor gene) can cause decreased backfat thickness and increased muscling while also causing reductions in meat quality. In table 1 are a few examples of the expected change of a pig that is heterozygous for the stress gene (carrying one copy) compared to a pig that is homozygous normal (has no copies of the stress gene).

**Table 1<sup>a</sup>. Estimated performance change between pigs carrying 1 or no copies of the stress gene.**

Item	Nn-NN <sup>b</sup>
Backfat Thickness, in.	-0.03
Loin Muscle Area, sq. in.	0.40
pH at 45 min. after slaughter	0.24
pH at 24 hours after slaughter	-0.03
Drip loss, %	1.0

<sup>a</sup>Adapted from A.C. Clutter and E.W. Bascamp. 1996. Genetics of Performance. In: M. Rothchild and A. Ruvinsky (ed.) Genetics of the Pig. CAB International, Cambridge, UK.

<sup>b</sup>Change in performance of a heterozygous pig (Nn, carrying 1 copy of the stress gene) compared to a homozygous pig (NN, carrying no copies of the stress gene).

As more major genes have been identified it has been determined that their ability to cause significant change in performance may be limited to a few breeds or lines. An example of this is the Estrogen Receptor gene (ESR) that can increase number born alive in some breeds. In early studies with Chinese Meishan crosses it was reported that one gene (B allele) could increase litter size by 0.5 to 1.0 pigs; however, its complement (A allele) would reduce litter size by the same amount (Rothchild et al., 1996). Animals that were heterozygous for ESR (AB genotype) would be intermediate between animal with either the AA or BB genotype.

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In table 2 are three studies that evaluated the impact of the suggested favorable B ESR gene on number born alive. In the first reference (Short et al., 1997) females with the BB genotype had an average litter size of 0.4 pigs larger than heterozygous sows and 0.8 pigs more per litter than those with the AA genotype. This is similar to what was found in Meishan cross sows. However, within the second study (Drogemuller et al., 2001) the B allele was at a low frequency and did not significantly change number alive. In this study they did not have any animals with the BB genotype so evaluations could only be done between animals with the AA and AB genotype. In the third study (Isler et al., 2002) both the A and B alleles were found and animals for all three genotypes (AA, AB and BB) were identified. There were no significant differences between genotypes and number born alive averaged 10.6. The interesting thing about these three studies is that Large White animals were represented in all three studies but the results regarding the effect of the ESR gene differed.

imposed for performance improvement) may have caused differences in how these many gene pairs control a trait. Thus the role of each of the gene pairs can be slightly different as well as their relative influence on a trait. What is a major gene in one line or breed may not hold true across all lines or breeds. Therefore, once a major gene is identified in one line or breed the effect must be quantified in the in the crosses that contain that line or breed used in commercial production systems. It can happen that a major gene can have a certain effect within the lines and crosses controlled by a seedstock supplier, but have a different effect if that particular line is crossed with breeds or lines from a different seedstock supplier.

### Summary

The discovery of major genes and QTL, and the evaluation of their effects, is an on-going process that is becoming a regular component in genetic improvement programs. The benefit to the commercial industry will be greater short-

**Table 2. The effect of the Estrogen Receptor gene in different populations for number born alive**

Reference	Lines and Line Crosses	Genotype		
		AA	AB	BB
Short et al., 1997	Large White and Large White Composites	-0.40	0.00	0.40
Drogemuller et al, 2001	Duroc, Large White and Duroc and Large White composite	-0.14	0.00	---
Isler et al., 2002	Yorkshire, Large White and crosses of both Yorkshire and Large White	NS <sup>a</sup>	NS	NS

<sup>a</sup>Differences between the ESR genotypes of AA, AB and BB were not significant for number born alive.

With these results there are several important things to keep in mind. The first is that there can be hundreds of gene pairs that have some influence in the expression of a trait. Most have a very small effect and it is difficult to detect their influence. There may be a few genes that have a major effect and can be detected in animal populations. The second is that the effect of a major gene within one breed or line may not be the same in another breed or line. There are many possible reasons for this. One plausible explanation is that there possibly are hundreds of gene pairs controlling the expression of a trait. Previous selection (either natural selection or selection

term improvement for some traits as well improvements in traits that have been more difficult to evaluate (e.g. meat quality) in the past. However, not all major genes and QTL identified will have the same effect across the many different breed and lines, and their crosses, used within the pork industry. Producers purchasing seedstock with identified genotypes for major genes should have documentation provided by the seedstock supplier of their effect in the lines and crosses provided. This documentation can be used in economic evaluations regarding the impact of these major genes on swine enterprise profitability.

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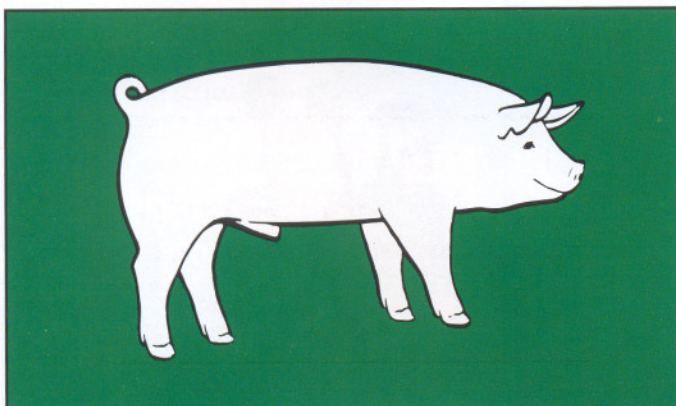
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## UPCOMING BREEDING MANAGEMENT WORKSHOPS

Michigan State University Extension Swine AoE Team will host two workshops on breeding management in January and March of 2003. Both will be held at the Pavilion for Agriculture and Livestock Education on the MSU Campus, East Lansing. Each workshop will have a "hands on" component that will be held at the Main Swine Farm on the MSU Campus. Persons participating in the on-farm portion of the program must be away from all other pigs for 48 hours and will have to shower into the Main Swine and use the farm's clothes during the session. The following is an outline for the two workshops.

### January 20, 2003 Breeding Management

Topics included will be:

1. Estrous Cycle and its control
2. Gilt housing and feeding
3. Artificial insemination and pregnancy detection
4. On-Farm Session: Estrous detection, artificial insemination and pregnancy detection.

### March 3, 2003 Breeding Herd Management

Topics included will be:

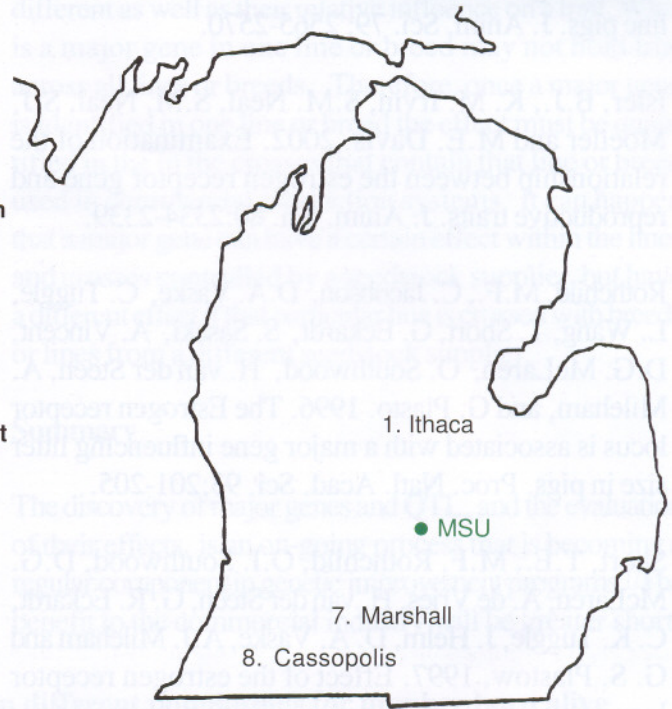
1. Introduction of gilts into the herd
2. Boar semen collection and extension
3. Trouble shooting reproductive problems.
4. On-Farm Session: Semen collection, extension and evaluation.

Registration information will be in the next issue of the *Pork Quarterly*. For more information or to make your reservation contact: Roy Kirkwood (Ph:517-432-5198; email: [kirkwood@cvm.msu.edu](mailto:kirkwood@cvm.msu.edu)) or Ron Bates (Ph:517-432-1387; email: [batesr@msu.edu](mailto:batesr@msu.edu)).



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



## 2002 Grand Champion Purebred and Overall Champion Truckload National Barrow Show, Austin MN, September 9, 2002

This Yorkshire truckload was bred, raised and shown by MSU Students



Standing (L-R). Dr. Maynard Hogberg, Jeff Mafi, Ryan Sweeney, Brian Hines, Daniel Hedrickson, Brady Ostrom, Joe DeLong, Tim Trattles and Lincoln Huffman.

Kneeling (L-R). Rod Fair, Mark Hoge, David Edwards, Emily Hogberg and Al Snedegar (MSU Swine Farm Manager).