

More E Please: Why Vitamin E Holds a Key to Better Swine Productivity

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Ask a pork producer to describe an ideal farrowing event, and it will include a fast, smooth delivery where pigs start nursing quickly after birth. The reality sometimes fails to match the ideal, though.

“We were facing issues with prolapses and sow mortality,” said Heath Kasperbauer, owner of Kasperbauer Swine Management, which manages 12,000 sows on three farms in west-central Iowa. “We were looking for answers.” Kasperbauer utilizes Dr. Paul Armbrecht, a veterinarian from Rockwell City, Iowa, who noted that sow mortality has been on the rise in the swine industry. Prolapses and stillborns are also a challenge in many herds. “The pigs of today aren’t always achieving their potential,” Armbrecht said. “I let the pigs be my guide as I tried to understand what might be going on.”

For Armbrecht, this quest involves more than 45 years of observing swine behavior and health, along with blood testing to pinpoint answers. When disease isn’t part of the equation, nutrition become a key factor. “Producers would say, ‘My feed supplier says my ration has everything it needs,’” Armbrecht said. “But when there is no disease present, it’s clear that something more is needed in the diet to maximize the swine genetics of the herd. We’ve starving pigs of some key nutrients.”

This supports the research of Rob Stuart, Ph.D., an animal nutritionist with decades of vitamin experience who founded Stuart Products, Inc. in Bedford, Texas, in 1988. “Of the six major nutrients, including proteins, fats, carbohydrates, vitamins, minerals and water, what’s the most costly? The one that’s most limiting,” Stuart said. “In many cases, that’s vitamin E.”

What has changed?

Vitamin E has long been recognized as an essential nutrient in hog production. It plays a key role in muscle function, the immune system and reproductive health, influencing everything from birthing time to the number of stillborns. “Vitamin E deficiency wasn’t a big issue when sows were raised on pasture,” Stuart said. “If you see green, this feed source is typically adequate in vitamin E. But most pigs today are raised in confinement and aren’t eating grass and forage.”

Swine nutritional needs have also changed due to modern swine genetics. “Today’s sows are asked to do more,” said Merlin Lindemann, Ph.D., a professor of animal and food sciences at the University of Kentucky. “They can produce twice as many pigs that grow twice as fast.”

Armbrecht agreed. “Go back 30 years, and sows typically had eight to nine live pigs born in a litter. Today, the average number of pigs born live is closer to 14.6. Also, sows used to raise 20 pigs per year, but now it’s closer to 28 or 30 pigs per sow per year.”

Early weaning is another key issue to consider, Stuart said. Since Mother Nature didn’t design pigs to be weaned at three to four weeks, early-weaned pigs’ digestive systems aren’t quite ready for the form of vitamin E that’s added to swine nursery diets today.

Despite all these changes, resources for vitamin recommendations in swine diets, including the National Research Council (NRC), haven't always kept pace. While the NRC increased its vitamin E recommendations for swine rations in 1988, the requirements for vitamin E haven't been changed since then.

"Requirements generally are greater today, because we don't have the same type of sow today as we did in 1988," Stuart said. His main concern with NRC's recommended fat-soluble vitamins like vitamin E focused on the gestating sow's needs. "Gestating sows consume approximately one-third less feed than lactating sows, yet the NRC recommendations per ton of feed are the same for both gestation and lactation," Stuart said. "This results in a potential vitamin E deficiency in the gestating gilt or sow."

Vitamin E deficiencies compromise swine health and reproduction

While proper vitamin levels are critical to swine health, deficiencies are common. Levels in serum offer an excellent method to assess vitamin E deficiencies. "We see vitamin E deficiencies in swine frequently," said Steve Ensley, DVM, Ph.D., a clinical toxicologist at Kansas State University.

These deficiencies can lead to serious consequences for swine health, especially for newly-weaned pigs. Mulberry heart disease (MHD) is one of the most common syndromes associated with vitamin E deficiency, according to Iowa State University's (ISU) College of Veterinary Medicine. MHD is manifested by sudden death in pigs one to four weeks post-weaning that were thought to be in excellent health. "I saw MHD fairly frequently when I worked at ISU," said Ensley, who worked at ISU for 16 years in the College of Veterinary Medicine prior to joining Kansas State. Supplementation with the right form of vitamin E will dramatically reduce deaths from MHD, according to ISU.

Vitamin E also functions as an antioxidant, which is nature's way of protecting cells from damaging free radicals. These unstable molecules, which are generated during metabolism and other factors, damage cells and trigger oxidative stress, which hinders pig performance and impairs animals' health and growth. "Pigs under oxidative stress are more likely to get sick," Stuart said.

Symptoms of oxidative stress may include decreased immunity, muscle degeneration, mulberry heart disease, loss of appetite, diarrhea and more. Oxidation to the body is what rust is to iron, Lindemann explained. "Antioxidants like vitamin E help the body cope with oxidation and resets the immune function so the body is prepared to deal with the next invader."

Low levels of vitamin E can also hinder reproductive efficiency. "Eggs and sperm are very susceptible to free radical damage," said Young Dal Jang, Ph.D., an assistant professor of monogastric nutrition in the Department of Animal and Food Science at the University of Wisconsin-River Falls. "This damage can reduce the number of eggs available for fertilization, which could reduce swine litter size. Sperm damaged by free radicals could lose their capacity to fertilize the eggs."

During delivery, inadequate levels of vitamin E can hinder the uterus's ability to push out the pigs. Proper vitamin E supplementation prior to farrowing, however, improves muscle tone, so sows can deliver pigs faster and easier. This can mean less stress on the sow and pigs, potentially resulting in fewer stillborns. "Good muscle tone means a farrowing time can be reduced up to 50 minutes," Armbrrecht said. "My goal is to keep sows alive and have fewer stillborns," Armbrrecht said.

While vitamin E is not high on the priority list for a lot of pork producers, it should be. "Vitamin E is essential in swine diets," Jang said. "Vitamin E deficiency is a bigger issue than feeding too much vitamin E."

How to know if pigs are short on vitamin E

There are some key tools to assess optimum vitamin E levels in swine. Evaluating a swine herds' vitamin status starts by sending serum samples to a veterinary diagnostic laboratory for analysis.

“Nutritionists may depend too much on feed analysis,” Stuart said. “Serum/tissue values reflect bioavailability of vitamins and minerals, while feed analysis alone does not.” If serum/tissue values reveal a vitamin E deficiency, adding more vitamin E to the feed ration may not be the right solution, though. “Vitamins aren’t always as stable as we’d like,” Ensley said.

Not all vitamin E is created equal

There are two forms of vitamin E: alpha-tocopherol and the feed-stabilized alpha-tocopheryl acetate. Alpha-tocopherol is the active form, as found in mother’s milk or green growing grass, while the “acetate” form is not. Due to superior stability, alpha-tocopherol acetate can be added to the diet, while the active-form of vitamin E can only be administered either by oral dosing or supplementing drinking water.

“The synthetic Vitamin E isn’t as readily available to post-weaned pigs as vitamin E in the alpha-tocopherol (“active” form), which is better absorbed and goes right to work in the body,” Ensley added.

Vitamin E injections offer the highest absorption rate. “Vitamin E must be absorbed before it can be utilized by the body,” Jang said.

Not sure how to distinguish synthetic from natural vitamin E? Unlike natural vitamin E, synthetic vitamin E products are designated the letters “dl” before alpha-tocopherol and natural vitamin E products are designated “d” before alpha-tocopherol. Feed tags are not required to show the source and form of vitamin E in feed or supplements.

Due to lack of intestinal enzymes in the newly-weaned pig, Stuart said. “Also remember, no matter how much synthetic vitamin E-acetate we add to weaning diets, the newly-weaned pigs can’t utilize it because it’s in the wrong form- the acetate ester.” That’s why Stuart developed VITAL E brand injectables, including VITAL E-REPRO, VITAL E-NEWBORN and VITAL E-500 and liquid supplements for adding to drinking water.

“We recommend injecting the sow one week pre-partum,” said Stuart, who has been furnishing vitamin E products since 1988. “The uterus is a big muscle, and adequate vitamin E helps reduce stillborns, because the uterus can push pigs out faster.”

A 2015 Michigan State University study showed that total farrowing time per pig dropped nearly 25 percent per pig for sows injected with VITAL E-Repro, dropping from 21.26 min/pig 16.38 min/pig. A 2015 North Carolina State University (NCSU) field study also showed that total farrowing time dropped 25 percent (139 minutes versus 185 minutes) for sows injected with VITAL E-Repro. In addition, the number of stillborn pigs in treated P-6 sow was 1.31, compared to 1.71 stillborns for the non-treated P-6 sows.

The benefits don’t stop there. A 2017 NCSU study tracked the percent of sows requiring birthing assistance. Treated sows were injected with 5 mL of VITAL E-Repro seven days pre-partum. The field study revealed that 9.5 percent of treated sows required assistance compared to 19 percent of sows in the control group, a 50% reduction.

Timing is everything

Injecting vitamin E pre-farrowing works, because vitamin E is delivered to all tissues, including colostrum. Jang cited a 2010 study indicating that the sow's supply of vitamin E is key to attaining a high vitamin E content in colostrum. "The results from the present study and other published data indicate that it should be possible to further increase the concentration of vitamin E in sows' colostrum and milk via higher dietary levels of vitamin E." Jang added.

Ensuring optimum vitamin levels for the gestating sow, especially during the last month of gestation, is vital, Lindemann said. "If you take care of the sows' nutritional needs pre-farrowing, especially with vitamin E, you benefit her pigs, too."

Vitamin E administered post-farrowing to pigs is also important. Young pigs are susceptible to vitamin E deficiency, Jang said. Vitamin E doesn't transfer across the placenta membrane, so pigs are born deficient in vitamin E. "For nursing pig, their only source of nutrition comes from sows' colostrum and to a lesser extent, milk," Jang said.

Next, consider the unique dietary needs of newly-weaned pigs, Lindemann said. "When pigs transition from milk to solid food, there's a two-week period when nutrient absorption is compromised. It takes the pigs awhile before they have the necessary enzymes to utilize the form of vitamin E found in nursery diets." Injecting natural vitamin E solves this challenge. "When you inject, you bypass any problems with the absorptive capacity of the gut," Lindemann said.

VITAL E pays

Kasperbauer boosts gilts upon arrival at his farms with VITAL E- REPRO to get them off to a good start. Sows are injected two weeks before farrowing. "It's priced right and costs me about 40 cents per sow," said Kasperbauer, who added that pigs receive an injection of VITAL E-Newborn when they receive their iron shot. VITAL E brand injectable vitamin supplements are paying off. Kasperbauer has lowered his farms' sow mortality rate from 18 percent to 12 percent. "VITAL E-REPRO is a safe, high-quality, American-made product that is making a big difference," he said.

VITAL E brand products from Stuart Products are extremely helpful, Armbrecht agreed. He noted that one farm he serves was struggling with three to four dead sows a week. After implementing a new system where sows are injected with VITAL E-REPRO pre-farrowing, the number of dead sows dropped to zero. "I expect at least a three-to-one return on investment before I'll recommend a product to my clients," Armbrecht said. "VITAL E products deliver this and more."

Lindemann has conducted studies that reveal the vitamin E content in sow ovaries increased by 75 percent when vitamin E is administered in the proper form, such as VITAL E-REPRO. "This speaks to the priority of this nutrient," said Lindemann, who noted that adequate vitamin E is essential for optimum reproductive success. "These results tell me this tissue really needed that particular nutrient, because it was starved for vitamin E."

An investment in vitamin E easily pays dividends, Lindemann added. "Too many people take a minimalist approach of saving a dime but losing a dollar. It's time to look at swine health from a different perspective. If you lower pre-weaning mortality, seven-day post-weaning mortality and sow mortality, reducing those losses can buy a lot of vitamins."

Boost optimal swine health

While more research is needed on vitamin requirements for all segments of the swine industry, especially the gestating sow/gilt, the role of vitamin E is clear. "There are many factors that work

together to promote swine health, including vitamin E,” Lindemann said. “If you don’t have enough vitamin E, it becomes the weak link in the chain when it comes to optimal swine health.”

Vitamin E contributes in so many ways to swine health, which contributes to better swine performance, Stuart concluded. “Anyone who is looking to improve their swine herd, needs to include vitamin E.”

Recommended VITAL E and EMCELLE Programs for Swine

Birth

VITAL E-Newborn (0.5 mL). This injectable, which can be administered at processing along with an iron shot, costs less than 10 cents per pig.

Nursery

EMCELLE E-D₃ Liquid is administered through the drinking water for 2-3 weeks post-weaning and costs 25 to 35 cents per pig during the two- to three-week program. A 2011 study conducted in North Carolina on nursery closeouts showed that EMCELLE E-D₃ delivered a two-to-one return on product investment.

Grow/Finish

EMCELLE E-D₃ Liquid, or **EMCELLE D₃ Liquid**, pulsed monthly, or as needed.

Gilts and Sows

VITAL E-REPRO (5 mL), used at one to two weeks pre-farrowing and at weaning time, Each injection costs about \$1 per sow.

For more information about **VITAL E** and **EMCELLE**-brand products, contact:

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Or visit our website: www.Stuartproducts.com.

About Darcy Maulsby: If you enjoy fascinating, true stories well told, you have a lot in common with Darcy (Dougherty) Maulsby. As Iowa’s Storyteller, Darcy believes anyone who eats has a connection to the things she’s most passionate about, including food, farming and history. As an author-preneur, business owner, marketing specialist and speaker, Darcy knows the power of effective writing to tell a great story, connect with others and amplify your impact. She is also proud to be part of a farm family that operates a Century Farm in Calhoun County near Lake City and Yetter, where she runs her own marketing/communications company, Darcy Maulsby & Co. Visit her online <http://www.darcymaulsby.com>.