

Featured Speaker

Dr. Laura Greiner

Host

Dr. Sarah Probst Miller

Commentaries

Dr. Joseph F. Connor

Dr. James F. Lowe



Sarah

Hello, this is Dr. Sarah Probst Miller with Carthage Veterinary Service. I want to welcome you to our third edition of P's in a Pod. P's in a Pod covers practical tips on pigs, production and profitability. P's in a Pod is a monthly podcast brought to you by Fort Dodge Animal Health and Carthage Veterinary Service.

In our first episode, we heard about TTV viremia and how it affects PCV2. We heard being infected with TTV prior to PCV2 can potentially lead to increased PCVAD (porcine circovirus associated diseases). With this knowledge, we worried about those pigs getting infected with PCV2 very young directly after TTV, but prior to vaccination. This knowledge led us to more questions about PCV2 vaccine timing and I think it is appropriate that we explore and examine the research behind PCV2 vaccination timing at this time.

Timing wise, I personally have had most clients vaccinate with a one-dose vaccine at weaning or with a two-dose vaccine at weaning and two to three weeks later. We've had good success for the most part. The only groups that have had PCVAD peek through are the groups that we tried vaccinating very young during lactation or with a half dose of a one-dose product before entering into a health challenge. I have heard other vets say they've seen the vaccine not prevent PCVAD in other circumstances, but most aren't sure what those other circumstances are. Is maternal immunity and vaccine timing a culprit? So I am very interested to hear from Dr. Laura Greiner. She is going to cover her literature review on the topic and also share the results of her recent research on PCV2 maternal antibodies and vaccine timing.

Laura

Hello. Thanks for the intro Sarah. This is Dr Laura Greiner of Carthage Veterinary Service. I also work with the CVS sister company called Innovative Swine Solutions (ISS), which seeks nutritional solutions to practical sow and piglet questions. Besides nutritional research, I also get the opportunity to work on other projects like PCV2 maternal immunity. Today, I want to discuss some of the key points surrounding PCV2 viremia and maternal antibodies.

Over the last five years, there have been multiple studies demonstrating the effectiveness of PCV2 vaccine programs in controlling and reducing porcine circovirus associated diseases. However, there have also been documented cases of what appears to be PCV2 vaccine failures. These vaccine failures have created multiple questions. Does maternal antibody interference occur? Are maternal titers good or bad for vaccination? What is the ideal timing of vaccination? Do we need to do maternal antibody vaccination? What to do with actively infected pigs at the time of vaccination? What other factors may influence the pig's ability to control a PCV2 infection?

Sarah

That's a lot of questions, Laura. Are you going to answer all of them for us today?

Laura

I'll do my best to answer these questions based on most recent research. The impact of PCV2 maternal antibodies on the offspring's response to PCV2 vaccinations is one of the discussions still in debate.

PCV2 is universal. It does not matter if your growing unit is raising pigs to go to market or serving as a replacement gilt barn. Animals will become infected by PCV2. We also know through previous data that most females in a sow farm have been exposed to PCV2 at some point during their development. This occurs naturally or through elective vaccination programs. Therefore, they will have maternal antibodies to pass on to their offspring.

Sarah

Laura, what does the research show?

Laura

Previous studies have shown that the antibody titer in sows, and therefore colostral immunity, increases with the number of vaccinations given to the dam (Charreyre C. et al., 2006). Recent research conducted by McKeown et al. also demonstrated that protection against PCV2 infection conferred by maternal antibodies is titer dependent. Higher titers are generally protective, but low titers are not. Another study by Auvigene et al. demonstrated the importance of the maternal antibodies on controlling PCV2 viremia. When sows were vaccinated 6 and 3 weeks pre-farrowing, post-weaning mortality was reduced from 4.4% to 2.6% and mortality in the finisher was reduced from 6.6% to 5.1% compared to offspring from non-vaccinated pre-farrow females.

In addition to vaccination, Oppressnig et al. in 2006 demonstrated that certain genetic lines (such as Landrace backgrounds) are more susceptible to PCV2 lesions compared to other genetic lines. Corregge et al. in 2001 described data that showed pigs that had a lower birth weight and weaning weights were more frequently affected by PCVAD and 7 of 10 pigs in an infected herd had insufficient colostral transfer and did not survive until weaning (Moll).

What we must acknowledge is that although maternal protection is important and does provide a significant reduction in PCVAD, vaccinating piglets at weaning does provide additional protection. This reduces grow-finish mortality and improves the percent of pigs marketed per barn.

However, when vaccination programs against PCV2 failed to reduce viremia and PCVAD, concerns rose on whether or not the dam's maternal antibody levels were an issue in affecting long-term immunity.

Sarah

Yes, the interference possibility. Fill me in Laura.

Laura

Most piglets at 21 days of age still have relatively high antibody levels even from sows that are not vaccinated pre-farrow. These sows typically will test positive on a PCV2 ELISA analysis indicating that most farms have some levels of circulating PCV2 virus. Delaying vaccination for an additional two to three weeks post-wean would be the logical approach if one is concerned with high antibody levels interfering with vaccination. However, recent research states that whether or not a sow passes on high or low levels of maternal antibodies, vaccination protocols at weaning are still effective. Oppressnig et al. published data indicating that vaccination with Suvaxyn PCV2 One Dose reduces viremia and prevents

microscopic lesions associated with PCV2 in the presence of maternal antibodies. Kixmoller et al. in 2008 also supported this data showing that vaccination with a single-dose recombinant porcine circovirus type 2 (PCV2) open reading frame 2 (ORF2) subunit vaccine was effective in protecting piglets regardless of the dam's anti-PCV2 antibodies.

Sarah

Do your studies agree?

Laura

To an extent . . . of note is that current studies conducted at Carthage Veterinary Service indicate that anywhere from 5% to 20% of the weaned piglets leaving the sow farm already have PCR positive results for PCV2. These findings indicate that vaccination either through the sow pre-farrow or the piglet at weaning are necessary in controlling pre and post-wean viremia.

Sarah

Was this early viremia present in all your studies at that rate?

Laura

In another study conducted by Carthage Veterinary Service and Fort Dodge Animal Health, only 1% of the weaned pigs tested positive for PCV2 virus at 3 weeks of age. Serum antibody levels were tested at a 0.5 s/p ratio at weaning and they showed a decrease over the following five weeks. One thousand pigs were vaccinated using Fort Dodge Suvaxyn[®], Intervet Circumvent[™], or BI CircoFLEX[™] products. Two hundred pigs were not vaccinated against PCV2. At 8 weeks of age, serum from piglets began to test positive for PCV2 virus and antibody levels began to elevate. Viremia appeared to peak at 15 weeks of age and antibody titers peaked at around 1.2 s/p ratio shortly thereafter. However, vaccination against PCV2 reduced the number of viremic pigs and resulted in improved mortality. This trial demonstrated that vaccinating at weaning regardless of maternal antibody presence provided protection against PCVAD.

Sarah

Laura, if I think I have problems with my PCV2 vaccination programs, what is the best strategy to evaluate that?

Laura

I'll give you the long answer Sarah. Bear with me. The most common diagnostic methods for detecting PCV2 antibodies include indirect immunofluorescent assays (IIFs) and immunoperoxidase monolayer assays (IPMAs). But these techniques are tedious and time-consuming. They actually have to infect cells, examine plates, etc. Enzyme-linked immunosorbent assays known as ELISAs can be automated, which decreases the potential bias that may occur with IIFs or IPMA results. But, Nawagitgul et al. discusses that PCV2 and ORF2 ELISAs seem to be slightly less sensitive than IIF since a considerable number of IIF-positive sera were classified as negative or equivocal by both ELISAs. He continues to state the subsequently compared to two modified ELISA systems: a PCV2-infected cell antigen-based ELISA and a recombinant ORF2-based ELISA. Repeatability tests were less than 30% when measuring the coefficients of variation of positive sera within and between runs for both assays.

To validate the different assays, PCV2 and ORF2 ELISAs were performed with 783 serum samples of young and adult pigs collected from different herds in the Midwestern United States and compared with an indirect immunofluorescent assay (IIF). Six out of 60 samples collected from nursery and grow/finish

pigs in 1987 were positive by both ELISA and IIF. Compared with IIF, the diagnostic sensitivity, specificity, and accuracy of PCV2 and ORF2 ELISAs were similar it's greater than 90%. The tests showed no cross-reactivity with antibodies to porcine parvovirus and porcine reproductive and respiratory syndrome virus. There was good agreement between the two ELISAs and between the ELISAs and the IIF. This allowed the sensitivity and accuracy of ELISAs to be validated for use instead of IIF. So we can use the automated ELISAs to test; however, it is important to understand the diagnostic lab you are submitting to and what their current assay for analysis is. Diagnostic labs due tend to differ slightly in their assays and the corresponding values. Actual viremia is best assessed by quantitative PCR.

Sarah

So Laura in light of your study, what is the take home message?

Laura

In conclusion, current data demonstrates the potential need for early sow vaccination programs to reduce viremia in piglets. Maternal antibodies do not interfere with the piglet's ability to respond to a PCV2 vaccine.

Sarah

Thanks, Laura. A lot of information there. I need to summarize it for my brain to get some action points. So let me see if I absorbed the main points. You started by asking a few questions in the beginning and I think you provided the answers. Let me just reiterate these questions and re-answer them briefly based on what I heard you say. You tell me if I got the point.

Does maternal antibody interference occur? Your answer, what I heard you say was not enough to interfere with vaccination programs for the vast majority of piglets when vaccinated at weaning or later.

Laura

That's right.

Sarah

So are maternal titers good or bad for vaccination? What I heard you say, Laura, was that maternal vaccination alone can reduce the signs of PCVAD post-weaning and in the finisher. It can also reduce piglet viremia in lactation. So if maternal immunity doesn't interfere with vaccination (and today's research says it doesn't), perhaps there is some benefit in both maternal boosting of immunity in combination with weaned pig injection protocols. And these maternal titers get higher with more vaccinations so repeat boosterings of sows pre-farrow may be a good idea for systems with high piglet viremia.

Laura

That's my interpretation, Sarah.

Sarah

Ok, Laura, your next question was . . . What is the ideal timing of pig vaccination? From what I heard you say, it looks like current protocols in the 3-5 weeks of age range continued to be a good timing even in the face of maternal antibody until proven otherwise.

Laura

Yes.

Sarah

And then you asked . . . What should we do with actively infected pigs at the time of vaccination? These findings you cited indicate that vaccination either through the sow prefarrow or the piglet at weaning are necessary in controlling pre and post-wean viremia. Vaccinating the wean pig as well seems to be the answer to getting the best protection in the finisher. Is this a decent summary, Laura?

Laura

Yes, that was a good summary, Sarah. It does make us wonder what other factors may influence the pig's ability to control a PCV2 infection, especially in those cases where everything appears to be done at the right time, but reports of PCVAD occur.

Sarah

Well in our first podcast, Dr. Connor talked about TTV and the influence this may have on PCV2 infected pigs. I think we should pick Dr. Connor's brain a bit on vaccination strategy. Joe, could you take the summary of what Laura presented to us and give us your impression on how the information impacts application in the swine industry today? We want you to summarize how you would attack a herd that appears to be having problems with vaccine success, but first could you comment on TTV, PCV2, and vaccine timing?

Joe

Yes, Sarah, in the last podcast we reviewed the TTV literature and added in some speculation on the affect of this virus on PCV2 and vaccination strategies. The reality is, however, we do not know the affect on performance of TTV co-infection on PCV2. We clearly know the economic cost of PCV2 from a multitude of trials, but in none of those trials am I aware was there any attempt to confirm TTV. With that said, we should then direct our consideration to individual sow herd PCV2 activity and how to control that activity.

Sarah

Laura's presentation suggested that sow vaccination may be necessary in some circumstances. I've seen it reduce preweaning mortality (PWM) in a few herds. Do we need to look harder at prefarrow shots as an industry? Or just if we are seeing PCR positive pigs for PCV2?

Joe

Recently, we have experienced PCV2 associated infertility in several herds as seen with an increase in stillbirths, mummies, irregular and regular returns. In addition, in part of those clinical cases was also an increase in weak pigs. Fetal hearts were submitted and were determined to be positive for PCV2. In these situations, we typically use a combination of sampling of the mummies and stillbirths. When we consider management of PCV2 activity in sow herds, sow vaccination is a part of that solution, but we must also take a look at gilt vaccination and acclimatization.

Sarah

What testing would you do in cases like the one you described?

Joe

In herds with increased stillborns, returns, and mummies, and perhaps in herds with increased PCV2 PCR's from lactating sows, I would submit fetal tissues and do PCR's on the tissues of the suckling pigs.

Sarah

In herds like this case you mentioned, Joe, what vaccination strategy would you implement?

Joe

In this particular case, I believe it is prudent to mass vaccinate the sows pre-farrowing and then to maintain pre-farrowing vaccination. Replacement gilts should be vaccinated at weaning and pre-breeding. However, when we implement a pre-farrow vaccination for PCV2, we must also consider the effect of maternal antibodies on the age of vaccination of the pig. Based on a number of trials for the best protection of the growing pig, we'd continue to vaccinate for PCV2 pigs at 3 weeks of age or older.

Sarah

Thanks, Dr. Connor, for those valuable insights. I am formulating my own action plan as I listen, but first Dr. Lowe, I'd like to hear what you think this means for your PCV2 vaccination strategy in a large system. Are you using pre-farrow sow vaccinations in some circumstances? How are you deciding when to use?

Jim

Thanks, Sarah, piglet vaccination is one of those things that seems to be confusing not only to myself, but really to many production systems. They'd have to balance the practical realities of application and timing with really the best available scientific information. PCV continues to be exceptionally challenging in my mind because we know so little about the transmission rates of circovirus within the sow farm and what implications that has on piglets. The little work that I have done sampling pigs at weaning, there is really a massive amount of variation in either ELISA or IFA antibody titers in these pigs. Therefore, practical consideration of optimizing timing continues to be exceptionally difficult. After reviewing the data, here's my take home message. Although there is some evidence of suppression of optimal response in the presence of maternal antibody, the response achieved, except in pigs with really just the highest maternal antibody, appears to be adequate to reduce economic losses and the clinical effects of the disease.

Sarah

Do you buy into the need for sow vaccinations?

Jim

Sarah, I think it's confusing to look at all the data and really draw any broad sweeping conclusions about the impact of sow vaccination and that's really because we've got this roll of impact of viremic pigs at weaning. We know in sow farms we've got high rates of PCV2 transmission. There are a relatively high number of viremic pigs at weaning. Anecdotally, we know that these viremic pigs are not very responsive to vaccination can go on to have clinical issues later. So where it is confusing to me is that as we get herds with high circulating PCV2 in the sow farm, you see higher levels of antibodies in the sow, you subsequently see higher maternal antibody, and then maybe we're confusing blockage of vaccination with higher maternal antibody. Really, because we've got more viremic pigs because I think high levels of maternal antibody in this variation we've talked about is all highly correlated to more viremic pigs at weaning.

So I like to think about making decisions within a production system really gets back to the basics of infection control within that cell population and probably not as much reliance on vaccination. I think we've learned all really the last six to nine months that stabilization of the sow herd is important. How do we do that? Well, we still think that really the basics of good acclimation times with those gilts coming in, we think that vaccination with those gilts prior entry may be helpful. We don't fully

understand how that works today, but we think that could be helpful. But I think that day is going to be forthcoming.

I think today what do we know? We know that vaccination of gilts prior to entry of the breeding herd is probably important even if they are vaccinated at piglets. We have had at least one case where we can document that vaccinated gilts at weaning are viremic early in gestation. We think that's due to waning of antibody and just more pressure on those gilts. So we think that vaccination strategy is probably important. We also think that coupled with routine vaccination of those outbound pigs. I don't think that sow vaccination at this point is going to supplement piglet vaccination for control.

So I guess as I look at it as of today, my take home message is what we really got to have more data to confirm what the potential of sow vaccines are and I really think we need to measure that as an outcome. Are we reducing piglet viremia? With that said, I speculate that we are going to come up with a cost that might solve herd vaccination programs coupled with that routine pig vaccination to produce the greatest economic results.

Sarah

Thanks Dr. Lowe for sharing how you have applied and will be applying this information in larger systems. Dr. Greiner, Dr. Connor, Dr. Lowe, you've helped me make my action points.

From what I've heard, I've pulled together four action points for myself as a swine vet. 1) I need to better ensure that sow to pig transmission is as calm as possible on sow farms. This may not mean using vaccines on all sow farms pre-farrow, but certainly, if we have increased stillborns, mummies, or irregular returns, or positive PCV2 PCR's in lactation pigs, I need to increase maternal immunity. This will likely include pre-farrow sow vaccination or boosting our gilts prior to entry into the sow herd. 2) I need to continue to use the timing of 3 to 5 weeks of age for PCV2 vaccination of piglets, recognizing that it still appears to be adequate to reduce economic losses and clinical effects of the disease. 3) I need to watch incoming literature on this topic to tweak my diagnostic approach and vaccine timing. 4) In tight economics, I need to watch those clients who are deciding to group pigs without PCV2 vaccine to carefully monitor how these pigs do. And I need to remind them to watch performance specs on these pigs as well as mortality to gauge vaccine worth. Communication-wise, in a large system, I am going to stick to the generic vaccine timing to simplify the message to all in the system. I appreciate the information I learned in this podcast. It will make me a better swine vet.

To get more action points from the field, tune into our next P's in a Pod where we talk about wean pig agreements. Dr. Bill Hollis is going to discuss past, present, and future agreement trends and the impact to us and the clients we serve. Drs. Connor and Lowe will talk to us about the information's application to us as swine vets and we'll come back to you with another list of action points for yourself and the farm. Drive safely and have a great day!