What Lessons Should We Learn From Porcine Circovirus?

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Porcine circovirus associated disease (PCVAD) was first described in Canada in the early 1990's; although at that time it was expressed as post-weaning multisystemic wasting syndrome (PMWS). For the first few years, the syndrome appeared to affect only sporadic pigs on individual farms. However by 2005, the severity on individual farms and the number of farms affected had increased to the point that PCVAD was epizootic and almost all regions of North America where swine are raised were affected.

Fortunately, our understanding of the cause of the disease (Porcine circovirus type 2 and associated strain differences) has increased tremendously. I am not convinced that our understanding of management of the virus (PCV2) and the disease (PCVAD) has improved proportionally except to say that vaccination has saved us and has improved the situation to a point that PCVAD problems are behind us. This is wonderful in that the catastrophic financial losses and the psychological trauma of feeling helpless in the face of an uncontrollable health problem are now under control. What is unfortunate is that we quickly give the credit to vaccination, we add PCV2 vaccination to our list of health management protocols, and we forget about all the other factors that contributed to the problem. Madec's Rules have gone into history and this is unfortunate. (1)

Now is an opportunity for us to learn from PCV2/PCVAD and try to put what we have learned into practice so that the next "mystery disease" does not harm our industry so greatly.

Anytime a new disease entity surfaces, I think we tend to view this new disease as the disease that is breaking all the rules – the disease that behaves differently from all the others; the disease that disregards "normal" epidemiology; the disease that disregards the influence of sow immunity, the influence of age segregation, the influence of co-factors of disease (stress, co-infections). This happened with PRRS, and this happened again with PCV2. Once the "dust" settles and we have a little time to reflect on the situation,

and no doubt once we have established better sow herd immunity without even knowing so at the time, then the disease begins to behave like the others.

So what are some of the lessons that have we learned?

PCVAD is a multifactorial disease. (2) This point should not surprise us. Essentially all diseases are multifactorial, so it is difficult for me to give a presentation where I am not reminded of the need to emphasize the importance of the triad relationship – host, infectious agent, and environmental factors. We have come to realize that genetic make-up of the host, environmental conditions, management practices, stress, and other infectious diseases are all factors that contribute to the severity of PCVAD in a production system. Prior to vaccination, our focus of management of PCVAD revolved around implementation of Madec's Rules which really were rules to help us control the environmental component of the triad. It is unfortunate how quickly we put all of this discussion in the background with the advent of vaccines. There will be another disease. Whether it will surface in two years or ten years I do not know. However, I am confident there will be another disease and again we will be addressing these same environmental factors just as we were doing in trying to control PRRS and PCV2.

What is the take home message? Let's challenge ourselves to continue to address the basic triad of host – infectious agent – environmental factors on all our farms so the next big disease is not so big. I hope that we do not allow the availability of vaccination to make us, as veterinarians, complacent in our responsibility to promote good management practices and long term planning for disease management. Vaccination must never be a substitute for good management practices.

Porcine circovirus acts like other diseases. Just as with other viral diseases such as PRRS, SIV, or TGE, sow health and immunity, and the level of challenge in the nursery to finisher phases all play a role as to how severely the disease will express itself. Prior to the availability of vaccines, we saw the disease within a given herd be quite dramatic for a period of time, and then usually lessen over a year or so. No doubt what happened

was unstable sow immunity become more stable with time, and this delayed the clinical expression of the disease from the nursery into the grower pigs as better maternal immunity was provided. The degree of disease expression in the grower pigs was at least partially dependent upon the viral load that the pigs faced depending on factors such as all in – all out management and sanitation programs.

What is the take home message? PCV2 control, like other viral diseases, requires stable sow and piglet health which is attained through such things as good biosecurity programs, correct gilt acclimation programs, correct gilt and sow vaccination programs, and good piglet management programs. Our challenge is not to become complacent when health stability is under control and begin to cut corners in some of these areas. All of the areas of biosecurity, gilt acclimation, and piglet management are areas that are our responsibility as veterinarians to promote and improve all the time.

Health is king. As quoted by Tim Loula in his address at AASV 2008, health is king. (3) As veterinarians, we can be forgiven for believing that health is more important than genetics or nutrition or production management. For sure the entire package is necessary but I do think health overrides the other technologies. Good health is very fragile, good health is easily lost, and good health is not so easily regained once it is lost. Even with the best production system, the best nutrition, and the best genetics, major disease will destroy the benefits that these other components offer. If we make an error in nutrition or genetics or a particular production practice, none will have the long term economic consequences that a loss of health status causes.

What is the take home message? Biosecurity has to always be at the forefront of our mind but unfortunately we still have lots to learn. How did PCV2 manage to spread through the entire North American industry so successfully? It crossed production systems, genetic lines and country borders as though they did not exist. Obviously our current understanding of biosecurity or our implementation of some of the biosecurity rules is terribly lacking. Did PCV2 spread so rapidly via pig movement, transportation practices, semen, feed ingredients or all of the above? Most likely “all of the above” is

the correct answer. It is especially clear that our current pig production systems and current biosecurity practices fall far short in dealing with a new disease. By the time we recognize the new disease, understand the agent involved, and understand the modes of transmission then the "horse is long out of the gate" and we have lost the battle. Then we are back to looking for another vaccine as quickly as possible to control the crisis. With respect to PRRS, we are making good progress with our understanding of disease transmission, and the role of aerosol transmission in spread of the virus. The results of studies that look at protection of herds from PRRS with air filtration systems are fantastic. Our challenge is to make this type of technology applicable to the entire industry. I suspect it is because we have not yet found highly effective PRRS vaccines that so much money and devotion has gone into studying the routes of transmission and control of transmission of this virus. For a virus like PCV2 that is so hardy, control of the various methods of transmission may be even more difficult, but I wonder if much attention is going to be paid to this at all because we are relying on vaccination to control the problem.

Veterinarians need to be counselors. Within my practice, I believe PCV2 was as great a challenge for us as PRRS. This may not be the case for practitioners in other parts of Canada, USA or Mexico where very virulent PRRS strains have caused and continue to cause great challenges. Until we had PCV2 vaccines, part of the challenge was the helplessness we felt when faced with another case of 10 – 15% grower mortality, plus 10 – 15% grower morbidity and a frustrated producer because we were inadequate in helping him fight the problem.

What is the take home message? One of the greatest lessons for me was seeing our role in not just diagnosing and treating disease, but also empathizing with the client and his frustrations. We are trained to do our best to deal with the science, but we will really do our best when we also deal with the art of being a compassionate listener when the producer feels his world is out of control.

Successful hog production requires thinking "outside the box". For any of us who have been involved in the swine industry for over twenty years, we can easily look back at the incredible number of changes that have taken place within that time period. We have seen the prominent diseases change from bacterial diseases (APP, atrophic rhinitis, swine dysentery) to viral diseases (PRRS, SIV, PCV2). We have seen the industry change to almost 100% use of artificial insemination. We have seen unit sizes increase dramatically, and at the same time shift away from farrow to finish production to segregated production. Diseases like PCVAD continue to remind us that the process of change never ends. Obviously we do not have all the answers yet, and we have to be eager and willing to push the boundaries of conventional thinking and consider changes that will help us prevent or minimize the next big disease.

The adoption of artificial insemination has been a huge advantage for several reasons. It has allowed superior genetics to be used by everyone. It have improved year around conception rates with better control of semen quality. At the same time, AI units pose a continual risk because one large AI unit impacts such a large sow base when a disease break occurs within the unit. All of us are familiar with PRRS breaks in AI units and the consequence with downstream sow farms. I am sure some of the initial transmission of PCV2 through the swine industry occurred via semen. We need to challenge our conventional thinking and examine whether these large AI units are the correct way to go. Perhaps more but smaller AI units are better so one operation does not impact such a large sow base. Perhaps individual on farm AI collection needs more consideration. Or perhaps better technology with frozen semen is the answer so we have more time to monitor for disease change.

As the industry expanded, and moved to segregated production, we saw significant improvements in pig health. The all in – all out approach of nursery and finisher production has helped control and eliminate some diseases like mange and atrophic rhinitis. However, we frequently have to choose between long fill times (greater than 7 days) or short fill times with multiple sow source farms to achieve the all in – all out principle. Neither of these options is ideal. Prolonged fill times mean prolonged emptying

times which means inefficient use of capital. Multiple source fills increases the risk that the co-mingled group will include a source with unstable PRRS status, or the group will have variants of opportunistic pathogens such as *H. parasuis* or *S. suis*. Although sow herd sizes have increased dramatically, we have not made any other major changes in breeding farm flow strategies, and yet we know that the health stability of the sow herd has a huge impact on the health stability of the piglets moving to the nursery. An old idea from the days of small farrow to finish farms that is getting renewed interest is the concept of batch farrowing within the large sow units so that we can create large numbers of piglets of the same age with similar health status to complete rapid, single source fills of nurseries and finishers. Batch farrowing is a great option to allow us to carry out the principles of health control more fully. We must not allow ourselves to rapidly dismiss an idea simply because it initially appears to have too many obstacles. (4)

What is the take home lesson? One of the most exciting aspects of swine veterinary medicine and production is that it has never been boring. We must always be prepared to challenge conventional wisdoms and look for new ways of doing things. Fortunately we did not accept continuous flow farrow to finish farms as the only way to raise pigs. However, we still do not have all the answers.

A disease such as PCV2 is a great teacher. I am pleased that highly efficacious vaccines came to the market as quickly as they did. However, I hope we do not accept these vaccines as the total answer. We need to continue to understand disease transmission and disease control better so that we can be more proactive with the next "mystery disease".

References:

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