PIG HEALTH TODAY™

ISSUE 11

NEWS ABOUT PIG HEALTH PRODUCTS

An interview with
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PCV3: Cause for moderate concern

Q: Pork producers have been battling porcine circovirus type 2 (PCV2) for years. Now numerous reports have surfaced about PCV3. Is this cause for alarm?

VU: Producers need to be moderately concerned because PCV3 is already considered to be widespread among US herds. We don't know if it will follow the same trajectory as PCV2, leading to another costly disease.

However, it's important to realize that it's undetermined yet if PCV3 is pathogenic.

> "At this time, we can't say for sure that any particular disease is caused by PCV3."

Q: Do you mean PCV3 doesn't necessarily cause disease?

VU: That's correct. At the University of Minnesota Veterinary Diagnostic Laboratory (UMN VDL), 27% of more than 2,000 samples from 730 cases submitted were PCV3-positive.[1] A UMN VDL pathologist considered most positive cases subclinical. Researchers from UMN VDL have said the virus is usually harmless and point out it can be found in healthy pigs and in pigs with multiple clinical conditions.[2]

Other PCV3 researchers have indicated the need for more studies before we know if PCV3 has any significant impact on pig health.[3]

Q: Is PCV3 prevalent in certain geographic areas or does it affect pigs of a certain age?

VU: Positive cases at UMN VDL were from 18 of 22 states and involved pigs of all ages.[4]

Q: What diseases have been associated with PCV3?

VU: At this time, we can't say for sure that any particular disease is caused by PCV3.

continued

> "Evidence to date indicates PCV3 has probably been circulating in swine for a long time in the US and other countries. It just wasn't detected."

In the US, PCV3 was linked to porcine dermatitis and nephropathy syndrome on a commercial swine operation in North Carolina that had a 10.2% increase in sow mortality and a 0.6% decrease in the conception rate compared to historical farm averages.[5] PCV3 has also been associated with cardiac and multi-systemic inflammation.[6] But as I said earlier, its role as a swine pathogen remains to be demonstrated.

Q: Can PCV3 occur along with other infections?

VU: Co-infections have been reported. In one epidemiological study of 272 clinical cases of porcine circovirus associated disease, 14.7% were positive for PCV3, and of those, 70% were co-infected with PCV2. Other co-infections the investigators found along with PCV3 included porcine parvovirus and pseudorabies virus. They speculate that synergism may exist between PCV3 and other pathogens.[7]

In a recent study, the proportion of PCV3-positive samples was equally distributed between healthy and diseased animals and was not associated with any clinical condition.[8]

Q: Is PCV3 genetically similar then to PCV2?

VU: It's not. For example, the capsid protein — the shell of a virus around the nucleic acid core — is only 37% identical to that of PCV2.[9]

Q: Does anyone know how US herds initially contracted PCV3 and how the virus is transmitted?

VU: We don't know. Evidence to date indicates PCV3 has probably been circulating in swine for a long time in the US and other countries. It just wasn't detected.[10,11]

PCV3 could be the result of a recombination between unknown parental circoviruses. Another possibility is cross-species transmission, since circoviruses are genetically diverse and can infect a broad range of hosts.

Vertical transmission from sow to piglet has been suggested,[12] but not much else is known about how the virus spreads.

Q: If it's genetically different from PCV2, does that mean PCV2 vaccines would not protect against PCV3?

VU: That's right. Cross protection would be unlikely. In one study, there was no difference in the prevalence of PCV3 in pigs that were or were not vaccinated against PCV2.[13]

It wouldn't make sense to develop a vaccine for PCV3 unless we know for sure that it's a cause of disease. Then we'd need to figure out a way to reproduce PCV3 in the lab. So far, that's not been possible,[14] which hinders our knowledge about this virus.

Q: If there's no concrete evidence that PCV3 causes disease in pigs, should the pork industry bother to test for this virus?

VU: Absolutely. I advise swine veterinarians to request testing for PCV3 in samples sent to diagnostic labs when herds have disease problems similar to those seen with PCV2. This will help us learn more about PCV3.

Q: What tests are done to detect PCV3 infection?

VU: Usually, polymerase chain reaction is the first step. There's a PCV2/PCV3 duplex test available at UMN VDL. Immunohistochemistry or in-situ hybridization are other possible tests.[15] The veterinary diagnostic labs at Iowa State University and Kansas State University also test for PCV3.

Q: How can it be determined if PCV3 is the cause of a disease?

VU: We need to establish the presence of causal relationship. One way to determine if an infectious agent is the cause of a disease is through the application of Koch postulates. In brief, PCV3 would have to be abundantly present in swine with a given disease. It would be possible to isolate PCV3 in affected animals and possible to grow the virus in culture — which, as I mentioned, is proving to be problematic. Lastly, PCV3 would cause disease when administered to healthy pigs, and it could be re-isolated and shown to be the same as the PCV3 that was administered.

There should also be clinical signs of disease, histological lesions and PCV3 antigen or nucleic acid associated with those lesions.

Q: Are some types of samples better than others for detecting PCV3?

VU: At UMN VDL, the rate of positive PCV3 samples was 89% for oral fluids, 81% for processing fluids, 23% for serum and 18% for tissue homogenate.[16]

Q: Do pork producers need to take action to protect herds from PCV3?

VU: Good husbandry and biosecurity are always good defenses against any infectious diseases. For now, we must look to research to discover if PCV3 is, in fact, a cause of disease in pigs. We'd need to know more about its pathogenesis. Only then can we take appropriate, specific steps toward its control.

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For more information, contact Vitelio Utrera (vitelio.utrera@zoetis.com) or your Zoetis representative.

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Toolbox is a series of interviews with veterinarians about their experiences managing antimicrobials, vaccines and other tools for swine health. It is produced by the editors of *Pig Health Today*™ on behalf of the US Pork Business of Zoetis.

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NA-01769