Porcine Circovirus Type 2 - Associated Diseases - An Overview

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Porcine Circovirus Type 2 - Associated Diseases - USA

Objectives for presentation

- Update on clinical manifestations of PCV-2-associated disease cases as currently in Iowa
- Update on past and current research on PCV-2-associated diseases at ISU
- Discuss current strategies for control of PCV-2-associated diseases
- Brief discussion of emerging Canadian situation

Acknowledgements

- Pictures and much information obtained from
  - Dr. Pat Halbur and Tanja Opriessnig
    - Department of Veterinary Diagnostic and Production Animal Medicine
    - Iowa State University
  - other workers are cited
- Materials from Canadian experiences
  - courtesy of Dr George Charbonneau, Dr Ernie Sanford and Dr Robert DesRosiers et al.

Porcine Circovirus Type 2 - Associated Diseases - USA

- Emerging clinical diseases - recognized over past 6 years
- Symptomology similar to other diseases - problem!!
- Primarily grow-finish effects, but some reproductive impact
- Spontaneous occurrence/remission - historic
- Variable morbidity/mortality - generally low
- Complex interactions with other common pathogens
- Treatment difficult/unrewarding - vaccines are possible
- Lack of unanimity in diagnostic significance of PCV-2
- Overriding concern - understanding action pathway for PCV-2 infection as disease causation
PCV-2 Associated Diseases
Issues with Diagnosis

- Non-specific clinical manifestations of common conditions
  - individual vs. groups of pigs
  - multiple events can trigger manifestations
- Circovirus Type 2 – commonly found in normal pigs
- Lack of understanding of lesion development
  - primary pathogen that creates lesions
  - secondary pathogen interacts with other organisms
  - PCV-2 attacks damaged tissues - not a “true” pathogen
  - combination of two above??

**Bottom line: PCV-2 is not a growth promoter**
Postweaning Multisystemic Wasting Syndrome - USA

- Emerging disease ??
- Grow-finish effects – death/performance
- Spontaneous occurrence/remission - historic
- Variable morbidity/mortality - generally low
- Complex interactions – common pathogens
- Etiology - not agreements in initiation
- Treatment difficult/unrewarding

PMWS: Case Definition
S. Sorden, Swine Health Prod 8(3): 133-136, 2000

- Diagnosis of PMWS requires that a pig/group of pigs exhibit all of the following:
  - **Clinical signs**: Weight/weight loss/ill thrift/failure to thrive, with or without other signs;
  - **Histologic lesions**: Depletion of lymphoid tissues +/- lymphohistiocytic to granulomatous inflammation in any organ (typically lungs and/or lymphoid tissues, and less often liver, kidney, pancreas, intestine);
  - **PCV-2 infection**: Demonstration of PCV-2 antigen (IHC) associated with characteristic lesions.

### Trends in PCV2-associated diseases

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### PCV-2 and PMWS

- **Infection of lymph nodes**
  - Lymphoid depletion + histiocytic replacement
  - 90%
- **Low viremia**
- **High viremia**
  - Leukopenia
  - Seroconversion
  - Systemic spread
- **Seroconversion**
- **Infection cleared -??**
- **Subclinical**
- **Clinical PMWS**
- **Mortality**
  - 70-80%
PCV-2 “Systemic Infection”
- “catch all DX” - designates PCV-2 present
- Sick pigs exhibit range of clinical signs - PNR
- Lesions in several organ systems
- PCV-2 widespread in tissues associated with inflammation and tissue damage
- NO evidence of lymphoid depletion – differentiates from PMWS

PCV-2 – Associated Enteritis
- Characterized grossly by moderately thickened small intestines - easily confused with ileitis
- Histopathological examination confirms granulomatous enterocolitis with moderate-to-severe lymphoid depletion and histiocytic replacement of Peyer’s patches, unlike ileitis
- Abundant PCV-2 antigen in lamina propria and Peyer’s patches associated with the lesions

PCV-2 – Associated Reproductive Failure
- Most common in gilt litters or new start-up herds – mixing PCV2 negative and positive sources ??
- Most commonly manifest as increased incidence of mummified fetuses. Increased incidence of abortions and stillbirths is less commonly reported.
- Rarely see increased preweaning (neonatal) mortality along with the reproductive problems.
- Typically very sporadic and short duration with minimal losses - distinguish from other agents (PRRS)

Trends in PCV2-associated diseases

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Porcine Dermatitis and Nephropathy Syndrome - PDNS

- Abnormal immune complexes developed
- Expressed primarily by skin and kidney lesions
- Generally found in sporadic cases in past
- Frequency increasing in field??
- Associated with “new” PMWS ??
- Can mimic Classical Swine Fever!!!
  - get confirmed diagnosis with multiple occurrences
  - may indicate “new” PMWS disease arrival

Ongoing PCV-2 Research Projects at ISU

- Identification of PCV-2 virulence markers
- Comparison of U.S. and European PCV-2 isolates in singular and co-infection models
- Control of PCV-2 with sero-therapy and comparison to PCV-2 vaccine efficacy
- Development and testing of efficacy and safety of a variety of PCV-2 vaccines
- Understanding the immunopathogenesis of PCV-2 -associated diseases

Control of PCV-2 -Associated Diseases

- Confirm PMWS/PCV-2 by histopath, IHC
- Identify and control concurrent viral infections
  - eliminate/control PRRSV if possible
    - focus on breeding herd stabilization and pig flow
    - work to avoid simultaneous coinfection
    - pig MLV PRRSV vaccination
  - eliminate/control SIV with vaccination of sow herd
  - further explore role of Parvo and use of PPV vaccine
    - models and field trials support a role in some herds
- Minimize effects of M. hyopneumoniae with vaccines and/or antimicrobials

Control of PCV-2 -Associated Diseases

- Aggressive treatment of bacterial coinfections
- Determine if associated with the use of certain vaccines or timing of vaccination - veterinary evaluation is required, but
  - Only use vaccines if needed
  - Change products and/or timing of vaccination
    - Oil-in-water vaccines appear to be more problematic - stimulation mechanisms
      - Not all oil-based vaccines are alike
    - Vaccine 2-4 weeks prior to PCV-2 infection
- Anti-inflammatory drugs may be beneficial
Control of PCV-2-Associated Diseases

- Pull sick pigs from building
  - Long term shedding in essentially all body fluids
  - Back up 1-2 stages on diet in sick pen
- **Focus on decreasing stress and improving pig comfort** (Madec’s 20 rules...)
  - Appropriate pig density and AIAO flow
  - Minimize mixing and regrouping
  - Good air quality and appropriate temp
  - Solid pen dividers, mats for sleeping, etc...
- Effective disinfectants (**Virkon-S**)
- Consider a change in genetics?
- PCV-2 vaccines are on the horizon!

What do we know ??

- Canadian experience similar to Europe
- Clinical manifestations are severe and long
- Spread appears to be:
  - animals from infected sow herds (minimal signs)
  - area spread plus (??) semen
  - “complete” isolation seems to be protective
- New bug OR severe sign of existing organisms
- Much work to do to sort this issue !!!!

Recent Canadian Experiences

- Increased severity and number of PMWS
- Spread through Quebec and Ontario
- Spread to Western provinces ??
- Causation unknown – PCV-2 Associated??
- High mortalities in post-nursery pigs
  - 4-12 weeks is common clinical expression
  - mortalities to 30-40% and over in groups
- Routine sanitation not sufficient to control

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Number of PCV Pathology Cases and Percent of PCV Pathology Cases of Total Swine Submissions

Source: Animal Health Lab - Guelph / Delay, McEwen, Camman, Fairles & VanDreumel
Figure 2. PCR-RFLP typing of PCV2

Porcine Circovirus Disease Issues

- Public health
  - Not recognized as infective to humans
  - Increases potential for zoonotic diseases
    - Salmonella, S. suis have increased in incidence

- Animal disposal
  - High and sustained mortality problematic
  - Need longer term strategy

- Human toll substantial
  - Emotional and financial toll
  - Increased animal care - time and talents

Questions???

Thank you for your patience!!