Post-weaning Multi-systemic Wasting Syndrome (PMWS) and Porcine Dermatitis and Nephropathy Syndrome (PDNS)
Foreword

Post-weaning Multi-systemic Wasting Syndrome (PMWS) and Porcine Dermatitis and Nephropathy Syndrome (PDNS) are two relatively new interrelated diseases that pose a significant threat to the economics of the UK, European and world-wide pig industries.

This booklet and ‘Control of PMWS and PDNS’ describe the latest information and research on these diseases and present this knowledge in a format that allows both the farmer and the veterinarian to develop a farm level control strategy.

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Mike Muirhead is a practising veterinary surgeon and pig farm owner, who for the past 25 years has specialised in pigs. Mike is author of 3 books on the management of pig health and disease and is a past president of the Pig Veterinary Society. Many large breeding and nutritional companies, commercial organisations and individual farmers world-wide have benefited from his experience, which is now focused on the problems associated with PMWS and PDNS.

Mike is also one of the consultants to the website www.thepigsite.com, a provider of high quality information to the Global Swine Industry, to which the Meat and Livestock Commission (MLC) provides support for the PMWS Technical Zone, and where updates on this information can be found.

Note:
Throughout the booklet the generic term “disease” is often used. Where appropriate, this term should be taken to mean either or both PMWS and PDNS and/or other associated conditions.

Front cover photograph: Well-bedded hospital pen.
Early signs of PDNS.
Introduction

PMWS is now recognised as being a disease of major economic importance to the Global Swine Industry.

First recognised in Canada in 1996, (and retrospectively diagnosed in 1985) it was first identified in the UK in 1999. Prior to this the disease had been identified in France (1996), Italy (1997) and has been reported in Asia and the USA since the mid 1990’s.

PDNS also emerged as a major problem for pig farmers at the same time PMWS appeared on the scene, although in hindsight, it is believed the first cases of PDNS were seen as far back as 1993, and possibly even earlier.

The causes of both PMWS and PDNS are not fully understood. However, research has identified that an infectious agent, Porcine Circovirus Type 2 (PCV2), plays a significant role in both diseases.

Two types of Porcine Circovirus (PCV) have been identified:

- Porcine Circovirus type 1 (PCV1) was first identified in 1974 and placed in the circovirus family in 1995 along with other animal viruses that include beak and feather disease and chicken anaemia viruses. PCV1 is non-pathogenic.

- PCV2 was first identified in 1997 in tissues associated with PMWS. The virus has also been found in association with other diseases including PDNS, Congenital tremors (CT-AII) reproductive disorders, prenatal myocarditis and proliferative and necrotising pneumonia. PCV2 is widespread and found in both healthy and diseased pigs.
PCV2 Virus and Infection

PCV2 is a very small (17nm), hardy virus that is extremely resistant to heat and most disinfectants. Research has identified PCV2 to be a causal agent of PMWS and that PMWS does not occur without PCV2 infection being present.

PCV2 is very widespread and the presence of the virus can be confirmed in most healthy herds and all diseased herds by the presence of circulating antibodies. This highlights two points; multiplication of the virus takes place, but the presence of virus does not necessarily lead to clinical disease.

Although it has been shown in the laboratory that PCV2 alone can cause very mild disease, the incidence and severity is greatly increased when pigs are co-infected with another virus or the immune system is challenged by other agents. This suggests a trigger is needed to cause disease.

The key points to understand about the PCV2 virus are explained below:

- The virus is widespread within most herds, as antibodies can be found in some pigs on almost all pig farms.
- Antibodies have been present since 1974 in some herds.
- PCV2 alone is unlikely to cause disease.
- The virus is highly resistant to many disinfectants. However, sodium hydroxide and Virkon S, (1% solution) have been shown to be the most effective.
- PCV2 appears to spread easily, although there is a lack of understanding in this area. Field observations suggest the following mechanisms may be involved:
  - **Mechanical transfer**: Dung/manure on boots, equipment, vehicles, birds, rats, mice etc.
  - **The carrier pig**: PCV2 may persist in the infected pig for long periods of time (5–6 months). The virus is excreted via the nose, faeces and semen, thus spread is likely to occur by direct pig to pig contact.
  - **Semen**: PCV2 may be excreted for up to 6 weeks in semen. It is therefore theoretically possible that the virus could be spread by AI or natural matings, although to date this has not been confirmed.
Post-weaning Multi-systemic Wasting Syndrome

Clinical symptoms of PMWS

It is important to appreciate that the clinical symptoms of PMWS vary considerably from farm to farm. This is an important factor in making a diagnosis because in the early stages it can be confused with other diseases (detailed later). Veterinary advice is essential to confirm a PMWS diagnosis. Mortality rates from PMWS also tend to be variable and fluctuate on farms.

The key points to understand are as follows:

- The disease can strike any herd regardless of health status or production system.
- Disease onset is often slow.
- PMWS generally affects pigs from 6 to 14 weeks of age.
- The disease may also affect pigs up to 20 weeks of age.
- PMWS causes wasting, depression and inappetence.
- Mild conjunctivitis with tear-staining is often seen.
- Affected pigs look pale and/or jaundiced and have diarrhoea.
- Sick pigs show severe respiratory distress.
- Sudden death of good pigs is sometimes the only symptom.
- The number of pigs affected can range from 3–50%.
- Up to 80% of affected pigs die (i.e. a 40% postweaning mortality is not unknown).
- Secondary diseases such as Glässers, meningitis, pneumonia, pleuropneumonia and salmonellosis are common.
- PMWS is often seen after an initial outbreak of PDNS or vice versa.
Diagnosis of PMWS

This is based upon three key areas: the clinical signs, as described above, the post mortem picture and laboratory examinations. Because PCV2 is also present in normal healthy farms the presence of antibodies cannot be used for diagnostic purposes.

Post mortem examinations

The picture is variable but includes:

- Affected pigs are usually 6 to 14 weeks of age but can be up to 20 weeks of age.
- Sudden death with massive effusion of fluid in the chest, abdominal cavities and the heart sac.
- Severe interlobular oedema (fluid) of the lungs.
- Secondary pneumonias with abscesses and consolidation (hard collapsed areas).
- Enlarged liver and spleen.
- Enlarged lymph glands particularly the inguinal ones.

Figure 1  Mortality and the progression of disease

A - A good health and status management

B - A poor health status with poor management

Two possible pictures in each case

Note: PMWS persists at a variable level
Post mortem examinations (continued)

• Enteritis.
• Multiple white foci (spots) on the surface of the kidneys.
• Severe oedema of the mesentery of the large bowel and caecum.
• Gastric ulceration and oedema of the stomach wall.
• Heart muscle changes in piglets.

Laboratory tests

Three different laboratory tests are used.

1. Histopathology - Inclusion bodies (virus particles) are found in the cells of the lymph glands, liver and spleen. There is loss of normal tissues in lungs, liver, kidneys which are replaced by lymphocytes and histiocytes.

2. Immunocytochemistry.

3. PCR tests.

Enlarged liver and spleen present in a pig suffering from PMWS.

Mild conjunctivitis with tear-staining is often seen in PMWS.
Porcine Dermatitis and Nephropathy Syndrome

Clinical signs of PDNS

The clinical signs for PDNS are highlighted below, the most striking being the red/brown skin lesions.

Veterinarians should be on their guard if dealing with the acute epidemic form of PDNS. The clinical signs and post-mortem picture are very similar to Classical Swine Fever. Such a picture should be immediately reported to the authorities for differential diagnosis.

Other disease/conditions that can be confused with PDNS are detailed later. Veterinary advice is essential to confirm a PDNS diagnosis.

The key points of PDNS are:

- Appearance of red/brown circular lesions under the skin with haemorrhages.
- Lesions usually appear on ears, face, flanks, legs and hams.
- Generally affects pigs from 10 to 16 weeks of age.
- Occasionally affects pigs from 5 to 24 weeks.
- Good pigs are often affected.
- Sudden death is sometimes seen following appearance of skin lesions.
- Pigs waste then die.
- Morbidity usually low (<5% of pigs affected).
- Mortality is often high (>50%).

Skin lesions associated with PDNS.
Diagnosis of PDNS

Diagnosis is based upon the clinical signs and the post mortem picture. However, in most cases the skin lesions are very evident. Recent work has indicated that infection with certain types of pasteurella in conjunction with PCV2, may be involved with this disease.

Post mortem examinations

- Affected pigs are usually from 10 to 16 weeks of age, but occasionally 5 to 24 weeks of age.
- Pigs are usually in good condition.
- Severe dark red/brown haemorrhagic skin lesions.
- Enlarged haemorrhagic lymph glands.
- Kidneys pale with haemorrhagic areas.
- Small haemorrhages in the lungs, small and large intestines.
- Gastric ulceration.

Laboratory tests

Histopathology - Loss of lymphoid tissues in lymph nodes. Signs of nephritis and inflammation of blood vessels in the skin and lymph glands.

Disease/conditions that can be confused with PMWS/PDNS:

There are a number of conditions that can be confused with either PMWS and/or PDNS, which is why it is important to consult with your veterinarian. The main ones, including Classical Swine Fever, are outlined below:

- Poor nutrition/starvation.
- Post weaning fading and villus atrophy (malabsorption).
- Diarrhoea (Salmonella, E. coli, Rotavirus, TGE).
- Porcine Reproduction and Respiratory Syndrome (PRRS).
- Mycoplasma hyopneumoniae infection (Enzootic pneumonia or Mycoplasma pneumonia).
- Glässers disease.
- Ileitis.
Disease / conditions that can be confused with PMWS/PDNS: (continued)

- Classical and African swine fevers (PDNS - see earlier note).
- Pasteurella infections.

**Epidemiology**

The exact role of PCV2 in the appearance of disease is not fully understood although the severity appears to be related to levels of infectious agents on the farm. Continuous production through buildings creates heavy challenges to the immune system. This continual challenge is believed to be the trigger factor that enables PCV2 to invade the lymphoid system to create disease. The role of nutrition is thought to be important in maintaining and improving health, and the availability of anti-oxidants may be important.

The following key points should be noted:

- PCV2 is found in most healthy and all diseased herds.
- Trigger factors are crucial. These seem to allow PCV2 to enter the lymph tissues and immune systems, causing disease.
- Trigger factors so far identified include exposure (or challenge) to PRRS virus, Porcine parvovirus (PPV), certain adjuvants in vaccines, heavy exposure to organisms already present on the farm and poor management.
- Impaired or inadequate nutrition predisposes.
- Certain breeds may be more susceptible.
- The possibility arises that PCV2 has become more pathogenic when the immune system is challenged.
- In the UK, the disease appears to behave like a new pathogen when it enters a naive herd.
- Disease is not seen in sows, gilts and sucking pigs although reproductive problems are reported in the USA.
- Disease/infection commences from around 3 weeks of age, becoming apparent from 4–6 weeks onwards.
Epidemiology (continued)

- Disease may be associated with low or no colostral antibodies to PCV2. Pigs with high levels of antibody do not appear to succumb to disease.
- Piglets can be infected with PCV2 in the uterus or at birth.
- In infected herds almost 100% of pigs show antibodies to PCV2 by 95kg of weight.
- PCV2 is very resistant to most disinfectants and persists in the environment for many months.
- The persistence of disease on any one farm can vary from 4 months to at least 18 months, and in some cases longer.
- Generally, the higher the herd health status the less severe the disease outbreak.
- Some studies have shown more piglets are affected from certain sows, whereas piglets from other sows are not affected at all, suggesting a sow or age effect.

References


Photographs: Copyright 5M Enterprises Limited 2002, excluding the electron micrograph of circovirus courtesy of Veterinary Sciences Division, Belfast.

April 2002/02182 141/10M