



Frequently Asked Questions

Postweaning Multisystemic Wasting Syndrome (PMWS) and Porcine Dermatitis Nephropathy Syndrome (PDNS)

What is PMWS?

PMWS is the short name for Post-weaning Multi-systemic Wasting Syndrome, an important disease of pigs.

What is PDNS?

PDNS is the short name for Porcine Dermatitis Nephropathy Syndrome, a disease of pigs.

PMWS - Postweaning Multisystemic Wasting Syndrome

What are the clinical signs of PMWS?

PMWS affects pigs mainly between 6 and 14 weeks of age. The clinical signs of PMWS are quite variable. The main signs are loss of condition, enlarged peripheral lymph nodes, paleness and depression. There may also be laboured breathing, coughing, fever, inappetence, sudden deaths, jaundice, diarrhoea, blue ears, oedematous eyelids, nervous signs (loss of balance, paralysis) or any combination of these signs

Are the clinical signs specific to PMWS?

There are many other conditions that can cause wasting in pigs. Many infectious diseases can cause wasting including PRRS, Swine influenza, Ileitis Enzootic Pneumonia and also Classical Swine Fever. There are also some non-infectious causes of wasting in pigs that must be ruled out, such as failure to adjust to solid diets. It is important to check management factors as they are the most important alternative underlying cause of wasting.

How can PMWS be diagnosed?

Diagnosis is based on the clinical picture, post-mortem findings, laboratory tests and the lack of response to treatment. Post-mortem findings are variable and it is recommended that 6 to 10 pigs should be examined to make a diagnosis. More advice on diagnosis will be available from your veterinary surgeon.

What is the cause of PMWS?

There has been a lot of research on the cause of PMWS. Most of the evidence points to the involvement of a virus called Porcine Circovirus-2 (PCV-2) in the disease. PCV-2 can always be found in pigs with PMWS. However, researchers have only been able to reproduce a mild form of the disease when pigs have been infected using only PCV-2. A disease similar to that seen on farms was only reproduced when pigs were infected with PCV-2 and other agents eg parvovirus, PRRS. Although the PCV-2 virus appears to be present in all cases it is possible that other factors may be involved in triggering the disease PMWS eg bacterial toxins, mycotoxins, other viruses.

Is Porcine Circovirus-2 (PCV-2) only found on farms with PMWS and PDNS?

It is thought that the PCV-2 virus is present on most pig farms. There is evidence from studies on blood samples

that sows on most pig farms have been exposed to PCV-2 because they have specific antibodies to PCV-2.

IS PMWS a new disease?

It is now known that sporadic cases of PMWS have occurred in pigs since at least 1986. However, large outbreaks of the disease were not recorded until 1991 in Canada. PMWS has now been reported in most of the major pig producing countries including the Netherlands, France, Spain, Germany, Denmark and USA as well as UK.

PDNS - Porcine Dermatitis Nephropathy Syndrome

What are the clinical signs of PDNS?

Porcine Dermatitis Nephropathy Syndrome mainly affects pigs between 12 and 16 weeks of age. The main signs of PDNS are wasting or fading. The classical clinical signs of PDNS are multiple haemorrhages under the skin. These appear as circular red lesions located particularly around the tail, hind-quarters and ears. On some affected units less than 1 in 200 pigs may develop the skin lesions. Some pigs may recover from the skin lesions. Lymph nodes are massively enlarged (x 10).

Are the clinical signs specific to PDNS?

There are some other conditions that can cause similar signs in pigs. In particular, signs can sometimes be confused with Classical Swine Fever or African Swine Fever. Laboratory testing can make an accurate diagnosis.

How can PDNS be diagnosed?

Diagnosis is based on the clinical picture, post-mortem findings, laboratory tests and the lack of response to treatment. Post-mortem findings are variable and it is recommended that 6 to 10 pigs should be examined to make a diagnosis. More advice on diagnosis will be available from your veterinary surgeon.

What is the cause of PDNS?

The cause of PDNS has still not been completely worked out. There is little evidence but researchers believe that the virus, Porcine Circovirus-2 (PCV-2) may be involved in the disease. Immune complexes in PDNS damage small blood vessels in many organs but particularly in the kidney.

IS PDNS a new disease?

In the UK PDNS was first described in 1993 although cases may have occurred even earlier. Sporadic cases were being seen on an irregular basis but outbreaks of PDNS were first noted in the second half of 1999.

Effects of PMWS and PDNS

What is the effect of PMWS and PDNS on herd performance?

Mortality rates of up to 20% are common with both PMWS and PDNS. Higher mortality rates have been experienced for short periods on some units. There are additional losses in both diseases from effects on performance and the need to cull pigs that survive but stop growing.

What about other infections?

Other diseases can increase as a result of the pigs being weakened because of infection with PMWS and PDNS. Many diseases can cause additional problems including Glasser's Disease, Salmonellosis, *Streptococcus suis*, Enzootic Pneumonia, Swine dysentery, *Actinobacillus pleuropneumonia* and *Pasteurella* infections.

Are there any problems in other ages of pigs?

There are some reports that indicate that PCV-2 could cause abortions in sows and respiratory disease, without wasting, in young pigs. This has not been noted on farms to date. There have also been no field reports of problems in pigs between birth and 6 weeks associated with PCV-2. Some farmers have reported an increase in pigs scouring before weaning. Further research is required to confirm if this is related to PCV-2 infection.

What is known about the incidence of these diseases in the UK?

There have been outbreaks of PMWS on a large number of farms in England since the 1 August 1999 with high morbidity and mortality (2 to 22%). The morbidity and mortality of PDNS also increased during this time period (mortality 0.25-20%). PDNS and PMWS tend to occur on the same unit although one form may predominate. Scotland had few cases until 2001 but since 2002 it has become widespread similarly.

How long do problems continue on affected farms?

As reported in other countries, units experiencing problems with PMWS have tended to experience a sudden onset of problems and serious problems for 18 months to 2 years – less on some farms but longer on others. There have also been ongoing smaller effects on production after this initial phase with post-weaning mortality rates on many farms remaining 2-5% higher than before PMWS.

How are the diseases spreading?

Our knowledge of these diseases is still limited. It is likely that the infection can spread from pig to pig although this has yet to be confirmed. The infection could be passed to the piglets in the uterus although this has also not been confirmed. It is possible that birds and small mammals could play a role in disease transmission but this will have to be checked by further research. The circovirus involved in PMWS is endemic in pig herds with and without disease so spread of PMWS appears to be related to the "spread" of "trigger factors". These trigger factors can be infectious or non-infectious.

How long is it from infection until there are signs of disease?

From laboratory studies it would appear that the incubation period is about one month. It could be longer or shorter than this on farm.

Do these diseases affect all pigs equally?

Not all pigs in a litter are affected to the same extent and some may be completely unaffected. Unaffected herd mates appear to have close to normal growth rates. It is not clear whether age or stage at infection is important and more information is needed on this.

How can I stop PMWS and PDNS getting on to my farm?

As not enough is known on transmission it is not possible to give absolute guidelines on preventing the introduction of PMWS and PDNS on to pig farms. More information is required on how they spread and become established on farms. Other diseases can increase the severity of PMWS. Focus is on the prevention and control of known risks.

- Bringing pigs on to a farm from other units probably represents the greatest risk of introducing diseases. It is not known whether PMWS or PDNS can be transmitted in semen but for most other diseases the use of AI is a lower risk than the purchase of breeding stock.
- It is possible that people, birds or animals other than pigs could introduce disease on to your farm. You should have a strict visitor policy and vermin control programme. All-in All-out systems on a house or room basis are recommended. Rooms should be thoroughly cleaned and disinfected between batches to reduce the risk of disease being passed from older to younger pigs.
- New breeding stock should be quarantined for as long as possible. Checks should be made with the supplier before and during quarantine to ensure that that unit has not been experiencing problems with PMWS and PDNS. Make a final check before letting pigs out of quarantine.
- Speak to your veterinary surgeon for further advice on preventing the introduction of diseases.
- If you do not have PMWS, consider very carefully any changes to your current regimes and husbandry practices.

What can I do if PMWS affects my farm?

The main control points can be categorised into Mike Muirhead's "four golden rules".

1. **Limit pig-to-pig contact.** Many diseases spread around the farm by pig-to-pig contact. Limit pig-to-pig contact and you will help to limit the prevalence of disease. REMEMBER pig-to-pig contact can also be INDIRECT by a needle, surgical instrument, manure or people.
2. **Minimise "stress".** Stressed animals are far more likely to become diseased. Apart from obvious physical stress factors, exposure to micro organisms can cause major stress to the immune system. If the immune system is overactivated, the PCV2 virus may produce disease, unless there is a good level of colostral antibody. THINK – If a procedure causes the pigs to become stressed, ask "can this be done in a less stressful manner?".

3. **Good Hygiene.** There is no substitute for good hygiene and biosecurity measures. Cleaning and disinfecting buildings and instruments coupled with good hygiene will make a difference. Don't spread disease by needle or other instruments.
4. **Good nutrition** is important not just for growth but also for development of the immune system. Colostrum provides protection against diseases present on the farm and it is important to ensure that pigs get as much colostrum as possible in the first 12 hours of life. After weaning pigs should be encouraged to eat high quality diets, eg provide gruels, extra feeding points. High levels of antioxidants in weaner diets may help strengthen the immune system improving the pigs' ability to fight off infection
 - Reducing stress through later weaning, keeping pigs in litter groups and/or minimal mixing until they are 30 - 40kg help reduce the impact of PMWS on some farms.
 - Leaving piglets in the pen, after removing the sow at weaning, until they are older and heavier may help.
 - Multi-site production units should try to minimise the mixing of pigs from different units.
 - Particular attention should be paid to stocking rates and ventilation.
 - Affected animals should be removed to hospital pens. If nursed intensively the impact of the disease and mortality rates can be reduced.
 - Further advice is available in the booklets "Control of PMWS and PDNS" and "Clean Flow Health Management" available from MLC.
 - Seek advice from your veterinary surgeon particularly on the treatment of affected pigs.

Can I get rid of the diseases by depopulating the unit and repopulating?

A number of strategies have been tried on units. These include depopulation and repopulation; partial depopulation of certain age-groups; All-in All-out systems with strict controls. Experience has been variable but many units have seen a reduction in mortality rates and an improvement in performance. The improvements may be related mainly to their effects in controlling other pig diseases but also to the control of PMWS and PDNS.

Is there a vaccine?

Two companies are working on the development of a PCV-2 vaccine. However, at this stage it is unlikely that a vaccine will be commercially available in 2004.

Is cleaning and disinfection effective?

PCV2 virus is very resistant but cleaning and disinfection of affected units should reduce the overall burden of infection. Cleaning prior to disinfection is very important as dirt can neutralise disinfectants and make them ineffective very quickly. In laboratory tests VirkonS was the most effective against PCV2. Strong hypochlorite solutions would probably be the 2nd choice although there is no evidence available on effectiveness against PCV2.

What should be done with transport vehicles?

All transport vehicles should be thoroughly cleaned and disinfected after transport of one batch of pigs and before

transport of subsequent batches. Disinfection should take place a minimum of 15 minutes before loading pigs.

Is any research being done on PMWS and PDNS?

Research on PMWS is being carried out in a number of countries - Canada, USA, Spain, France, Belgium, the Netherlands, Denmark and the UK. The EU has funded programmes of research into PMWS. Less research has been done on PDNS.

One of the most active research groups on porcine circoviruses is the Veterinary Sciences Division of the Department of Agriculture and Rural Development in Northern Ireland. This group has demonstrated that while PCV-2 may be present without disease PCV-2 is always present where PMWS occurs.

A team at the Veterinary Laboratories Agency at Weybridge is studying PDNS. An epidemiological study by the University of Warwick is under way. SAC have reported studies on the possible role of bacterial toxins in PDNS. MLC has funded four studies relating to PMWS.

Q. How realistic is it to believe that good hygiene and cautious sourcing can stop PDNS/PMWS spread?

A.: Before August 1999 PMWS and PDNS were rarely identified but in the following 9 months there had been over 400 incidences. It has to be accepted that we do not yet know enough about PDNS and PMWS to be absolutely sure that we can prevent further spread of these diseases in GB.

Good biosecurity is essential to minimise the risk of introducing any disease on to pig units. Pigs probably represent the greatest threat for spread of the disease. If the disease is not present on a unit then it is important to source pigs from a unit that has not been affected. A vet-to-vet conference may be useful for establishing the health status of the source unit. Incoming pigs should be held in quarantine for as long as possible - at least 30 days for breeding stock.

Specific precautions should be taken to ensure that staff looking after the pigs in quarantine units minimise the risk of transferring disease. They should use separate equipment and protective clothing and boots in the isolation unit. Ideally staff should only service the unit at the end of the day and should not return to the main unit that day. Further assurances on health status should be sought from the source unit before releasing the pigs from isolation on to the main unit. Vehicles used for transporting pigs should be thoroughly cleaned and disinfected when pigs are being transferred on to farms.

Contact with pig faeces is likely to represent the next highest risk after direct contact with other pigs. A good rodent and pest control programme will reduce the risk of introducing the disease although we cannot be sure if these pests play a role in the spread of PMWS. There is some concern that birds could play a role in PMWS spread. It is important to ensure that birds do not have access to feed storage areas.

People coming into the unit may also represent a risk. This is particularly true of people who may visit a number of pig units eg service engineers, lorry drivers. If people must come onto the unit their contact with pigs should be minimised. Boots and clothing should not have been used on other units and if necessary protective clothing and boots should be supplied. Vehicles should be left outside the unit and any equipment transferred using farm vehicles. If it is essential to

use equipment that has been used on other farms then it should be sprayed with or soaked in disinfectant.

Other unknown factors may be involved in the spread of PMWS and PDNS but the steps outlined above will minimise the risk of introducing other diseases as well as reducing the risk of introducing PMWS and PDNS.

Q. What should producers who have had PDNS diagnosed do to ensure it is not SWINE FEVER?

A.: The clinical signs of Porcine Dermatitis Nephropathy Syndrome (PDNS) and Post-Weaning Multisystemic Wasting Syndrome are very similar to Classical Swine Fever. Farmers faced with sick haemorrhagic pigs should seek veterinary advice from their own veterinary surgeon or the Defra Divisional Veterinary Manager so that other diseases including notifiable diseases such as Classical Swine fever or African Swine Fever can be ruled out.

Any age group of pig can be infected with Classical Swine Fever. You should immediately inform your veterinary surgeon and the Defra Animal Health Office of any suspicious clinical signs.

My breeding herd has suffered PMWS for 9 months with no sign of relenting. If I was to totally destock how long would the virus persist in my buildings, assuming that no disinfectant can be 100% effective on a whole farm basis

A.: Most herds are PCV-2 positive so the virus will almost certainly be reintroduced when the farm is restocked. The aim when destocking should be to eliminate other diseases such as enzootic pneumonia and PRRS, raise the general health status and thereby reduce the impact of PMWS. Destocking has been tried as a control strategy for PMWS but it has not been fully evaluated. The impression is that results have been mixed but generally favourable.

PCV-2 virus is very resistant to inactivation. It can survive being heated to 70°C for 15 minutes and is not inactivated at pH3. In laboratory studies VirkonS was the most effective of the disinfectants tested but only a limited range have been tested to date. On farms organic material (pig manure, dirt, dust) neutralises disinfectants and can make them ineffective very quickly. Cleaning prior to disinfection is therefore very important. Cleaning and disinfection should reduce the level of challenge but it is unlikely that it would be 100% effective for PCV2.

The length of time that the PCV2 virus can survive in the environment has not been studied. The circovirus seems to be at least as resistant to inactivation as parvovirus, which may also be a co-factor in causing PMWS. Because the virus has been shown to be very resistant it is assumed that it can survive for long periods - probably at least 6 months.

Examination of blood samples from Northern Ireland and elsewhere has shown that serum antibodies to PCV-2 have been present in a high proportion of pigs since at least 1974. This suggests that either the virus has changed and become more virulent and/or changes in commercial pig farming practices worldwide have allowed the PCV-2 virus to multiply more quickly leading to PMWS.

Further studies are required on other interacting co-factors that may be important in the development of this syndrome such as weaning age and the effects on the immune system of the social stress of mixing litters of young pigs.

Q. Is there a laboratory test to diagnose PMWS?

A.: There is no definitive diagnostic serological test for PMWS at this stage. The diagnosis can only be made on the basis of the clinical picture on the farm, post-mortem findings and laboratory analysis of tissue samples. A number of laboratories, including the Veterinary Sciences Division, Stormont, Belfast, have developed serological and PCR tests for Porcine Circovirus-2, the virus considered to be one of the major factors involved in triggering the disease. Serological surveys appear to show that many pigs have been exposed to Porcine Circovirus-2 without developing PMWS. Antibodies to PCV-2 have been found on examination of sera taken from pigs over the past 30 years, long before PMWS was identified as a disease problem in the UK. If there are no clinical signs of PMWS on a unit the significance of a positive serological result for PCV-2 is not clear at this stage.

Q. Can semen be a major cause of infection with PMWS? Should producers buy semen from A.I-studs that are negative for PRRS and Circo-2 virus?

A.: The importance of semen in the transmission of PMWS has not been thoroughly investigated. A Canadian research group reported finding PCV-2 DNA in 6% (2 of 34) of semen from randomly chosen healthy boars. The finding that PCV-2 DNA was in semen is not proof that the virus can be transferred in semen and cause infection but is evidence that there is potential for it to be transferred in this way. At this stage there does not appear to be any commercially available test for PCV-2 in semen although VSD, Belfast have developed a test with MLC funding.

The strains of PCV-2 tested to date do not differ in virulence. Most pig farms appear to have been exposed to PCV-2. The value of insisting that semen comes from studs that are serologically negative to PCV-2 is debatable. Ideally the sources of boars for boar studs should have no recent history of PMWS and PDNS.

Research has shown that PRRS virus can be shed in semen for as long as 43 days after exposure to the virus. Transmission of PRRS virus through AI with undiluted semen from experimentally infected boars has been demonstrated. If a herd is free of PRRS then it should use semen from boar studs that are PRRS-negative.

Question: Is there any treatment for the disease?

A.: There is no specific treatment for either PDNS or PMWS. The diseases are thought to be caused by a virus. There are no antiviral medicines for animals on the market.

The effects of the disease can be minimised by good management. Mixing pigs seems to aggravate PMWS and should be minimised. Reducing stress through later weaning, keeping pigs in litter groups or minimal mixing until they are 30 to 40kg have helped to reduce the impact of disease on some farms. Particular attention should also be paid to stocking rates and ventilation.

Affected pigs should be removed to hospital pens. If affected pigs are nursed intensively the effects of the disease may be reduced. Many pigs develop other diseases which can be treated – eg pneumonia, scouring, Glasser's Disease. The farm vet can advise on treatment of these other diseases and also on how best to minimise the effects of PMWS.