

# Porcine Circovirus Disease (PCVD) – Have we won the war in Europe?

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## ■ Introduction

Respiratory and systemic diseases are the most common and costly diseases in nursery and finishing pigs. On one hand, there is a multitude of microorganisms that have the ability to cause or exacerbate respiratory/systemic diseases in swine and, on the other hand, adoption of intensive swine production methods may have contributed to the development of respiratory/systemic disease complexes. One of these systemic complexes is postweaning multisystemic wasting syndrome (PMWS), a multifactorial disease in which the involvement of porcine circovirus type 2 (PCV2) is strictly needed but not sufficient (Segalés et al., 2005).

PCV2 has been associated with a number of disease syndromes or pathological conditions in pigs during the last 10 years, and terminology porcine circovirus diseases (PCVD) was proposed to replace existing acronyms (Allan et al., 2002). The role of PCV2 in some of these PCVD is debatable; while PMWS and reproductive disease has been, somewhat, reproduced in a number of experimental studies, the causal role of PCV2 in other pathological conditions such as porcine dermatitis and nephropathy syndrome (PDNS), porcine respiratory disease complex (PRDC) and proliferative and necrotizing pneumonia (PNP) is questionable (Segalés et al., 2005). The putative association of PCV2 with congenital tremors All has not been supported by most recent studies.

PMWS is considered the most significant PCVD, and most of the prevention/control and research efforts have been focused on it. In fact, it was estimated that PMWS cost the EU pig producers losses in excess of 600 million EURO per year, at least during years 2000-2003 (Armstrong and Bishop, 2004). PMWS was first described in Europe in 1995, in France (LeCann et al., 1997). Since then, the disease has been reported in most of

the European countries that have looked for it, and it has been considered a serious threat to European pig production (Wellenberg and Segalés, 2006).

The objective of the present review is to describe the nowadays situation of PMWS in Europe and to compare it with that of late 90s and beginning of 2000s, when major outbreaks of disease were diagnosed. Speculation on the effect of the implemented control and prevention strategies on PMWS evolution is discussed. Since a centralized database on PMWS occurrence is not available at a European level, some of the information given in this review is based on personal observations, discussions and information given by veterinarian colleagues throughout Europe.

## ■ PMWS Situation in Europe

Countries in Europe can be divided into five main different categories in regards to PMWS at present (adapted from Segalés, 2006):

1. Countries in which the impact of the disease has been or it is still severe or very severe. This category might be further sub-divided, since some countries still consider PMWS as a major disease in its national swine production (such as United Kingdom, Denmark, Austria, Ireland and Sweden), while others had very severe problems between 1995-2003, but the disease is nowadays less evident (such as France, Spain, Portugal, Italy, Germany, Greece, Czech Republic, Hungary, Poland, Croatia, Slovenia and the Netherlands)
2. Countries in which, despite describing cases of PMWS, the disease does not seem to represent a major problem, or it is absent nowadays (such as Switzerland, Belgium and Norway)
3. Countries that have reported PMWS cases but no data to establish how important the disease is in their respective swine populations (such as Serbia-Montenegro, Bulgaria, Lithuania and Latvia)
4. Countries that have never reported the disease (such as Finland), although surveillance systems have been implemented
5. Countries with unknown PMWS status (Estonia, Albania, Iceland, Macedonia, Slovakia, Cyprus, Bosnia-Herzegovina, Romania, Belarus, Russia, Ukraine and Moldova)

Country category must be seen as subjective, since sometimes it only reflects observations of some veterinarians and colleagues, and not a wide national survey. As a general statement, it can be said that prevalence and incidence

of PMWS (based on confirmed laboratorial diagnoses) in most significant pig producing countries have decreased during last 3-4 years. Certainly, this does not mean that PMWS is not an important disease nowadays in those countries, and careful interpretations of diagnostic data must be considered. Other factors to explain the lower number of PMWS diagnoses in the last few years might be taken into account (Segalés and Morvan, 2004):

- Veterinarians have learnt how to clinically diagnose or suspect the disease much better than in the past, so they do not confirm the diagnosis with laboratory analyses
- Both veterinarians and farmers have learnt to “live together” with higher rates of postweaning mortality, so the same levels of mortality that in the past deserved laboratory analyses do not deserve them today
- Laboratory diagnostic submissions have been limited to those cases where a reasonable doubt regarding “to be or not to be” PMWS exists or to those where the objective is only to rule out PMWS

In fact, herds affected by PMWS rarely return to postweaning mortality rates existing before the first detection of the disease, in the opinion of a significant proportion of veterinarians. Therefore, it would not be surprising that a more enzootic form of PMWS (not so easy to diagnose as before, from a clinical point of view), with lower levels of mortality and less severe clinical signs, is nowadays present in those countries that first experienced severe outbreaks of disease.

The origin of differences in PMWS presentation among countries is not well understood. In fact, PCV2 infection seems to be widespread in all of them based on serological studies. On the other hand, when different PCV2 isolates from different parts of Europe (and even worldwide) are genetically compared, 94% or higher nucleotide identity is observed (Olvera et al., 2006). This fact might suggest that, from a theoretical point of view, minimal differences should exist among those isolates and, therefore, it would be difficult to explain pathogenicity differences of PCV2 isolates based on the viral sequence. However, this issue is nowadays a “hot topic”, which is being addressed by researchers from both Europe and North America. It is probably too early, based on the available information to date, to rule out or confirm definitively whether differences in pathogenicity among PCV2 isolates do exist.

## ■ Prevention and Control Methods

Common sense indicates that the best way to control a viral infection would be using vaccines if such products are available. However, only one PCV2 vaccine is currently commercially available and in use under special license in France (since 2004), Germany (since 2004) and Denmark (since 2006),

indicating that most European countries still demand a vaccine product to control the disease.

PMWS is defined as a multifactorial disease that involves infection of pigs with PCV2 and the influence of infectious and non-infectious factors or triggers for the development of clinical disease (Segalés et al., 2005). The ubiquity of PCV2 infection and the lack of an available vaccine product against the virus in most of the European countries implied that most if not all efforts to control PMWS were directed towards interventions on “known” triggering, risk or “worsening” factors involved in individual farms. The most studied co-factors and triggers in relation to disease progression or protection are outlined below:

### **Management and Zootechnical Measures**

The implementation of what is today known as the Madec’s 20-point plan (a list of management measures to lower the impact of the disease) has significantly decreased the percentage of mortality in severely affected herds (Madec et al., 2001). These measures were designed to reduce “infection pressure” in regard to PCV2 and any other infections, improve hygiene and to reduce stress at the different production stages (Madec et al., 2000; Madec and Waddilove, 2002). Management usually ameliorates the disease situation but does not overcome it.

### **Concurrent Diseases**

Control of concurrent viral and bacterial infections in the postweaning area have decreased the incidence of PMWS in most affected herds. Control of porcine reproductive and respiratory syndrome has been a cornerstone in a significant proportion of herds. In a proportion of cases, the control of significant concurrent diseases implied the practical disappearance of PMWS.

### **Stimulation of the Immune System**

The induction of clinical disease following immunostimulation in conventional pigs reared under commercial conditions is still a debatable issue (Allan et al., 2001; Kyriakis et al., 2002; Haruna et al., 2006). However, since it is a described potential triggering factor, re-scheduling the timing of vaccination (mainly with mineral oil-based vaccines) to minimize the PMWS impact has been used by those veterinarians that have had a reasonable evidence of this triggering. However, the true impact of this measure has not been properly tested.

## **Nutrition**

An increase in the nutrient density of young pig diets and addition of commercial feed additives (most of them with anti-oxidant effect) and vitamin complexes have been used to ameliorate the effects of PMWS. However, no clear effect of these measures has been shown.

## **“Serum-therapy”**

Subcutaneous injection of PCV2 hyperimmune sera from commercial slaughterhouse age pigs in suckling or nursery pigs has been reported as successfully reducing mortality in several PMWS affected herds of France, Spain and United Kingdom (Ferreira et al., 2001; Waddilove and Marco, 2002). However, success of this procedure has been variable, and the use of “serum-therapy” in some farms did not result in any significant effect. Moreover, recent studies reported no benefit of using this methodology (Hassing et al., 2006; Opriessnig et al., 2006). The mechanism of action of “serum-therapy” has not been elucidated yet.

## **Genetics**

Field observations from farmers and veterinarians suggested that certain genetic lines of pigs, specifically in relation to boar lines, were more or less susceptible to PMWS. This observation has not been clarified yet from a scientific point of view, but significant changes in the use of sire lines have been implemented in the last 3 years in many European countries. Some veterinarians are fully convinced that this has been the “major” point in overcoming the epizootic form of the disease in their practice.

## **PCV2 Vaccination**

As mentioned above, only one vaccine is now commercially available (under special license) in some European countries. It consists of an adjuvanted, inactivated PCV2 vaccine for use in sows and gilts. Roughly, about 400,000 sows (from France and Germany) received the vaccine by the end of April 2006 (Joisel et al., 2006). In a large scale field study performed in France, after vaccination, the mean rate of global mortality dropped from 4.4% to 2.5% ( $p=0.04$ ) in the nursery and from 6.6% to 5.1% ( $p=0.08$ ) in the fattening units. Besides these results, herd veterinarians reported that reduction of mortality was associated with a decrease in PMWS clinical cases (Joisel et al., 2006). Similar positive results were obtained in Germany. It must be said, however, that the PCV2 vaccine was initially used in 2004, where the severe outbreaks of PMWS in those countries (France and Germany) were not so evident compared to the period 1998-2002. Therefore, to the knowledge of the author,

this vaccine has not been used in a scenario with predominant severe outbreaks of PMWS in Europe.

## ■ **Have we won the war in Europe?**

Definitively, many different measures have been implemented across European countries and an overall significant improvement has been noted from the point of view of disease evolution. However, it is rather difficult to establish the specific measure(s) that helped to diminish the impact of the disease in Europe. Moreover, normal disease evolution (epizootic to enzootic scenarios) may have played a role independently of those measures. As said before, most of the herds that experienced PMWS did not recover production records they had in the postweaning area before the disease outbreak. Therefore, have we won the war against PMWS in Europe? Probably not!!! But we are trying to do it...

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