

# PRRS – its impact on pig performance, prevalence and control

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## Summary

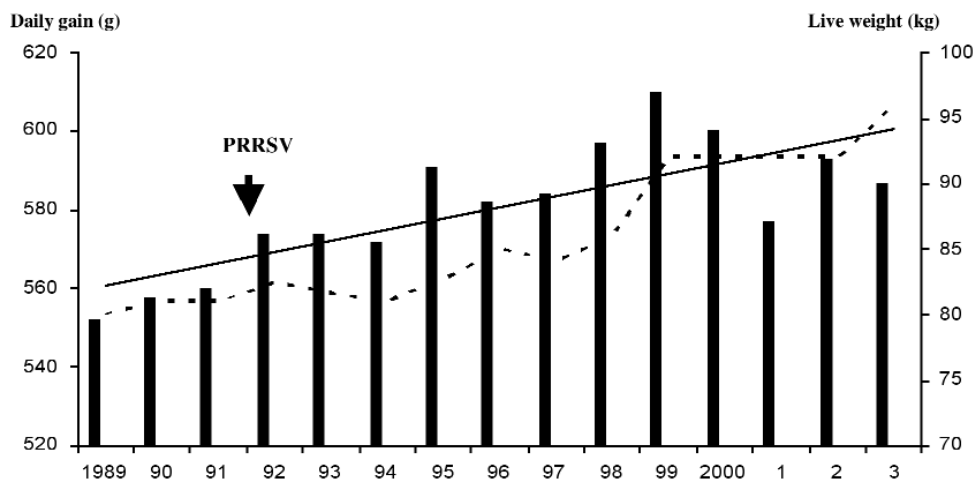
The effect of Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) was first seen in the UK in 1991; this and other viral insults have depressed performance in growing and finishing pigs in infected herds. The use of diagnostics to determine if a herd is infected, and when pigs are challenged, provide useful information when formulating methods of control.

Use of appropriate vaccines and the response to vaccination is supported by trials and case studies.

## Performance of growing and finishing pigs in the UK herd

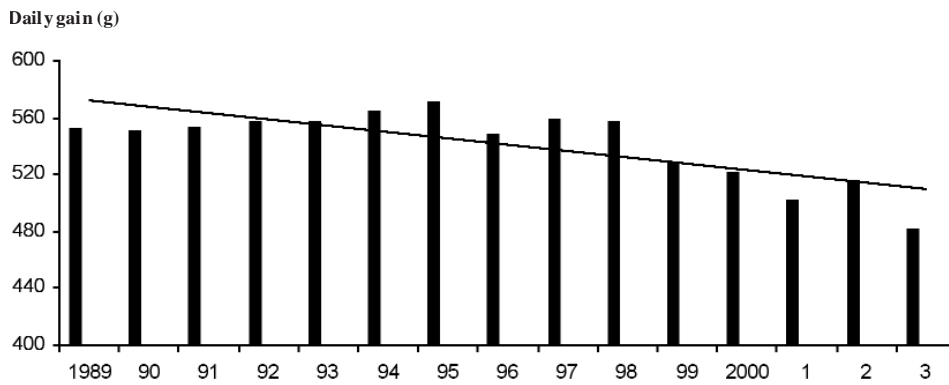
The trend in growth rate of pigs from weaning at approximately 7 Kg, through to slaughter weight during the period 1989-2003 is shown in figure 1. During this period live weight at slaughter increased from 80 Kg to 96 Kg, this per se, can be expected to have a positive effect on daily growth rate

Figure 1 Growth rate from weaning to sale weight 1989-2003



The use of a pig growth model was used to standardise the daily growth rate data to a fixed weight at sale relative to that in 1989. This enables a comparison of growth rate during the period to be assessed without the confounding effect of variable weights at sale. (See Fig 2)

**Figure 2** Growth rate from weaning to a regressed sale weight of 80 Kg live



PRRS virus entered the UK in 1991 and spread progressively during successive years. Since 1999 PMWS has increased in prevalence resulting in increased mortality and a further decline in growth rate in growing and finishing herd performance. (See table 1)

**Table 1** % Mortality weaning to slaughter 1989-2003

1989	90	91	92	93	94	95	96	97	98	99	2000	01	02	03
4.7	4.8	4.7	4.1	4.3	4.8	5.3	4.3	4.9	5.2	4.8	4.9	7.8	8.7	8.8

There are several possible reasons for the declining growth rate in grower / finisher pigs, these include viral challenges from PRRSV, Swine Influenza, and PCV2, compounded by the effects resulting from movement restrictions following Classical Swine Fever and Foot and Mouth infection. Additionally there has been negligible investment in new buildings or staff training for 2 decades, this together with cost cutting measures in respect of staffing, hygiene, general bio-security and less detailed performance monitoring have had a negative effect overall.

### The importance of growth rate to the profitability of pig production

The mean growth rate recorded by UK grower finisher herds from weaning to 95 Kg during the period 1999-2003 was 590 g / day. An improvement in growth rate of 50 g / day (+8.5%) would result in pigs reaching sale weight 12 days quicker, giving the following savings:

- reduced feed required for maintenance = 98 pence/pig
- reduced interest on working capital = 10 pence/pig
- reduced labour input = 42 pence/pig
- Total saving (extra margin) = £1.50/pig**

If pigs are taken to heavier weights as a result of faster growth rate, i.e. are sold at the same age, then additional sales value and margin are achieved:

- 5.8 Kg additional carcase weight at £1 / Kg = £5.80/pig
- less 23 Kg extra feed at 12p / Kg = £2.80/pig
- Extra margin = £3.00/pig**

## Actual, realistic and potential growth rates

The UK average growth rate for pigs from weaning to 95 Kg live weight based on a 4 year average recorded by Agrosoft is 590g / day. A realistic target for pig producers of 695g/day would be the mid-point between UK average and that achieved by some multiplication herds and development trials farms using commercial pigs and diets.

See Table 2

**Table 2** Actual, realistic and potential growth rates

	UK Average	Realistic Target	Very Good	Nucleus Top 10%
Wean – 95Kg (g/day)	590	695	800	870
Age at 95Kg (days)	175	150	133	122
Break even production cost (p/Kg)	95	87	78	71

Assuming that the break even cost of production for the average producer is 95 p / Kg, then by achieving the ‘realistic target’ growth rate, the break even cost would be reduced to 87 p / kg, and margin / pig would improve by £6 / pig. It is interesting to note the performance of the top 10% of nucleus pigs, and its value, as this is what potentially could be achieved. The reality is that due to compromised health status, poor investment and management the average producer cannot demonstrate the genetic potential of pigs currently available on the commercial unit.

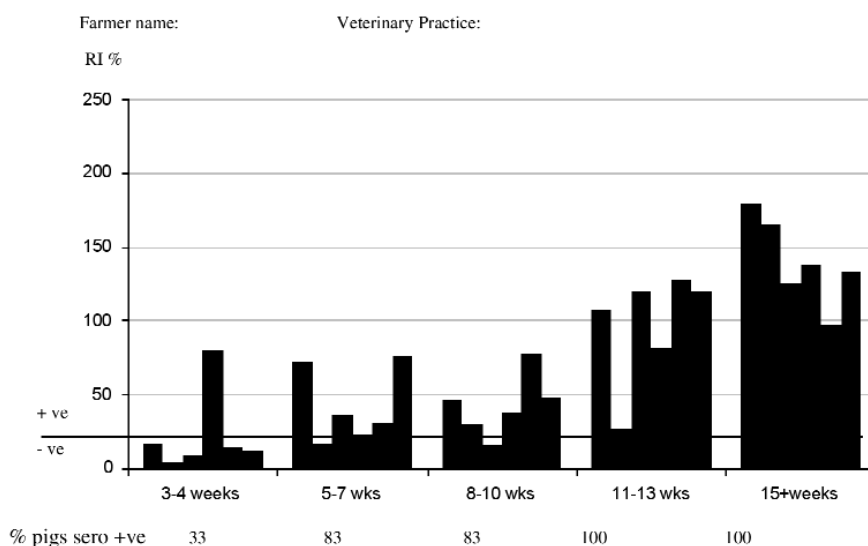
## PRRS VetCheck – a diagnostic service

PRRS VetCheck is a diagnostic service offered by Intervet to veterinary surgeons for use with their client’s herds. Six samples are taken from each of 5 age groups and are sent to an independent laboratory, ELISA test results are available within 48 hours of sample receipt.

## PRRS VetCheck results

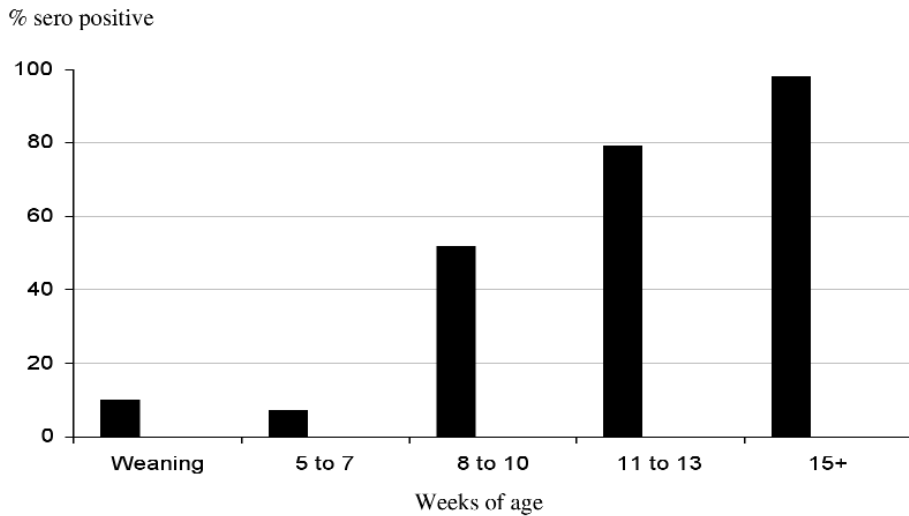
Typical serology results for growing pigs of varying ages from a PRRS seropositive herd are shown in figure 3. Reflective Index readings (RI%) of 20 and below are classed as PRRSV seronegative, readings above 20 are seropositive.

**Figure 3** PRRS seroconversion with age in a PRRS positive herd



A summary of results relating to 164 herds that have tested PRRS seropositive are summarised in figure 4. Each age group is represented by the mean score of 6 pigs. Maternally derived antibody (MDA) is present in weaned pigs, this declines and is negligible by 6 weeks of age.

**Figure 4 Summary of 164 herds which tested PRRS seropositive**

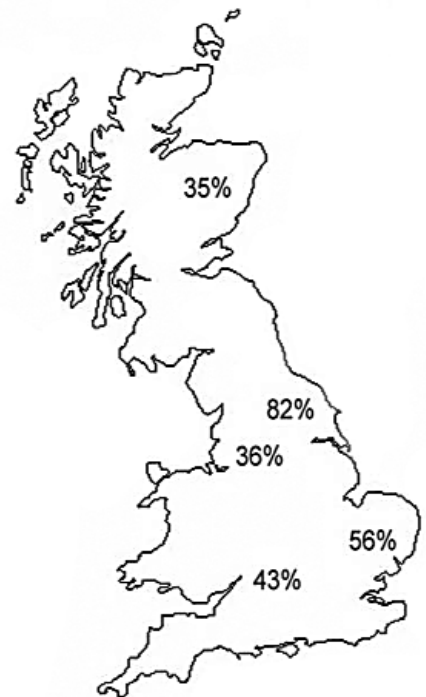


Within a PRRS positive herd, as pigs become older they increasingly become seropositive, approximately 50% of pigs aged between 8-10 weeks of age are PRRS virus seropositive, by 15+ weeks of age typically 98% are positive.

**Figure 5 % of herds tested PRRS seropositive by region in Great Britain**

In Great Britain, 56% of the 356 herd samples submitted for ELISA testing during 2001-2003 were PRRSV seropositive, regional variation was apparent.

In general terms outdoor herds, and regions where outdoor production tends to predominate, the incidence of PRRS seropositive herds is lower.



### Porcilis PRRS vaccine

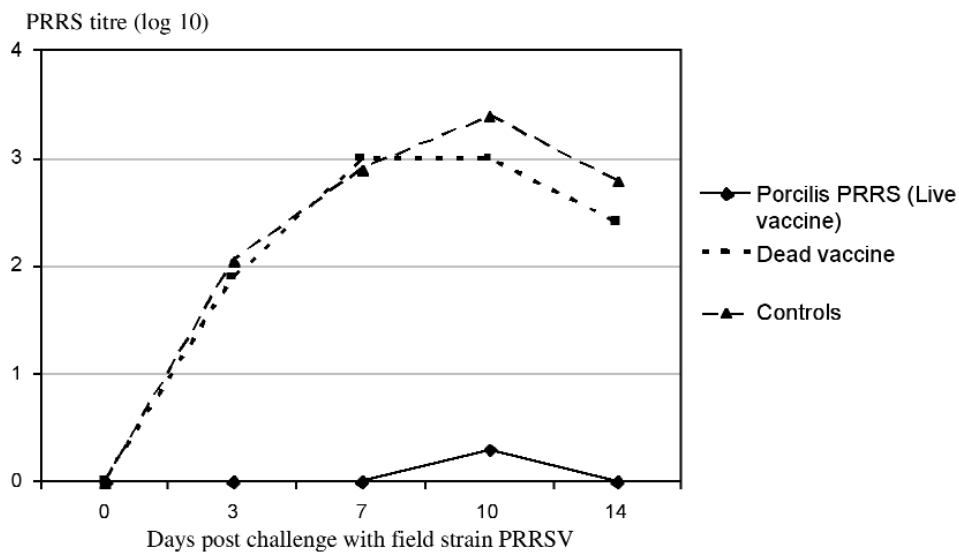
Porcilis PRRS vaccine was first licensed in the EU via the UK in April 2000.

It is a live vaccine for use in growing pigs; so why a live vaccine?

### Porcilis PRRS – a live vaccine

Trials conducted by Intervet using live and dead vaccines in growing pigs showed that when pigs were challenged using a field strain of PRRSV that pigs which had been vaccinated with a dead vaccine had similar PRRSV titres as unvaccinated control pigs (figure 6). It was concluded that when PRRSV is inactivated it evidently lacks immunogenicity.

Figure 6 A comparison of live and dead PRRS vaccines in growing pigs



It was concluded that antibodies present in pigs given the dead vaccine were of limited protection. Pigs vaccinated with the Porcilis PRRS (live vaccine) were protected when challenged with a field strain of PRRS virus; the live vaccine activated cell mediated immunity, which is required to enable protection against field viral challenge.

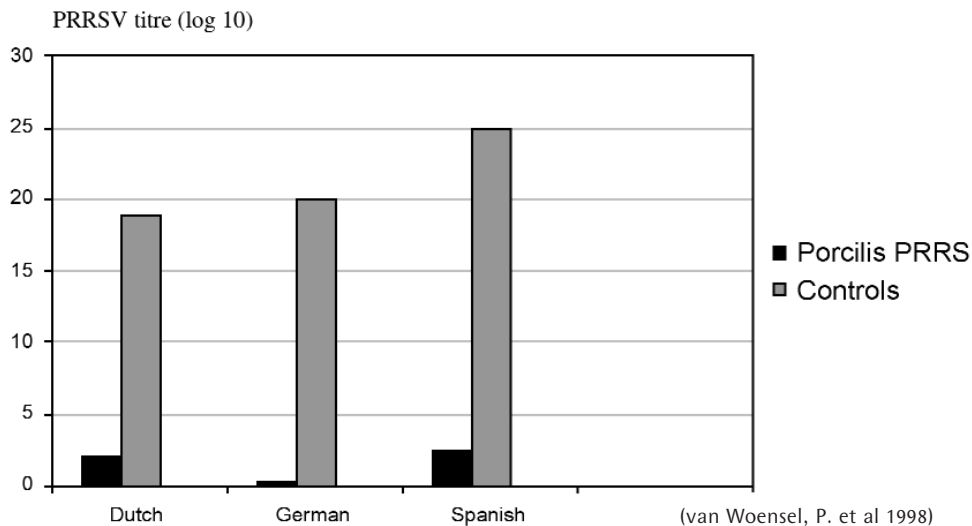
### Porcilis PRRS vaccine – strain efficacy

PRRS virus is an arterivirus, the genome consists of a single-strand of RNA; the genetic diversity of PRRS virus isolates indicates that there are many strains within Europe (Martelli et al 2003, and Yoon et al 2003). Globally there are two distinct strains- the North American and the European, they differ genetically (Murtaugh et al, 1994) and antigenically (Wensvoort et al, 1992; and Nelson et al, 1993).

The efficacy of Porcilis PRRS has been demonstrated after challenge with 3 European PRRSV isolates (Figure 7). Pigs were vaccinated with Porcilis PRRS at 6 weeks of age; pigs were then challenged 4 weeks post vaccination with either a Dutch, German or Spanish PRRSV isolate. PRRSV titres were measured and expressed as the daily mean titre during a 2 week period.

Based upon the results of this trial Porcilis PRRS was effective in protecting growing pigs from a PRRSV challenge from isolates from 3 different European countries.

**Figure 7 Porcilis PRRS efficacy against 3 European PRRSV isolates**



### American and European PRRS viruses and vaccinal cross-protection

American strains of PRRS are not evident in the UK at present, but are seen in Europe. Cross-protection challenge trials (Labarque 1999) have shown the following results in terms of viraemia relative to unvaccinated controls.

**Table 3 Serotype specificity**

	EU serotype challenge	US serotype challenge
Unvaccinated pigs	100%	100%
Porcilis PRRS vaccinated pigs	14.8%	84.3%
American PRRS MLV vaccinated pigs	88.6%	17.9%

(Labarque 1999)

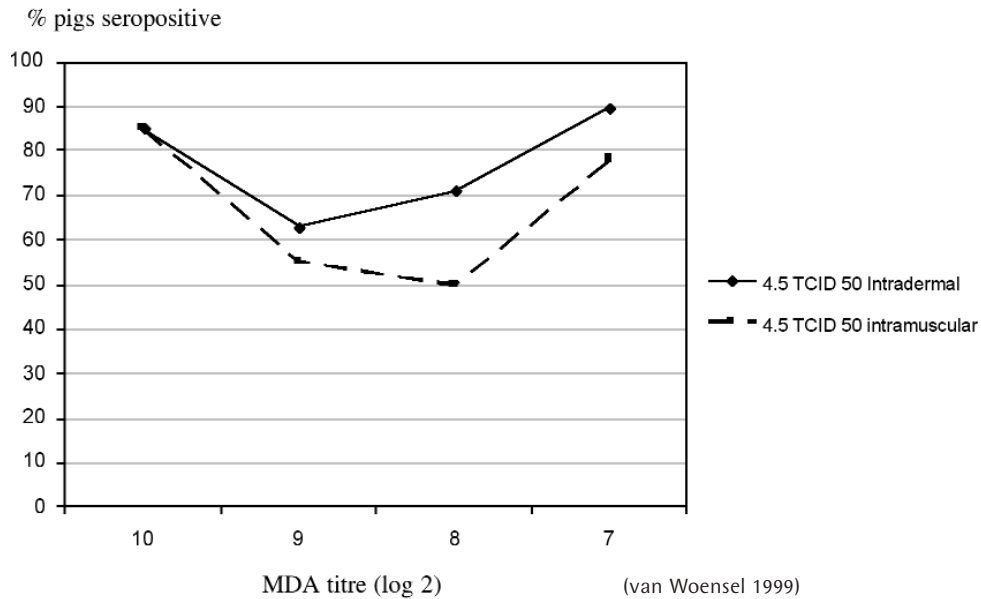
American serotype vaccines will induce limited protection against European serotypes, and vice versa. Hence it is important to know the origin of the field strain in order to ensure vaccine efficacy, as homologous protection has been demonstrated to be superior to heterologous protection in Europe.

### Vaccination in the presence of maternally derived immunity (MDA)

The target cell of PRRSV is the macrophage, the virus enters by means of a unique receptor. Neutralising antibodies prevent the entry of PRRSV into the macrophage by blocking this receptor. However, in the presence of antibodies, PRRSV has an alternative entry route into the macrophage.

When PRRSV-specific antibodies attach to the virus, the Fc-part of the antibody can attach to the Fc-receptor of the macrophage enabling the virus to enter the macrophage.

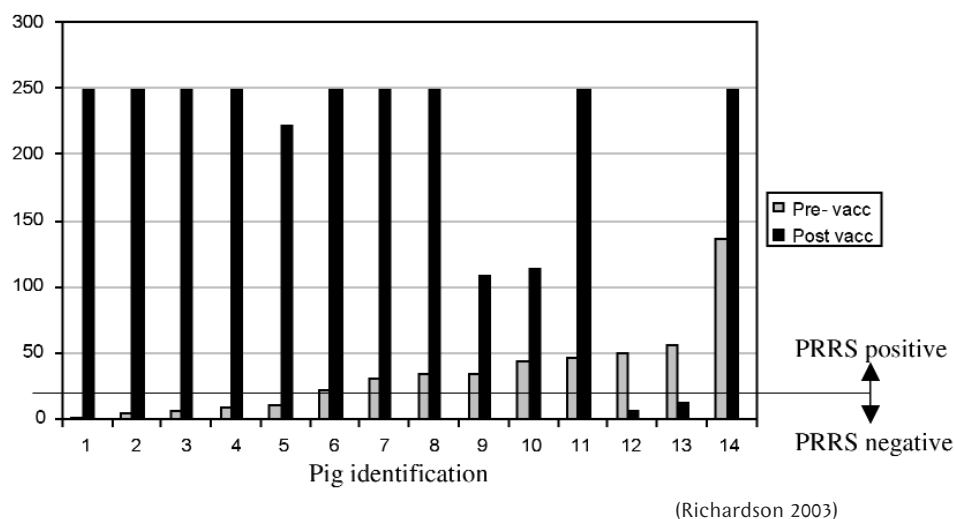
**Figure 8** The % of pigs which seroconvert to vaccine in the presence of MDA



PRRS VetCheck data relating to UK pigs indicate that only 1 in 6 pigs are seropositive to PRRS when weaned at 3-4 weeks of age; this is most probably due to the presence of MDA, which is negligible by 6 weeks of age.

Dead PRRS vaccines are licensed for use with sows; figure 9 indicates MDA levels in the progeny of vaccinated sows, and their response to Porcilis PRRS vaccination given at 4 weeks of age.

**Figure 9** ELISA results relating to Porcilis PRRS vaccination at 4 weeks of age in pigs from sows vaccinated with a dead PRRS vaccine



A positive response to vaccination was achieved when pigs from vaccinated sows were given Porcilis PRRS vaccine and blood sampled 5 weeks later.

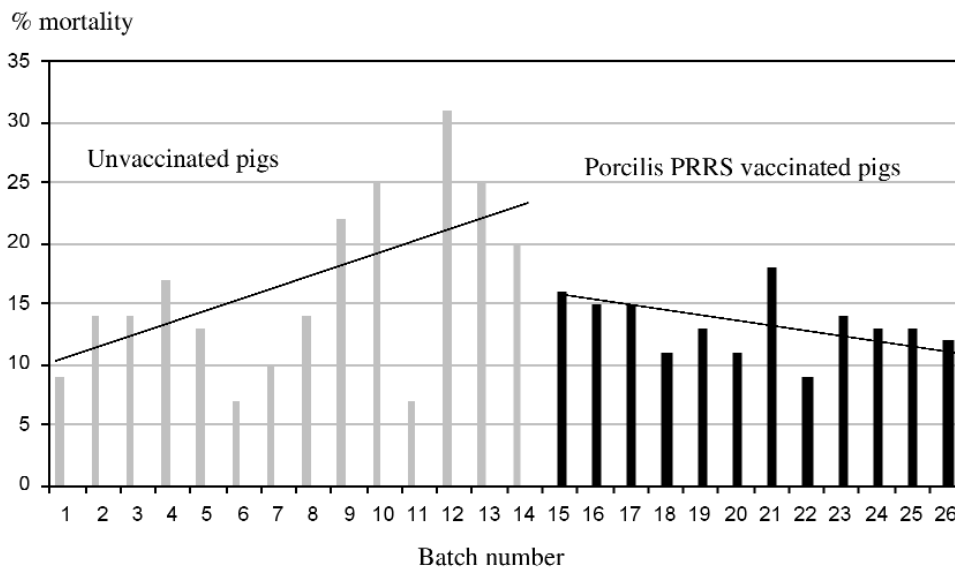
### Use of Porcilis PRRS vaccine in herds with PMWS

The response to vaccination with Porcilis PRRS of pigs at weaning, in terms of efficacy in ‘controlling’ PMWS, appears in part, to be related to the age at which pigs are exposed to the field strain PRRS virus. This may account why significant success in response to Porcilis PRRS vaccination is experienced in some PRRS positive herds, and less so in others; vaccination regimes may need to be modified in order to improve success.

## A farm case study assessing Porcilis PRRS vaccination in relation to mortality caused by PMWS

The progeny of a 2300 outdoor sow unit were sent to a number of finishing units operated on an all in – all out basis. The mortality rate of pigs during the finishing period fluctuated during a 14 batch period from 6 to 31%. Serology of pigs on arrival, weighing 32 Kg at 10.5 weeks of age, indicated that 1 in 20 pigs were PRRS seropositive. Four weeks post arrival all pigs tested were seropositive to PRRS; the main period of PMWS related mortality occurred 4-6 weeks post-arrival. Vaccination with Porcilis PRRS vaccine was instigated at weaning (25 days of age), the mortality of vaccinated pigs averaged 13% and continues to decline; see figure 10.

**Figure 10** Mortality of pigs 32-100Kg pre and post Porcilis PRRS vaccination



The reduction in mortality achieved would improve margin / pig in the batch by £4.50, also there would be improved growth rate and uniformity, and much less management aggravation when pigs were vaccinated with Porcilis PRRS.

### Conclusions

Growth and mortality rates are major determinants of profitability in pig production; the indications are that in recent years deteriorating performance is being recorded for these two parameters. Viral challenge, of which PRRS is but one, is heavily implicated. The use of specific diagnostic tests can be used to profile presence and onset of challenge and should be used periodically to determine the changing status of a herd. Where appropriate, PRRS vaccination will reduce the clinical effects of PRRS virus, and so the impact of other associated secondary viral challenges.

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