Vaccination – an Asian perspective

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Certain pig production systems or pig rearing practices determine the prevalence of pathogens and how they behave on the farm.

In other words, pig production systems have a significance on the infection timings for most of the pig pathogens and the concentration of these pathogens in the farm's environment (infection pressure). This is critical for intestinal pig pathogens that induce clinical disease.

The presence of a whole range of pathogens creates a disease cocktail that is very difficult to manage.

Pathogens such as PRRSV and Mycoplasma hyopneumoniae (M. hyo) are more difficult to control within a one site system than on the multi-site system where re-circulation and spread of pathogens is great.

This can be limited by the implementation of the all-in all-out discipline and maximising the physical distance between the three basic pig rearing periods – lactation, weaning and growing-fattening.

In the case of M. hyo, the one site system necessitates vaccination at an early age (lactation) since M. hyo challenges may occur at any time after weaning.

The presence of a whole range of pathogens does not necessarily mean that each individual farm has to vaccinate against them all. In reality many farmers have no access to basic diagnostic tools so they vaccinate their pigs every other day and this provokes stress. The proper use of laboratory tests can help us to prioritise or even eliminate certain vaccinations. This is especially necessary when designing vaccination programmes.

Many of the pig producing countries in South East Asia (Thailand, Vietnam, Philippines and China) harbour a large population of backyard pigs (at least 70% of the whole pig population) which are not submitted to any sanitary control and are rarely vaccinated. They are the reservoirs of disease!

Biosecurity

Biosecurity concepts are seldom understood and even less implemented around South East Asia (of course there are exceptions).

The new entry of pathogens into a farm or the extended spread of already existing pathogens frequently upsets the balance between health and illness. Many biosecurity breaks occur and some of these breaks are repetitive and dangerous for the farm's health status.

Middle men or live pig buyers, who buy fattener pigs in order to sell them back to wet markets or slaughterhouses, frequently visit farms.

Although it is a quite lucrative business, this activity is a serious source of diseases as these people go daily from farm to farm until their trucks are full of pigs!

Another biosecurity shortcoming is related to the lack of real gilt replacement policies. There is often a lack of proper separated quarantine/acclimatisation facilities and/or standard protocols for the introduction of new sows and gilts into the herd.

New batches of gilts, especially from outside the farm, need to be vaccinated early enough so that when they enter the herd they are protected from exposure to the sows and vice versa.

Needless to say, this quarantine period is also a good policy for the farmers in order to avoid the introduction of new diseases.

Unfortunately in South East Asia few farmers are giving long enough to the acclimatisation period to allow vaccination to develop its full protective potential. Frequently, gilts are introduced directly into the farm in such a way that they are exposed to the whole set of farm pathogens.

These gilts may then shed large numbers of micro-organisms at this time that could unbalance the health conditions on the farm.

This management is the exact opposite to what should be done to control key pig pathogens such as PRRSV and/or Aujeszky's disease virus.

In these two instances it is important to be sure (by the use of specific laboratory tools for each pathogen) that gilts, once they get on the farm, have some degree of protection (that is, correctly vaccinated before entry) and they are not shedding wild virus.

In such instances gilt introduction is akin to Russian roulette!

Table 1. Age distribution of M. hyo infection starting in the 20 farrow-to-finish units evaluated (Bruguera, S. D et al 2006).

	Age range (weeks)			
	4-7	8-11	12-5	>16
No. of farms	1	3	8	8
Percentage	5	15	40	40

Farm data monitoring

Although many farms monitor production data, there are still farmers who do not use a computerised system and even some who do not even use a manual one.

Obviously, without proper monitoring data it is impossible to evaluate the real effect of any treatment or vaccination programme

Consequently, they just miss the added value from high quality products.

Farmers who do not evaluate products are prone to buy the cheapest ones available, which are usually not the most cost effective ones. This often adversely affects vaccination programmes.

Thus, for example vaccination timings are based on convenience rather than on real diagnostic or evaluated performance.

The consequences of this can be compounded when we are using vaccination to control one of the contributing agents to a complex or multi-factorial syndrome.

Vaccines require very specific conditions of storage and need to be administered correctly. These specific conditions need workers to be adequately trained as well trained

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labour will play an important role in getting the best vaccine effect.

Farms in many countries of South East Asia have large amounts of labour present. The number of workers the farms use is at least twice what we find on European or American farms.

What makes this potential labour asset a nightmare in some cases is the lack of training, motivation and follow up routines associated with the implementation of the proper production practices on the farm.

Training essential

The labour hired for working in farms often has a low educational profile and so requires a lot of training about basic pig production skills before they really can be efficient employees.

However, many farms, independent of their size, do not have a proper introduction training programme so that some workers really struggle inside the farm making many mistakes that can affect the final farm performance.

Sometimes older, higher hierarchy workers who are not trained to be trainers are responsible for the training, so they teach the wrong techniques or bad habits to the next generation, thereby compounding the problem. In addition, motivation is quickly lost and apathy arises when workers keep doing tasks in the same wrong way, and results go from bad to worse. The follow up is not effective since it is inside the same vicious cycle. Ideally, external certified trainers should be used such as those from veterinary consulting companies.

External regular certified practical and theory training could be the answer that will break the negative trend on a farm.

This training, given by external experts can always, with the collaboration of farm managers, give new ideas to improve and correct those bad old habits. Post training follow up of the implementation of these new learned skills is very important and must occur.

So now well trained farm managers have to design a very strict plan in order to regularly check the correct implementation of the newly learned techniques.

Good farms, apart from getting constant refresher training for their workers, also share good times with their workforce through economic incentives based on productivity parameters.

It is a matter of fact that economic incentives alone do not keep motivation up, but they do help to keep the attention focused on the daily tasks, especially with low salary standards .William Edwards wrote incentive examples for swine farm workers. Although these incentives cannot be adapted directly to Asian pig farms, due to obvious reasons, what matters most is the intention behind involving the work force for improving whole farm performance:

PRRSV

Recently it seems there have been new PRRSV outbreaks in the whole area but these have been especially important in China and Vietnam. Chinese farms have suffered from severe reproductive disease inducing a lot of abortions and mortality in adult animals with clinic lesions closer to what we would expect from an acute HCV (Hog Cholera virus) outbreak rather than to what was diagnosed by Chinese authorities as 'the effect of a new American PRRSV strain'.

This episode in China occurred in an increasingly unfair unofficial condemnation of the MLV (modified live virus) PRRS vaccines that resulted in a more than surprising launch of a new killed PRRSV vaccine (the same strain as the putative strain responsible for the outbreak). Production and distribution of this vaccine is closely controlled by the Chinese government.

Opinions apart, looking at it objectively, this scenario is openly promoting the use in China of killed PRRSV vaccine or a specific killed PRRSV vaccine rather than the use MLV PRRSV vaccines. Obviously vaccination protocols in order to control PRRSV will change in China if this trend continues.

Aside from this episode in China, in neighbouring countries there is a different trend in relation to PRRSV vaccination protocols. Recently the implementation of vaccination programmes that combine the use of MLV PRRS vaccine with the use of killed PRRS vaccines has been seen. This combination seems to be more successful than previous protocols, which only rely on the use of one or other vaccine type.

In fact, quite recent studies have shown us that pigs vaccinated with an MLV PRRSV vaccine or infected previously with a field PRRSV showed a better immune response when they were vaccinated with a killed PRRSV than those pigs that were not previously in contact with a live PRRSV.

Within this new vaccination protocol the key is to keep potential naïve animals vaccinated with live PRRSV vaccine and keep boosting the already immunised population of breeders with the killed vaccine.

According to our experience, the key of these protocols is the proper vaccination of gilts and young boars (if they are going to be in the same premises as sows) with two doses of MLV PRRSV vaccine protocol (one month apart) before the first mating.

As we can appreciate in the vaccination programme example (see inset), mass vaccination is still the preferred first action during an overt PRRSV outbreak.

Mass vaccination protocols with MLV PRRS vaccines have been an object of criticism for being considered a less safe way of application that could compromise the vaccine safety features. Contrary to this conception mass vaccination protocols seem to be an important part of the beginning of regular vaccination protocols or PRRSV eradication programmes.

For instance, T. Voglmayr et al, was successful on three pig farms with a PRRSV eradication programme based on two mass vaccinations with an EU MLV PRRS vaccine combined with 160-175 days herd closure period to new replacement breeders. Thus, it seems that proper MLV PRRS vaccine handling renders quite acceptable safety and efficacy guarantees even in the most demanding situations.

It has been observed worldwide that vaccination programmes in sows used to be more effective to prevent reproductive problems than the vaccination in piglets in order to prevent respiratory distress.

The sow is an adult animal with an already well built immune system. Furthermore, piglets are challenged by different pathogens which provokes the whole respiratory syndrome, in which PRRSV is only one cause of the problem.

As was seen during a study of 39 different PRDC cases in the Philippines, PRRSV was not always participating in the most severe PRDC clinical outbreaks. In fact sometimes PRRSV infection timing cannot be related in PRDC cases. This means that other pathogens are also playing an important role.

So, contrary to the reproductive problems in sows, in pigs we sometimes used to misdiagnose PRRSV as the actual, or as a more important cause of a PRDC case than it probably was. Consequently, it was sometimes heard that the vaccine did not have the expected result. This is not surprising if in the field PRRSV was not the main pathogen to neutralise but it does not necessarily mean that the PRRSV vaccine is not inducing protection against PRRSV.

M. hyopneumoniae

Pig farmers are divided when it comes to the use of M. hyo vaccines – more or less a half uses one dose and the other half uses two dose vaccination protocols.

One dose vaccines appeared more recently and were welcomed by farmers since their practical advantages were obvious although the cost was nearly the same.

	Average initial body weight (kg)	Average body weight at slaughter (kg)	ADG (g/day)
VP	33.5	116.3	0.860^{a}
NVP	33.6	115.1	0.750^{b}

*At 11 weeks of age. ¹From 11 weeks to slaughter. ^{a,b}Values were statistically different ($p<0.001$).

Table 2. Average daily gain results during the fattening period of vaccinated pigs (VP) n= 5400 with a SIV vaccine (Gripork) and non-vaccinated pigs (NVP) n=10950 (Bruguera, S.D. et al 2007).

However, beyond the farmer convenience by halving the time spent vaccinating we need to carefully think about the weakness of the pig's immune system at early ages, the booster effect advantage and, even more importantly, the possible challenge timings of M. hyo in our pig production systems in Asia.

As was mentioned previously, in South East Asia most of the farms are one site production with a continuous flow farrowing to finish operated with natural ventilation.

Fattening pig units are mostly very close to farrowing houses, whereby transmission of M. hyo from fattening pigs to piglets and sows in farrowing crates is more than a possibility. Within these usual production systems, pigs can be challenged by M. hyo as soon as they are weaned. So it seems quite reasonable to prefer developing active immune protection in the piglet, rather than trust in passive immunity (Maternal Derived Antibodies; MDA).

As can be seen in Table 1 from a compilation of one site farrowing to finish farms affected by M. hyo, 20% of the detected cases were occurring at quite early ages. It means that although, most probably, most of the weekly pig batches are challenged at fattening units, there are still enough of an important percentage of pig batches that could be infected much earlier, whereby early vaccination protocols before weaning time may render effective protection to most of the pig batches in the farm.

The choice of whether to use a one or two dose M. hyo vaccination protocol depends on:

● The ever present boosting effect. Piglets have not totally developed their cellular immune system until at least 5-8 weeks of age, whereby a second dose that can induce a boosting effect seems to be more trustworthy. Besides this, at early ages piglets have MDA. It is observed that MDA cannot totally diminish the efficacy response of the vaccine, but it is also true that when pigs with high levels of MDA are vaccinated a serum conversion response occurs and the consequences of this are probably greater in one dose vaccination programmes.

● Confidence that all piglets get one dose of M. hyo vaccine when we apply a two dose M. hyo vaccine programme. From a practical point of view, within scientific experimental conditions, it is easy to be sure the whole number of pigs involved in the trial have been vaccinated properly. However, within field farm conditions we have to vaccinate hundreds or even thousands of pigs. Do we really consider that our operatives vaccinate, just with one dose, 100% of the piglets without failing to give it to some of them? It seems too improbable to us that the whole population of pigs will be properly vaccinated.

● We need to be aware that although oil adjuvant vaccines are a factor that seems to favour the appearance of PMWS they are not the only and the most important one. There must surely be other more significant triggering factors since not all the farms that currently use oil adjuvant vaccines in pigs at early ages are suffering from PMWS.

Swine influenza virus

There has recently been an increased concern in relation to swine influenza virus (SIV).

For the last four years, we have detected fatteners that were showing serum conversion against SIV with the co-infection of other pathogens as clinical PRDC cases.

In these cases SIV was behaving as a chronic insidious pathogen rather than as the usual most well known acute self-limiting outbreak.

These cases, once diagnosed, responded very positively in terms of growth and even mortality rates when pigs were vaccinated with a SIV vaccine.

H1N1 and H3N2 subtypes are still the most extended SIV subtypes within the pig population.

SIV vaccines in the market bring protection against H1N1 and H3N2 subtypes, whereby they bring enough protection for most SIV cases.

It is important to highlight that a frequent co-infection interaction with APP (Actinobacillus pleuropneumoniae) has been observed.

Thus, behind apparently APP clinical cases in fattening units there was sometimes the presence of a more chronic SIV infection.

According to observations in this SIV infected farm, the severity of the signs and the appearance of APP type cases during the fattening period decreased markedly once a SIV vaccine had been administered to the new incoming batches of pigs at eight and at 10 weeks of age.

PMWS and PCVDA

The new PCV-2 (Porcine Circovirus type 2) vaccines have been, or are soon expected to be, launched in most pig producing countries in Asia. Irrespective off the efficacy of these vaccines it could say that many producers have already learned how to control the main factors that trigger PMWS – the most widespread PCV-2 induced syndrome.

Therefore, for some pig producers these vaccines may have arrived too late. For some time it has been pointed out in Europe that too much PCV-2 is the cause of all the wasting problems in pigs, when proper diagnosis was not undertaken in most of the cases.

Pigs do not necessarily have to suffer from a PCV-2 syndrome just because they are continuously losing weight. Lower quality feed, raw materials supplies and even the need to add sub-optimal raw materials into pig diets has probably increased the percentage of runt weaning pigs who did not have a proper diet digestion and/or adaptation.

Of course for well diagnosed PMWS cases it is expected that the vaccination of sows will be the most successful or at least cost-profitable, as it has been observed that MDA can protect against PCV-2.

However, the solution to the whole low health status picture will not automatically happen because of the arrival of a new vaccine. ■

Vaccination programme example (PRRSV outbreak)

● First step. Immediately vaccinate the whole population of sows and gilts with a MLV PRRS vaccine. Repeat the same operation one month later.

● Second step. Regular programme.

● Gilts. Two doses of MLV PRRSV one month apart with second dose applied 3-4 weeks before first mating.

● Sows. Three different options:

• New vaccination trend: One mass vaccination with a killed PRRSV vaccine every four months or one dose of killed PRRSV vaccine 30-21 days before each farrowing.

• The most used regular vaccination programme option: One dose at 12-15 days after farrowing with a MLV PRRSV vaccine.

• The less popular regular vaccination programme option at this moment: One mass vaccination with a MLV PRRSV vaccine every four months.