

Porcine respiratory disease complex

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Porcine respiratory disease complex (PRDC) is attracting attention all over the world because of its economic impact on finisher farms.

Various strategies have been devised – many aimed at controlling different pathogens by using antimicrobials and some concentrating on one pathogen only, by means of vaccination. Will it always be this way? Or is the market moving towards a more targeted approach?

Some years ago, whenever veterinarians and farmers were discussing PRDC, the talk was about single pathogens such as *Mycoplasma hyopneumoniae*, Aujeszky's disease and maybe influenza virus, and later concomitant infections with other pathogens, mostly bacteria.

For various reasons, the talk now includes PRRS, and more recently, PCV-2 virus has appeared on the scene. Most veterinarians and farmers must still consider that *M. hyopneumoniae* plays a very important part in PRDC because over 70% of piglets in the EU are for example vaccinated against *M. hyopneumoniae*.

However, more data is becoming available pointing to the importance of other pathogens and not only for their direct effect on the lungs of the growing piglet.

Information is also becoming available about their concurrent effect on the piglet's immune system.

Research findings

M. hyopneumoniae induced lesions in the lungs of a young piglet are to a large extent due to the (over-) reaction of the immune mechanism. This has been reported by several researchers and is now generally accepted. White blood cells, which are essential to this over-reaction, are present in normal lungs, but, in a disease episode, are attracted in greater numbers by the process initiated by the pathogen.

M. hyopneumoniae is not the only pathogen which attracts white blood cells to the lungs. Infection with a PRRS virus, for example, will lead to a massive influx of these cells into the lungs of infected pigs, as has been demonstrated by Labarque (2004).

The cells, diverted to the lungs from other sites, are already in a stage of activation when they arrive.

Once there, they release substances that contribute to an even greater over reaction of the immune system than would normally be seen in an infection with *M. hyopneumo-*

niae alone. The result is that the animal becomes sicker from this dual infection. *M. hyopneumoniae* can potentiate a PRRS virus infection, as reported by Thacker (1999) but it can also happen the other way around.

Field veterinarians often report that *M. hyopneumoniae* disease has worsened since the arrival of PRRS virus. To complicate this matter further, vaccination with an USA strain based mlv PRRS vaccine appeared to reduce the efficacy of the *M. hyopneumoniae* bacterin vaccines, just like the PRRS field virus, making it very difficult to devise a protection strategy against both pathogens at once.

It forces veterinarians and farmers to choose to vaccinate against only one of the pathogens, risking a possibly severe infection by the other. Any such strategy to control PRDC on the farm is clearly incomplete.

Dr Sudarat (2006), who studied the response to Classical Swine Fever (CSF) vaccination in the presence of circulating PRRS virus, concluded that PRRS virus significantly inhibited the efficacy of the CSF vaccine. This example of interference by PRRS field virus in the build-up of immunity, has serious implications for the swine industry, especially in countries in which CSF is

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endemic. During the last AASV meeting in the USA, PCV-2 was reported to have a negative effect on the efficacy of a mlv PRRS vaccine; yet another example of interference between pathogens and vaccines.

It is clear from the above studies that circulating PRRS virus has a negative impact on the immune system of the young pig, and that this is translated into an enhanced sensitivity to other pathogens, or to a reduced response to vaccination.

When a modified live PRRS vaccine strain is used, which would normally mimic a field infection, it should not, of course, exhibit the same non-desired characteristics as the field isolates have.

A targeted approach

How does this translate into the situation in the field? The relative importance of each of the pathogens involved must clearly be assessed, if a choice has to be made to vaccinate against one of these pathogens.

This can only be achieved in systems that allow the monitoring of more than one pathogen at the same time.

It is even more important to carry out a standardised analysis of the situation on the farm from time to time, in order to assess the effects of management changes, as they are implemented.

This standardised analysis called farm audit will generate input that can be fed into a mathematical model in order to evaluate the importance of different intervention strategies (known as economic modelling).

So far only *M. hyo* and PRRS have been used as examples. But, as already mentioned, other pathogens will be included such as *Actinobacillus pleuropneumoniae* and *Haemophilus parasuis*, as they can play a part in PRDC, and it is not always obvious which is the most important.

To be of any value, an economic model therefore needs to take account of interactions between these different pathogens and the related input in the model will be based on information derived from articles published in the scientific journals.

Moreover, when there is more than one pathogen involved, it becomes important to choose vaccine products which, when used together, are proven not to interfere with the immune response to any of them.

Another important consideration when using more than one vaccine at the same time, is the adjuvant used in each.

If different antigens are formulated in different adjuvants (usually for very good reasons), then it is highly unlikely that they should or can be used together.

Adjuvants are capable of directing the immune system in different directions; some promote a more cellular and some a more humoral type of response, for example.

Two adjuvants giving opposite signals to the immune system will result in a reduced response to one or both vaccines.

New developments

Audits, as discussed above, are under way in several countries in order to provide a better insight into what is actually happening on finisher farms. This will enable the design of much more focused strategies against PRDC, which can in turn be evaluated by further auditing.

Economic modelling should improve the information about cost benefits. The model can be run, at any time, to check the effect of management changes. But it will require the input of both farmer and veterinarian to produce the most valuable result from the model.

One significant development is the realisation that PRDC control can no longer be thought of as necessary only for finishers.

When PRRS virus circulation needs to be addressed in young piglets, for example, controls also need to be implemented at the piglet producer's farm.

Controlled studies, soon to be published, will confirm the practical advantages of using vaccines which employ the same adjuvant, allowing two or more products to be combined in the face of mixed infections, without loss of efficacy. ■