Monitoring your PCV2 intervention leads to higher economic returns!

by Eric van Esch, Technical Director BioChek.

There still is much debate on how to get the best return on investment when PCV2 virus control is implemented. Last year at the ESPHM 2014 meeting in Sorrento data was presented in which two different vaccines were tested in a large field study.

The two vaccinated groups differed in their serological response after vaccination and in their ability to control PCV2 viraemia after the PCV2 field challenge.

The result was that the group with the better sero-conversion and a significant reduction of PCV2 viraemia had a much better economic performance. Vilaca found similar results in a comparative field study.

This year at the ESPHM 2015 meeting in Nantes, also data was presented that PCV2 viraemia in vaccinated animals is causing no significant effect because there is still a favourable difference between the vaccinated and the control groups.

However, in this study only a negative control group (a group of piglets without any PCV protection) was included.

Another option is to include a group with a better protection against a PCV2 infection, a so called positive control group, than the product under testing. In this way of testing differences between different vaccines are reported in sero-conversion, reduction of viraemia and economic performance.

Biological variation in the case of PCV2 virus seems to be very large and to give advice that is uniformly applicable is impossible.

Monitoring on sero-conversion and PCV2 viraemia (what is actually happening after vaccination) is therefore crucial.

Neutralising invading virus

The hypothesis has always been that PCV2 antibodies induced by PCV2 vaccines are capable of neutralising invading PCV2 field virus.

This is clearly shown by the fact that colostrum from sows carrying antibodies against PCV2 virus perfectly protects against a PCV2 virus infection and this protection is based on these (Maternally Derived-) antibodies (MDA) only.

Martelli and Fort report on a field and a laboratory study where both humoral and cellular immunity were investigated and they concluded that both components play a role in PCV2 immunity.

Although an important finding, cellular immunity only works when cells are infected, while virus neutralising antibodies prevent cells from becoming infected with PCV2 virus. When taking the mode of action of PCV2 virus into account, this is a remarkable difference.

Detrimental effect

The second part of the hypothesis is, and there is abundant literature on this matter, that PCV2 virus has a detrimental effect on the health of the pigs in a dose dependent matter.

Segales made this very clear and also introduced the concept of PCV2 SD and SI (Systemic Disease and Subclinical Infection) where PCV2 SI specifically targets at low levels of PCV2 viraemia and is still causing significant economic damage mainly through a reduced Average Daily Weight Gain (ADWG).

Viraemia only occurs when the PCV2 virus infects cells, multiplies in these cells and is released from these cells.

Isabelle Vincent published data on how PCV2 virus invades and alters the function of important immune competent cells. This effect is on the innate level and on cytokine production.

Cytokines are very small messenger molecules that are giving direction to the immune system response when pathogens are infecting the pig and therefore they have an impact on the whole immune system of the pig. PCV2 virus induces much lower levels of the required cytokines or even induces the wrong type of cytokines giving the next line of immune competent cells the wrong information.

Now it all depends on how many immune competent cells are affected.This explains, at least in part, the dose dependent nature of a PCV2 virus infection.

Or, in other words, the important question is: what is the balance between the amount of virus neutralising antibodies and the amount of invading PCV2 field virus?

When the antibodies are in surplus, the invading virus will be neutralised and the PCV2 virus will not enter cells where it can multiply.

When the PCV2 virus wins and is capable of entering cells, we will see PCV2 viraemia!

Research data has shown that with PCV2 vaccines biological protection can be achieved. This means that in a vaccination challenge experiment no PCV2 viraemia will be detected in vaccinated and challenged pigs.

This is an optimal scenario when PCV2 reduction is desired. In the field biological protection is very difficult to obtain simply because of the

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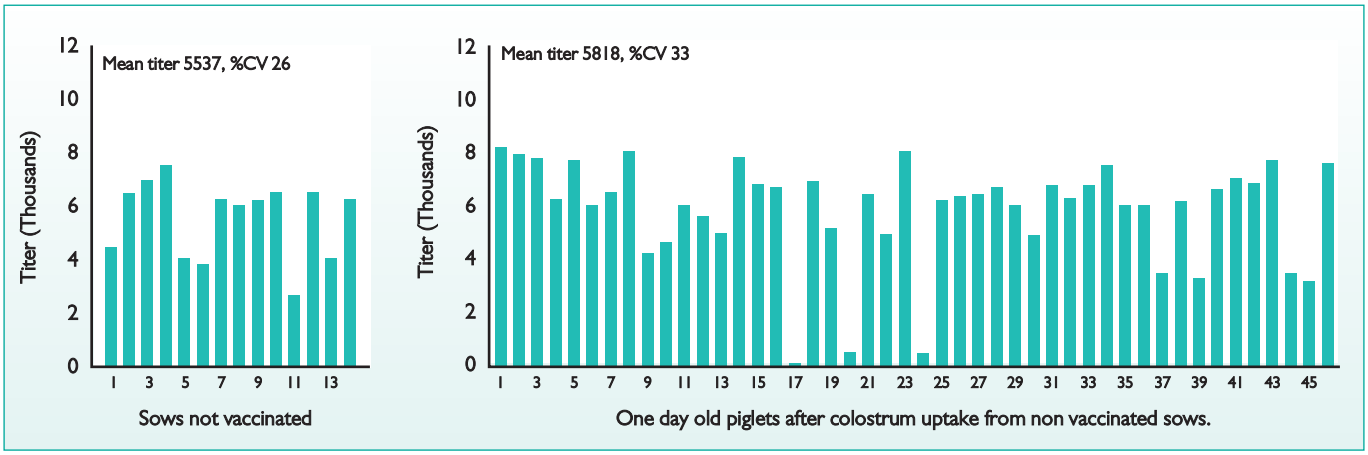
Fig. 1. Serological profiles of sows in a herd without PCV2 vaccination (left) and the PCV2 antibody titers in the piglets originating from these sows (right). Note the large%CV (BioChek data on file).



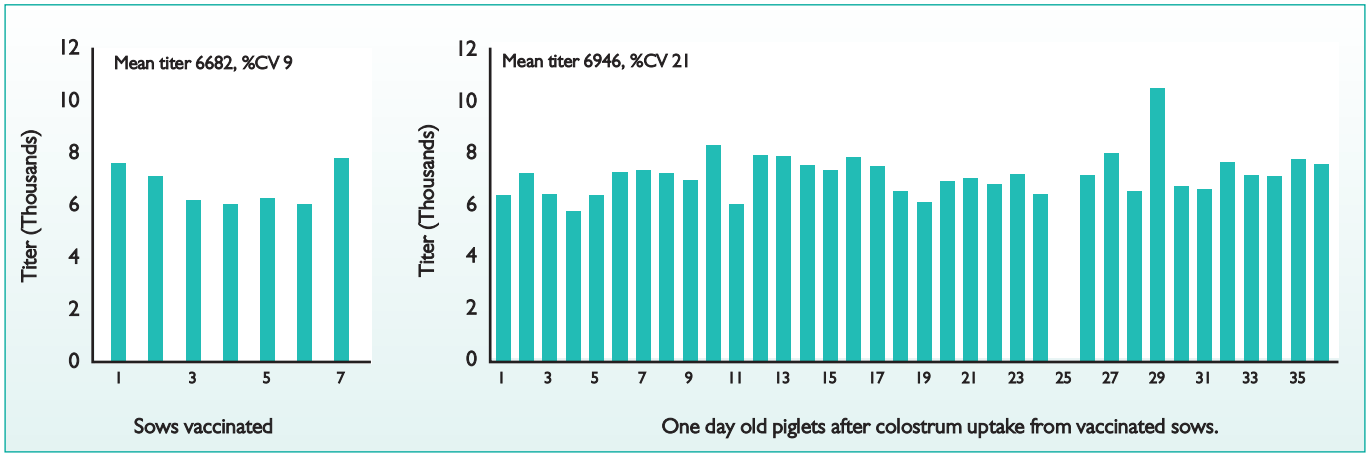


Fig. 2. Serological profiles of sows in a herd with PCV2 vaccination (left) and the PCV2 antibody titers in the piglets originating from these sows (right). Note the narrow %CV (BioChek data on file).

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large variation in the starting material. In the laboratory we can select and monitor the pigs closely and thereby create the optimal conditions to achieve optimal protection when testing vaccines.

In the field we have to rely on historical data and the interpretation and subsequent use of these data.

Field situation

The situation in the field is that over 90% of all herds are infected with PCV2 virus. This counts for both breeding herds, pigs in nursery units and finishing pigs.

Antibodies against PCV2 virus induced by natural infection are only present for a certain time period. In a breeding herd where no sow-vaccination against PCV2 is done, a large variation in serological titers can be found that originate from a natural PCV2 infection. This variation in titer is reflected in the (MDA-) titers in the piglets born from and nursed by these sows (see Fig. 1).

In contrast, when PCV2 vaccination of sows is implemented we see a much more homogenous profile in both the sows and the pigs born from these sows (see Fig. 2).

When biological variation is an issue, it is clear that breeding stock vaccination helps in reducing this variation.

The critical question is how to implement the next step: the timing of the piglet vaccination.

Palzer reports on vaccination in two different groups with the same vaccine.

The first group was vaccinate in the first week of life and the second group in the third week with a field challenge occurring later in life.

The second group with lower MDA titers at moment of vaccination had a significantly better ADWG.

Sibila found that piglets with high levels of (PCV2-) MDA had a lower ADWG compared to piglets vaccinated with lower levels of MDA at moment of vaccination, upon natural field challenge with PCV2 virus.

When translating this all to field conditions there are basically only two important factors that can be advised: first reduce the biological variation and second control the PCV2 viraemia.

Importance of monitoring

Monitoring is necessary to investigate if this is already the desired situation on individual farms. There are still many farms where both the farm manager and the involved veterinarian are not fully satisfied with the economic performance of the finishers or have the feeling that the performance could be improved.

PCV2 viraemia in the finishing herd is a risk factor and can be responsible for a lower than expected ADWG.

When PCV2 viraemia is detected in herds that are vaccinated against PCV2, than the MDA titers at moment of vaccination should be monitored. When they are too high, the timing of vaccination should be changed. When they show a coefficient of variation which is too high, breeding stock vaccination is a tool to uniform the MDA titers.

When these amendments in the intervention strategy are made than this should lead to lower PCV2 virus levels and higher economic returns.

This can only be checked through both antibody (serology, ELISA) and PCV2 virus (qPCR) monitoring. The financial returns of such an investigation can be impressive (Atlagich, ESPHM 2014) ■

References are available from the author on request

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