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Vaccinology XIII



# A practical example: PCV2 vaccination

In this series on vaccinology, different aspects in relation to handling and working of vaccines have been covered. Now it is time for practical cases. This Pighealth Byte deals with PCV2, and more will follow.

It should always be kept in mind that in vaccinology we are dealing with biology. And in biology, variation and exceptions to rules are always present and knowledge changes over time. Not only by increasing knowledge but also by changes in the pathogens of which viruses are the most noteworthy ones.

PCV2 virus is a very small virus and it is the capsid of the virus that is responsible for inducing immunity. This capsid is in fact a cluster of proteins that are based on the genetic code commonly known as ORF 2. The capsid protein can also be produced separately in large quantities and forms the basis for a number of vaccines currently on the market. These vaccines fall in the category of sub-unit vaccines. Next to this there are full inactivated virus vaccines. The capsid protein is highly antigenic and is responsible for inducing both the humoral (antibodies) and the cellular (white blood cells) component, providing excellent immunity.

As discussed before, circulating Virus Neutralising (VN)- antibodies are the first line of defence, and certainly so in the case of PCV2 virus. These VN antibodies are induced by vaccination and can be transferred from the sow to the piglets by colostrum. With the good handling of vaccines, the correct vaccination technique and the right timing of the vaccination; solid protection against PCV2 infection can be the result of PCV2 vaccination. In both the very young piglets, in the form of passive immunity by Maternally Derived Antibodies (MDA) through sow vaccination, as in the grower pig population by active vaccination.

Cellular immunity is of importance in the case of PCV2 immunity and is also induced by the capsid protein. Antigen (capsid protein) – antibody complexes, are formed when vaccinating young piglets with high levels of MDA. In such cases, normally no increase in level of antibodies is noted after vaccination but protection, when compared to non-vaccinated controls, can still be recorded. The mechanism can be that PCV2-capsid-antigen – PCV2-VN-antibody complexes are taken up by specific white blood cells and are processed by internal sections of that white blood cell, resulting in a specific, cellular, immune reaction towards PCV2. This process takes longer than the immediate action of the circulating VN antibodies, and a higher metabolic cost can be present, but still when the humoral part fails to react to the vaccination, the cellular part is still working!

So here we see how the two different parts of the immune system work together when no interfering factors are present but can also work alone as we see with the sow derived MDA and the cellular component in absence of a clear humoral response. No wonder PCV2 vaccines have such a great worldwide appreciation.