Nachfolgeprojekt zu 1.16.09 Optimierung der Impfstrategie gegen Clostridium perfringens Typ C induzierte nekrotisierende Enteritis bei Saugferkeln

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Key words
Clostridium perfringens type C, pigs, vaccination, colostrum, serum

Aim of the study
In our previous study (Aramis *1.16.09)* we developed and applied a novel cell culture test to evaluate anti- *C. perfringens* beta-toxin antibody levels in serum and colostrum samples of pigs. We had observed, that multiparous sows receiving repeated booster vaccinations developed high antibody levels in colostrum and milk, which were passively transferred to their piglets. Gilts (uniparous sows) however did not always sufficiently seroconvert after the recommended basic immunization during the first pregancy and thus piglets seemed to be insufficiently protected against *C. perfringens* type C enteritis. This follow up study was performed to evaluate an adapted vaccination protocol.

Material and methods
A vaccination trials using two commercially available vaccines was conducted on a pig breeding farm.

Animal experiments were limited to intramuscular (i.m.) injections of licensed and commercially available vaccines or sterile NaCl, blood and colostrum sampling of sows and piglets. They were approved by the Bernese Cantonal Veterinary Office (Animal Experiment No. BE61/16).

Sixty-one 6 months old sows were randomly assigned to three groups of 15 and one group of 16 sows respectively. Eight sows developed health issues independent of the vaccination and were excluded from the study. Group 1.1 and 1.2 were vaccinated using vaccine 1: Porcilis® ColiClos ad us. vet. vaccine (MSD Animal Health GmbH, Lucerne, Switzerland). Group 1.1 was vaccinated following the manufacturer recommendation against C. perfringens type C, which included two injections of 2 ml of the vaccine i.m. 6 and 2 weeks ante-partum (a.p.). Group 1.2 was vaccinated three times prior to the first farrowing. They received 2 ml of the vaccine i.m. 4 weeks prior to insemination and at the day of insemination. They received an additional booster vaccination with 2 ml of the vaccine 2 weeks before farrowing. Group 2.1 and 2.2 were vaccinated using vaccine 2: Suisen ad us. vet. vaccine (Dr. E. Graeub AG, Bern, Switzerland). Group 2.1 was vaccinated according to the manufacturer recommendations, twice before the first farrowing. They received 2 ml of the vaccine i.m. 6 and 3 weeks a.p.. Group 2.2 was vaccinated three times prior to the first farrowing. They received 2 ml of the vaccine i.m. 3 weeks prior to insemination and at day of insemination (basic immunization). They received an additional booster vaccination with 2 ml of the vaccine 3 weeks before farrowing. Blood samples from all gilts were collected prior to insemination, at day of insemination and twice before farrowing. Colostrum and blood from sows were collected in the first 24 hours p.p.. Two to three days p.p. blood was drawn from two piglets per litter. The cell culture essay using primary porcine aortic endothelial cells (PAEC) was performed as established in the previous study (Aramis 1.16.09) and recently published [1].

Results and significance
The previously established cell culture assay, allowed us to quantify neutralizing antibodies against the *C. perfringens* beta-toxin as the currently best characterized measurement for protective immunity against C. perfringens type C enteritis in newborn piglets. As reported in our previous study [1], we observed that a proportion of gilts vaccinated using the currently recommended immunization protocol (2 injections for the basic immunization) developed low or no neutralizing anti-beta-toxin antibody titers in serum and colostrum. Accordingly, piglets showed no or low levels of serum antibodies, indicating insufficient protection against *C. perfringens* type C enteritis. Adapting the immunization scheme to 3 instead of 2 initial injections increased serum and colostrum antibody titers in gilts and serum antibody titers in piglets.

In conclusion, over the entire period of both studies, we showed that currently recommended *C. perfringens* type C vaccination programs induce good levels of antibodies that neutralize the essential virulence factor of *C. perfringens* type C in colostrum and milk as well as piglet serum of multiparous sows. The standard vaccination scheme however might leave a proportion of piglets from gilts susceptible to disease. In cases of recurrent problems, where the immune protection of this subpopulation of piglets in a herd has to be improved, a simple extension of the vaccination scheme for gilts including a basic immunization before insemination and a booster immunization before the first farrowing can be applied to increase neutralizing anti-CPB antibody levels and thus most likely reduce the risk of outbreaks of *C. perfringens* type C enteritis in pig breeding farms.

Publications

1. Richard OK, Springer S, Finzel J, Theuss T, Wyder M, Vidondo B, et al. Application of an Endothelial Cell Culture Assay for the Detection of Neutralizing Anti-Clostridium Perfringens Beta-Toxin Antibodies in a Porcine Vaccination Trial. Toxins. 2019;11(4). doi: 10.3390/toxins11040225. PubMed PMID: 30991691.

Submitted Manuscript

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Project *1.16.09/2*

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