Press Release
final project report

Project No. QJ1210120 “Monitoring Programme for Economically Important Infections in Pig Herds“

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The research project "Programme for Monitoring Economically Important Infections in Pig Herds" was implemented from April 2012 until the end of 2016. The research team was composed of the staff involved in immunology and virology at the VRI, virology at the University of Veterinary and Pharmaceutical Sciences Brno and the staff of the model enterprise Agrofarm, Ltd., Žďár nad Sázavou. The VRI was the project coordinator, with Prof. MVDr. Miroslav Toman, CSc. being the responsible investigator.

The project was mainly focused on respiratory infections in pigs and was conceived comprehensively. Within the scope of the project, several viral and bacterial infections were investigated, using in vitro and in vivo models. A substantial part of research consisted of field monitoring, both on the model farm and other pig farms. The aim was to gain new knowledge of the given infections, and to improve diagnostic procedures and possibilities of specific immunoprophylaxis.

During the project implementation, new diagnostic procedures were introduced to our laboratory for the detection of viruses, using both RT-PCR and the serological technique ELISA. Two fundamentally new ELISA methods were developed for serological detection of antibodies against PRRS virus and presented in the form of functional patterns. We also developed a method enabling us to distinguish between post-infection and post-vaccination antibodies after vaccination of a herd with an inactivated vaccine. Furthermore, other
innovative diagnostic procedures have been developed for the detection of porcine circovirus, *Haemophilus parasuis*, *Actinobacillus pleuropneumoniae* and *Streptococcus suis*. Assays for monitoring cell-mediated immunity against PRRS virus have been introduced and tested in an immunization and infection experiment. The results of experimental work and examinations carried out under the field conditions were included in the following certified method: Smola J., Celer V., Nedbalcová, K. Toman, M.: System of complex diagnostics of respiratory infections in pigs, 2014 (ISBN 978-80-86895-39-0).

In order to extend the insight into immunopathogenesis of PRRS virus and the possibilities of specific immunoprophylaxis for its control, an extensive experiment was conducted in piglets. In this experiment, groups of piglets were immunized with four different commercial vaccines (two of them were inactivated and two were live attenuated) and subsequently, the piglets were challenged with PRRS virus. Antibody responses and cell-mediated immunity in the blood and locally in other compartments (saliva and respiratory tract lavages, faeces) were monitored and compared. These results, including the evaluation of the efficacy of immunoprophylactic measures in pig herds were included in the following certified method:

Another important task was monitoring competitive interactions in mixed infections with PRRS virus and bacterium H. parasuis under in vitro conditions. In a series of successive experiments, we gained considerable knowledge which often differed from previously acknowledged information. Immune responses of monocyte-derived macrophages after in vitro infection with PRRS virus and subsequent infection with Haemophilus parasuis were studied. Mixed infection of macrophages reduced the expression of pro-inflammatory cytokines, IL-1beta and IL-8, at both mRNA and protein level. The role of interferon alpha, the production of which is induced by PRRS virus in monocyte-derived macrophages, played in the subsequent bacterial infection with H. parasuis, was experimentally tested. It was found that downregulation of proinflammatory cytokines occurs after cell activation with interferon-alpha and subsequent bacterial infection. H. parasuis causes formation of giant multinucleated cells that originate from fusion of macrophages. These results were presented at several international conferences and published in two peer-reviewed articles.

We successfully carried out an experiment leading to the development of a new type of a vaccine against H. parasuis, based on the isolation of capsular protein, using an original method. The product was presented as a functional pattern. The immunogenicity of this vaccine was confirmed in mice and subsequently in piglets. However, unfortunately, the effect of this vaccine on the induction of cross-immunity against heterologous strains was low.

In the period of the project’s implementation aimed at disease eradication under the field conditions, improvements were achieved in the economic parameters, i.e. productive and reproductive performance indicators in the partner enterprise Agrofarm. Partial improvements were also achieved in other herds, but these varied per herd with regard to their management and approach to adopting the measures. Key findings were obtained by
solving health problems of animals on the model farm, but also on other pig farms in the Czech Republic. These results were incorporated into the following certified method: Smola J. Celer V., Toman, M.: Systems of immunoprophylaxis of respiratory infections in pigs. VRI 2016 (ISBN 978-80-86895-95-6).

We can conclude that the objectives set out in the project have been achieved. During the project implementation, we obtained new knowledge in the area of respiratory infections in pigs, with focus on PRRS virus and infection with *Haemophilus parasuis* (Glasser’s disease). These results were compared with those obtained by other authors and results from investigations under the field conditions. The project outcomes were the basis for 17 registered results published in journals with IF and other peer-reviewed journals (another two publications are in preparation), 3 functional patterns and 3 certified methodologies. Certified methodologies are available on the VRI website. Their user is the Czech Pig Breeders Association and its members and veterinarians - specialists in pig breeding. The results will be popularized at professional seminars in 2017 - 2018.

**Achieved results:**

All results were achieved during the project implementation and are dedicated to the project.

A total of planned results: **17 results**

A total of results achieved by the end of 2016: **16 results** + one Jimp (a journal with IF) which has been submitted for peer review, two manuscripts are in preparation (one publication with IF in the form of a manuscript submitted for peer review) + 12 poster presentations + 7 lectures at national and international conferences.