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Invitation

PhD PUBLIC DEFENSE

Different vaccination protocols with bacterins as a means to control *Mycoplasma hyopneumoniae* infections in peri-weaned and fattening pigs

Ioannis Arsenakis

November 9th, 2018

Promoters

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Faculty of Veterinary Medicine, Ghent University, Belgium

Curriculum Vitae

Ioannis Arsenakis was born on 11 December 1984 in Chicago, Illinois, USA.
He graduated in March 2010 from the Faculty of Veterinary Medicine of Aristotle University of Thessaloniki, Greece. He then received a scholarship grant to continue his studies at the Roslin Institute of the Royal (Dick) School of Veterinary Studies in Edinburgh, Scotland. He graduated on June 2012 and received a Master's degree in Animal Biosciences (awarded with Distinction). He then continued in the Republic of Ireland, where he worked as a poultry veterinarian, taking care of broiler and broiler breeder flocks. From August 2013 until October 2018, he was a member of the Unit of Porcine Health Management (lead by Prof. Dr. D. Maes) at the Faculty of Veterinary Medicine of Ghent University, Belgium. He has completed the residency program for the European College of Porcine Health Management. Apart from clinical training, he also performed studies focusing on the optimization of vaccination strategies against *Mycoplasma hyopneumoniae* in peri-weaned piglets and breeding sows. Other studies he conducted and published focused on the use of autogenous vaccination in sows for the control of exudative epidermitis in nursery pigs and the evaluation of semen quality of Belgian Piétrain boars. Ioannis has supervised Master's theses of final-year Veterinary Medicine students and contributed to the conception and development of several field trial protocols related to enzootic pneumonia, assessment of the colostrum quality as well as optimization of swine artificial insemination techniques. He has been an invited speaker on several national and international conferences, and he has authored several papers in international peer reviewed scientific journals.

Where?

The defense will take place on
Friday the 09th of November 2018 at 17:00, in Auditorium B
Faculty of Veterinary Medicine,
Ghent University
Salisburylaan 133, Merelbeke, 9820

After the defense, a short reception will follow.

RSVP

If you wish to attend the reception, you are kindly asked to confirm your presence before the 4th of November 2018 by e-mail to Ioannis.Arsenakis@UGent.be

Summary of thesis

Mycoplasma hyopneumoniae (*M. hyopneumoniae*) is the primary agent of enzootic pneumonia, a chronic respiratory disease which results from infection of *M. hyopneumoniae* and other secondary bacteria, and inflicts major economic losses to the pig industry. One of the ways frequently used to control *M. hyopneumoniae* infections worldwide is vaccination. The most common vaccination strategy in practice is vaccination of the piglets during suckling or at weaning. Currently, it is not known whether the efficacy of vaccination against *M. hyopneumoniae* can be influenced by the weaning process when vaccination is applied at the day of weaning.

Concerning the breeding sow population, vaccination of gestating sows against *M. hyopneumoniae* is not frequently practiced under field conditions. Nevertheless, breeding sows could be a reservoir of *M. hyopneumoniae* infections for the suckling and recently weaned piglets in endemically infected herds. Thus, it is interesting to investigate whether vaccinating sows during gestation could decrease the percentage of their offspring that is colonized with *M. hyopneumoniae* at weaning as well as in the nursery units.

The general aim of this thesis was to investigate different vaccination strategies against *M. hyopneumoniae* infections in order to improve the control of enzootic pneumonia.

The first study assessed the efficacy of a *single M. hyopneumoniae* vaccination (Ingelvac MycoFLEX®) three days before weaning (V1) or at weaning (V2) against experimental challenge infection. Four weeks after vaccination, groups V1 and V2 (n=20 pigs each) and a non-vaccinated, positive control group (PCG) (n=20) were inoculated endotracheally with a virulent *M. hyopneumoniae* strain. All pigs were euthanized five weeks after challenge. The average macroscopic lung lesion scores in groups V1, V2 and PCG were 0.54, 0.88 and 1.04, respectively (P>0.05). The average lymphohistiocytic infiltration scores in groups V1, V2 and PCG were 2.95, 3.16 and 3.61, respectively (P<0.05). The average qPCR values were: V1=$10^{2.94}$, V2=$10^{2.76}$ and PCG=$10^{3.23}$ (P>0.05). Significant differences between groups V1 and V2 were only obtained for the histopathological lung lesions, where group V1 had a lower number of lesions.

In the second study, 828 piglets were randomly divided into three groups: group V1 was vaccinated three days before weaning, group V2 at weaning (21 days of age) and group NV was left non-vaccinated. Vaccinations were performed using Ingelvac MycoFLEX®. After the nursery period, 306 pigs were allocated to fattening unit one (F1) and 501 pigs to a second unit (F2). Statistically significant differences were obtained in F2 where group V1 had a higher average daily weight gain compared to groups V2 and NV for the entire study period (17 and 18 g/day, respectively) and the fattening period (26 and 36 g/day, respectively) (P<0.05). Average lung lesion scores were: V1=3.44, V2=4.61, NV=4.55 (P>0.05), and prevalence of pneumonia: V1=35.0, V2=38.0, NV=41.4 (P>0.05). Overall, vaccination against *M. hyopneumoniae* ahead of weaning provided numerically better performance, but did not reach statistical significance.

The third study was performed in two herds. It investigated the effect of pre-farrowing primiparous sow vaccination (at six and three weeks before farrowing) against *M. hyopneumoniae* on offspring colonization at weaning and post-weaning, and lung lesions at slaughter. In each herd, two sow groups received *M. hyopneumoniae* vaccination with Ingelvac MycoFLEX® and two sow groups remained non-vaccinated. From each sow group, per herd, the litters of five primiparous sows were selected and sampled. Upon slaughter, the severity of *Mycoplasma*-like lung lesions (LLS) in these pigs was assessed. In herd A, 14.17% and 20.00% of the piglets from the vaccinated and non-vaccinated sows, respectively, were laryngeal swab-positive at weaning (P=0.225). At seven days post-weaning those values were 0.81% and 6.08%, respectively (P=0.031). In herd B, there were no statistically significant differences in the piglets from vaccinated and non-vaccinated sows that were laryngeal swab-positive at weaning (P=0.948) or seven days post-weaning (P=0.738). The average LLS in herd A was 15.54 for the piglets of the vaccinated sows and 26.40 for the piglets of the non-vaccinated sows (P=0.021). In herd B, those values were 9.70 and 8.51, respectively (P=0.541). In conclusion, in herd A offspring from vaccinated sows had a significantly lower colonization rate seven days post-weaning and a significantly lower LLS at slaughter when compared to the offspring of the non-vaccinated sows.

From the studies included in this thesis, it can be concluded that vaccination of piglets against *M. hyopneumoniae* prior to weaning when compared to their vaccination at the day of weaning conferred numerically, but not significantly better results across the majority of the efficacy parameters investigated. Additionally, in a herd with a substiantial early circulation of *M. hyopneumoniae*, the vaccination of primiparous gestating sows could further reduce the impact of *M. hyopneumoniae* infections in their piglets, when used in combination with early piglet vaccination.

Future research efforts on the effect of the weaning process on the efficacy of vaccination against *M. hyopneumoniae* should focus on selecting herds with different levels of *M. hyopneumoniae* infection, especially during the fattening period. Additionally, more herds facing mixed respiratory tract infections should be selected, in order to elucidate between-pathogen interactions that could possibly hinder the beneficial effect of vaccination. Last but not least, it would be interesting to conduct future research to investigate whether vaccine-induced colostral antigen-specific T-cell responses in newborn piglets correlate with the bacterial load in the lungs and the severity of EP-induced lung lesions after challenge infection with a virulent *M. hyopneumoniae* strain.

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