

Invitation to the public defense of the doctoral thesis

“Novel insights in the host-
pathogen interaction of
porcine toxoplasmosis”

Malgorzata Jennes

3rd of October 2017

Promoters

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Dr. Brecht Devleeschauwer
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Dr. Steven Sarazin
Faculty of Veterinary Medicine, Ghent
University

Curriculum Vitae

Malgorzata Jennes was born on July 26th, 1982 in Lublin, Poland. In 2009, Malgorzata obtained the Master of Science degree in Veterinary Medicine from Ghent University, Belgium with distinction. In November 2009, Malgorzata started her doctoral study in the same Laboratory, where she actively participated in two projects funded by the Belgian Federal Public Service for Health, Food Chain Safety and Environment (grants RF 09/6213 and RF 13/6274), focused on multiple aspects of the natural and experimental infection with *Toxoplasma gondii* in pigs.

In addition to her doctoral study, Malgorzata held the position of the teaching assistant for the practical classes of immunology for the Bachelor students of Veterinary Medicine. She supervised several Master students of Veterinary Medicine, Bachelor students of the Laboratory Technology and Master Students of the Interuniversity Program Molecular Biology. In her daily work Malgorzata was involved in the detection of immune-mediated diseases in domestic animals, and in the leading of the Animal Welfare Unit, being responsible for the implementation of the Ethical Committee regulations on the use of the laboratory animals. As a representative of the PhD students' community from life sciences, she was a member of the Doctoral Schools steering committee.

Malgorzata is an author and co-author of several publications in peer-reviewed international journals and she actively participated in national and international conferences, presenting her research.

The date and the venue

You are cordially invited to the public defense that will take place on:

Tuesday 3rd of October
at 17:00

in the Auditorium B of the Faculty of
Veterinary Medicine, Ghent University,
Salisburylaan 133, Merelbeke.

After the defense you are kindly invited for
the reception in the Museum of Morphology.

Please confirm your attendance before 20th
of September by phone (+32 499 14 12 32)
or mail (malgorzata.jennes@ugent.be).



Summary of the dissertation

Toxoplasma gondii is an ubiquitous parasite with a significant impact on human's health and livestock production. Human toxoplasmosis is predominantly foodborne and originates, among others, from the consumption of raw or undercooked meat containing tissue cysts. Pork is an important source of infection for humans. Therefore, the insights of the mechanisms regulating the interactions between the parasite and the porcine immune system in both the early and later stages of the infection, as well as the estimation of the parasite's persistence in porcine tissues on the long term, could substantially contribute to a better control and prevention of infection in pigs. Consequently, it could play a pivotal role for global food safety and human health by diminishing the risk of foodborne toxoplasmosis.

The focus of this thesis was to estimate the infection rate with *T. gondii* of the porcine population in Belgium, and to investigate the immune responses in pigs upon an experimental infection in relation to the parasite burden and its viability in edible tissues. Special attention was also given to the parasite antigens with the highest immunogenic potential in *in vitro* assays, as possible candidates for a porcine vaccine against *T. gondii*.

In **Chapter 4** we provide a first estimation of the apparent prevalence of porcine toxoplasmosis in Belgium, based on two serological assays (GRA7- and TLA-ELISA) and applied on serum samples from conventional herds. A Bayesian model was used to assess the true within-herd and between-herd prevalence to correct for the limitations of the serological assays in biological samples. The total apparent and true prevalence across all herds, the between-herd prevalence and the within-herd prevalence of infected farms were significantly higher in Wallonia than in Flanders.

In **Chapter 5** the cytokine expression in blood mononuclear cells and the antibody production were followed in seronegative piglets upon inoculation with the IPB-Gangji strain of *T. gondii*. The expression of IFN- γ was elevated,

while the serum antibody responses showed a clear rGRA7-reaction. The parasite burden and viability was demonstrated via RT-qPCR and bio-assay in all the sampled porcine tissues. The findings of this study in relation to the parasite persistence in the tissues over time, motivate the hypothesis of the parasite clearance in a chronic model of IPB-Gangji strain infection in pigs.

Chapter 6 describes homo- and heterologous infection experiments with two distinct *T. gondii* strains (IPB-LR and IPB-Gangji), evaluating several immunological parameters of the host's immune response, and the parasite burden in the host's edible tissues. First, an extensive humoral response was observed against GRA7 and TLA antigens upon inoculation, characterized by important differences between both strains. Second, the *in vitro* IFN- γ production by TLA-stimulated blood mononuclear cells was directly correlated with the infection dose of both strains, and was predominantly derived from CD3+CD4-CD8 α bright T-lymphocytes. Finally, in homologous infection experiments we demonstrated a strain-dependent parasite persistence in the tissues that was inversely correlated with the infection dose, while in the heterologous challenge experiment, a remarkable reduction of the parasite burden was observed. Therefore, our results strongly indicate a reduction in the amount of parasite DNA and viable cysts in porcine tissues over time due to the potential of the IPB-Gangji strain to elicit a strong immune response in the host.

In **Chapter 7** we further investigated the *in vitro* activation of T-lymphocytes by *T. gondii* antigens, fractionated prior to use by the continuous elution-electrophoresis. This study demonstrated that the group infected with the IPB-LR strain produced higher quantities of the cytokine than pigs inoculated with the IPB-Gangji, after stimulation with each TLA-fraction.

Chapter 8 provides a general discussion, highlighting the main findings of each experimental study, as well as the conclusions and future perspectives for further research.