Le Corps professoral de
Gembloux Agro-Bio Tech - Université de Liège vous prie
de lui faire l'honneur d'assister à la défense publique de la dissertation originale que

Monsieur SUI Xiukun,

Titulaire d’un diplôme de *master majoring in preventive veterinary medicine*,

présentera en vue de l'obtention du grade et du diplôme de

**DOCTEUR EN SCIENCES AGRONOMIQUES ET INGENIERIE BIOLOGIQUE**,

le 13 juin 2019, à 8h30 précises (personne ne sera admis après cette heure),

en l’auditorium TERRA,

Passage des Déportés, 2, à 5030 GEMBLOUX.

Cette dissertation originale a pour titre :

« *A vaccine against porcine reproductive and respiratory syndrome virus* ».

**Le jury est composé comme suit** :

Président : Prof. P. JACQUES, Professeur ordinaire,
Membres : Dr L. WILLEMS (Promoteur), Prof. H. ZHU (Copromoteur - CAAS, Chine), Prof. M. VANDENBOL, Prof. M. SCHROYEN, Prof. C. SAEGERMAN, Prof. N. GILLET (UNamur).
Summary

Porcine reproductive and respiratory syndrome (PRRS) is caused by porcine reproductive and respiratory syndrome virus (PRRSV). It is an economically important disease responsible for reproductive failure in sows and respiratory disease in young pigs. For prevention and control of PRRS, vaccination is the primary choice for the majority of pig producers. There are two kinds of commercial vaccines: modified live-attenuated vaccines (MLVs) and inactivated vaccines. These two types of vaccines cannot prevent and control of PRRSV. Thus, efficient (i.e. induce protective immunity) and safe (e.g. cannot revert to virulence) vaccines are required. At present, most researches on PRRSV inactivated vaccines are focused on the protection efficiency. Information on strain prevalence, inactivation and quality of the vaccine is lacking.

In our study, a prevalent PRRSV strain was chosen for vaccine development. We collected tissue and blood samples from a suspect farm, then isolated and identified the virus. After that, we compared the genome and the virulence of the different prevalent strains. Then, a strain similar to the virulent HP-PRRSV was selected for further vaccine development.

To determine the best inactivation procedure of PRRSV, different concentrations of β-propiolactone (BPL), binary ethylenimine (BEI) and formaldehyde (F) were tested at different times and temperatures. BPL diluted at 1:2000 for 24h at 4°C completely inactivates PRRSV while maintaining adequate reactivity. This study thus provides a detailed inactivation procedure for PRRSV.

In the third part, two purification methods, based on sucrose density gradients ultracentrifugation or liquid chromatography were conducted. We found that the liquid chromatography method yields highly pure and immunogenic viral particles. The purification method described here should thus be useful in large-scale production of highly pure PRRS virus.

Finally, we describe a preliminary evaluation of the purified PRRSV vaccine inactivated with BPL. After immunization and challenge, significant clinical signs were observed in the mock group. Mean anti-PRRSV neutralizing antibody titers were higher in the inactivated vaccine group while the mean copy number of virus was significantly lower. There were less severe macroscopic and microscopic lesions in vaccinated pigs. These results indicate that the purified inactivated vaccine has the ability to reduce clinical signs of PRRSV infected pigs.

In conclusion, this thesis has contributed to the implementation of a novel experimental inactivated PRRSV vaccine aiming at priming antibody response and protecting pigs from PRRSV infection.