

Relationship of microscopic lesions and viral load in fetal implantation sites for type 2 PRRSv infected pregnant gilts

Predrag Novakovic¹ DVM, MSc; Ahmad Al-Dissi¹ DVM, MSc, PhD, Diplomate ACVP, Andrea Ladinig² DVM, PhD; John Harding² DVM, MSc, Diplomate ABVP, Susan Detmer¹ DVM, PhD

¹Veterinary Pathology, ²Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada

Introduction

Porcine reproductive and respiratory syndrome (PRRS) continues to be the most costly diseases facing the North American swine industry resulting in reproductive losses estimated to be over \$500 million annually. However, after nearly 25 years of PRRS research, the pathogenesis of fetal death during infection is still poorly understood. In most of the cases of abortions associated with late gestation infections of PRRSv, microscopic lesions in the internal organs of the fetuses are rare and inconsistent. This suggests that fetal death might not be a consequence of PRRS virus replication in the internal organs, but that fetal implantation sites may play an important role in the pathogenesis of fetal death. The objective of this study is to determine whether PRRSv RNA levels in endometrium correlate with microscopic lesions present in the fetal implantation sites of pregnant gilts infected with type 2 PRRSv.

Material and methods

- 113 PRRSv-naïve pregnant gilts were intramuscularly and intranasally inoculated with PRRSv (10^5 TCID₅₀ total dose) and 19 negative control gilts were sham inoculated on gestation day 85±1
- 21days post inoculation, dams and their litters were humanely euthanized for necropsy examination
- Histopathology of the uterus and placenta for all fetuses was assessed by pathologists blinded to PCR results
- Scoring scheme included the assessment of uterine and blood vessel inflammation
- The severity of the inflammation in the uterus was assessed based on percentage of affected endometrium and total number of inflammatory cell present in the lamina propria
- The degree of vasculitis was assessed based on its distribution and severity in the endometrial tissue

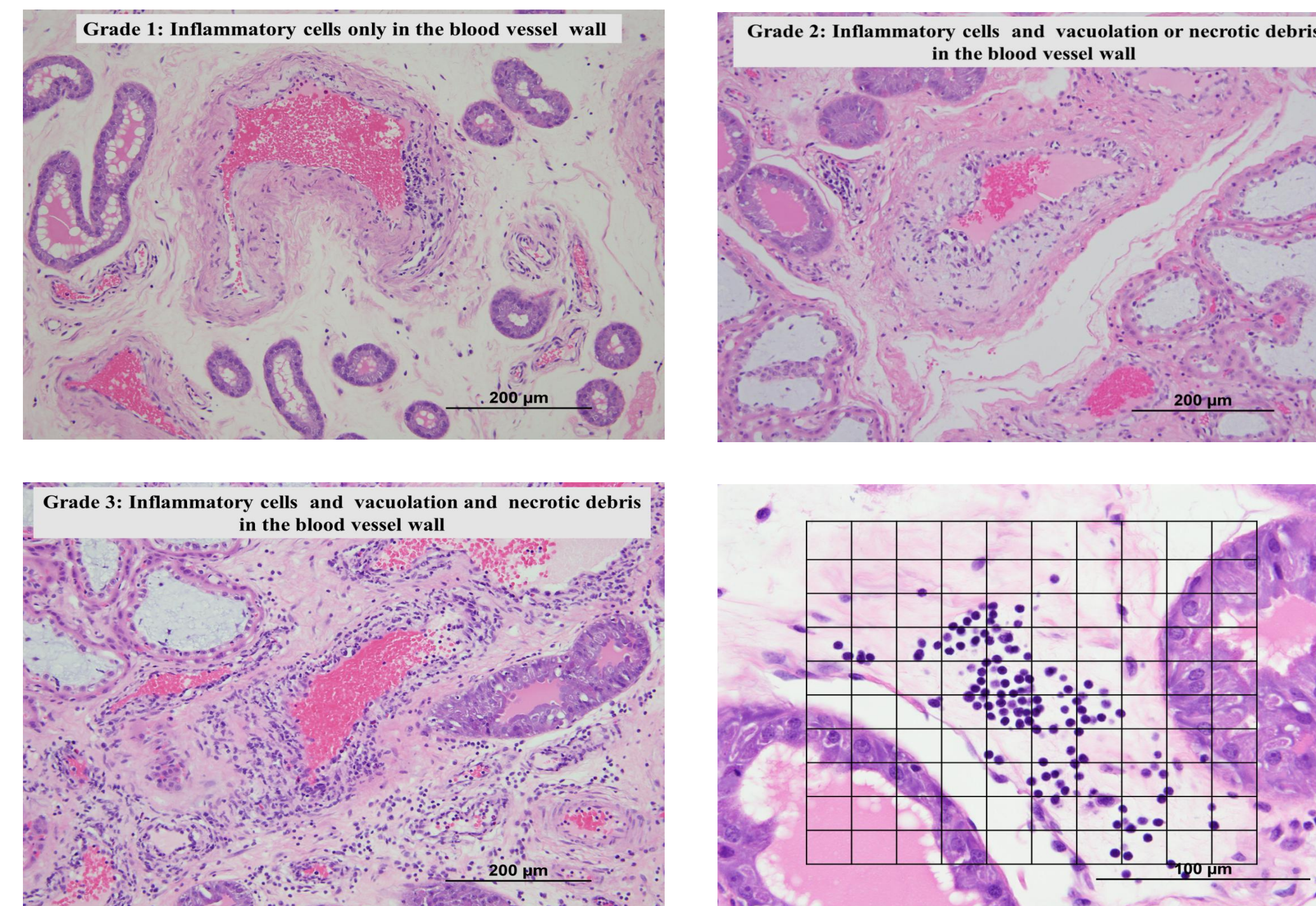


Fig. 1. Examples of endometrial inflammation and vasculitis (grade 1 to 3) and the grid used for counting lymphocytes.

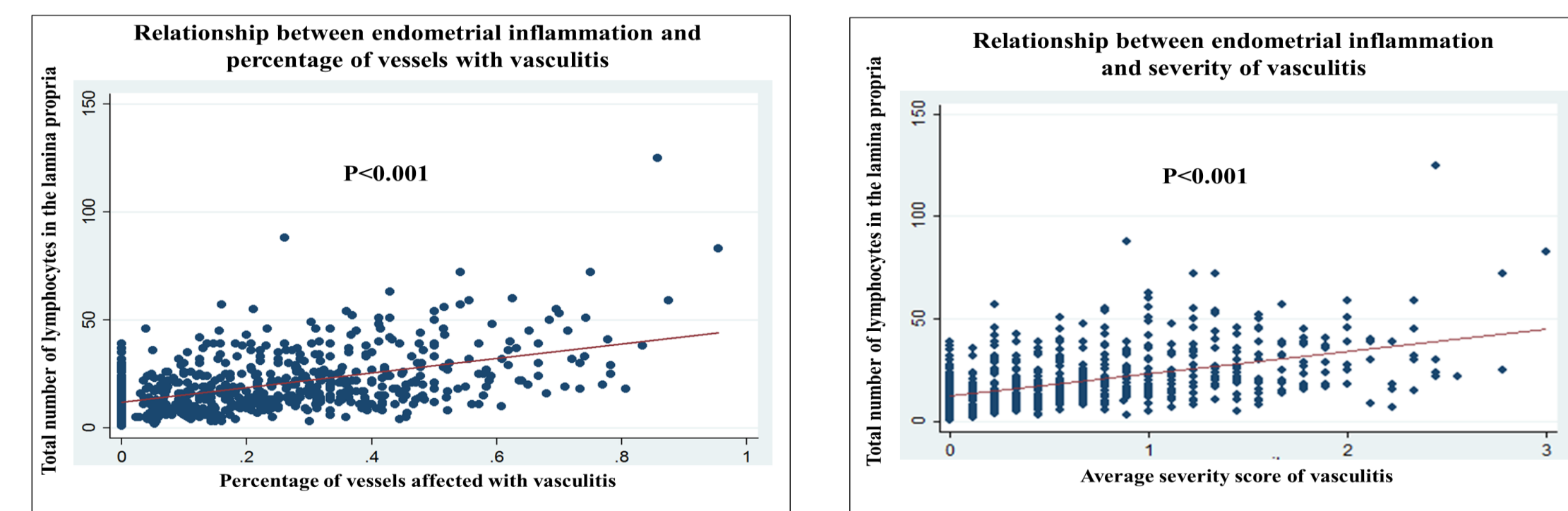


Fig. 2. Graphs showing the positive correlation between endometrial inflammation and vasculitis: percentage of vessels (left) and severity (right).

Results and Discussion

- 679 uterine tissue sections randomly selected from 110 infected pregnant gilts were microscopically examined
- No signs of uterine infection or vasculitis were found in negative control gilts
- 73% of uterine tissue samples exhibit severe lymphohistiocytic endometritis (grade 3) and very severe for an additional 10% of tissue sections (grade 4).
- Endometrial inflammation expressed as total number of inflammatory cell present in the lamina propria was positively related to distribution and severity of vasculitis in the endometrium ($P < 0.001$; Multilevel Mixed-Effect Model, STATA).
- No significant relationship between endometrial inflammation and PRRS viral loads in uterus ($P = 0.4059$; Multilevel Mixed-Effect Model, STATA).
- Percentage of vessels affected with vasculitis and average severity score of vasculitis were not significantly related to PRRS viral loads in the uterus ($P = 0.4147$, $P = 0.6425$, respectively; Multilevel Mixed-Effect Model, STATA)

Acknowledgments

The funding for this project has been provided by Genome Canada and Genome Prairie. Dr. Novakovic was funded in part by a grant from the AASV foundation and a stipend from the University of Saskatchewan College of Graduate Studies and Research.

References

- Holtkamp DJ, et al. 2013. Assessment of the economic impact of porcine reproductive and respiratory syndrome virus on United States pork producers. J Swine Health Prod 21: 72-84.
- Christianson WT, et al. 1992. Experimental reproduction of swine infertility and respiratory syndrome in pregnant sows. Am J Vet Res 53:485-488.
- Karniychuk UU, et al. 2011. Porcine reproductive and respiratory syndrome virus (PRRSV) causes apoptosis during its replication in fetal implantation sites. Microb Pathog 51: 194-202.