



# Maternally derived antibody against canine parvovirus part 1: dam transfer rate and variability within the litter



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## Objectives

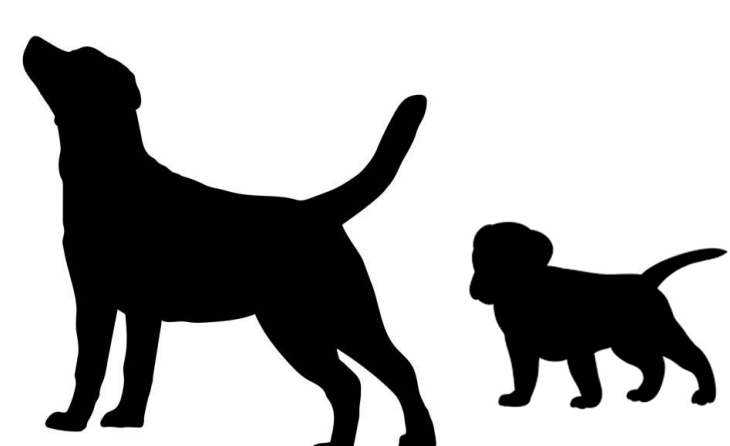
- Determine the average transfer rate of anti-canine parvovirus IgG from bitch to litter
- Analyze the variability of anti-canine parvovirus IgG levels between pups of the same litter

## Introduction

- Passive transfer of maternally derived antibody (MDA) through the consumption of colostrum is essential for neonatal survival, but MDA blocks immunization by modified live vaccine through viral neutralization.<sup>1</sup>
- Nomograph testing of the breeding bitch has been shown to significantly improve immunization outcomes for puppies.<sup>2</sup> Half-life degradation analysis of bitch titers against canine distemper (CDV) and canine parvovirus (CPV-2) is used to generate a tailored vaccine schedule and determine timing of follow-up testing for the litter.
- The nomograph is based on conservative assumptions of 100% transfer of titer from the bitch to the litter at birth and minimal variability between individuals within the litter. Expected inherent assay variability of  $\pm 1$  is included in the analysis
- Previous studies by others found significant variation in colostrum quality among mammary glands of bitches and variability of IgG levels in pups<sup>3,4</sup> but did not compare anti-CPV titers between pup and dam, or within litters.

## Methods

- Anti-Canine Parvovirus 2 (CPV-2) antibody titers were determined by hemagglutination inhibition (HI) assay<sup>5</sup>
- Serum samples were collected from 45 pregnant beagle bitches approximately 4 weeks pre-whelp and their resulting 45 litters at 14 days of age
- MDA titer at birth was determined by reverse half-life<sup>1</sup>. Geometric mean titer for each litter was compared with that of bitch to determine transfer rate
- Chi-square analysis of bitch transfer rates was performed (significance at 0.05)
- CPV-2 MDA titers were determined within the 45 beagle litters (238 pups) and from 27 litters from the field (87 pups) representing 15 breeds. All individuals were unvaccinated.
- Intra-litter MDA variability was analyzed by calculating sample variance (Excel VAR.S). Variance >1 exceeded assay variability and was considered highly variable



## Results

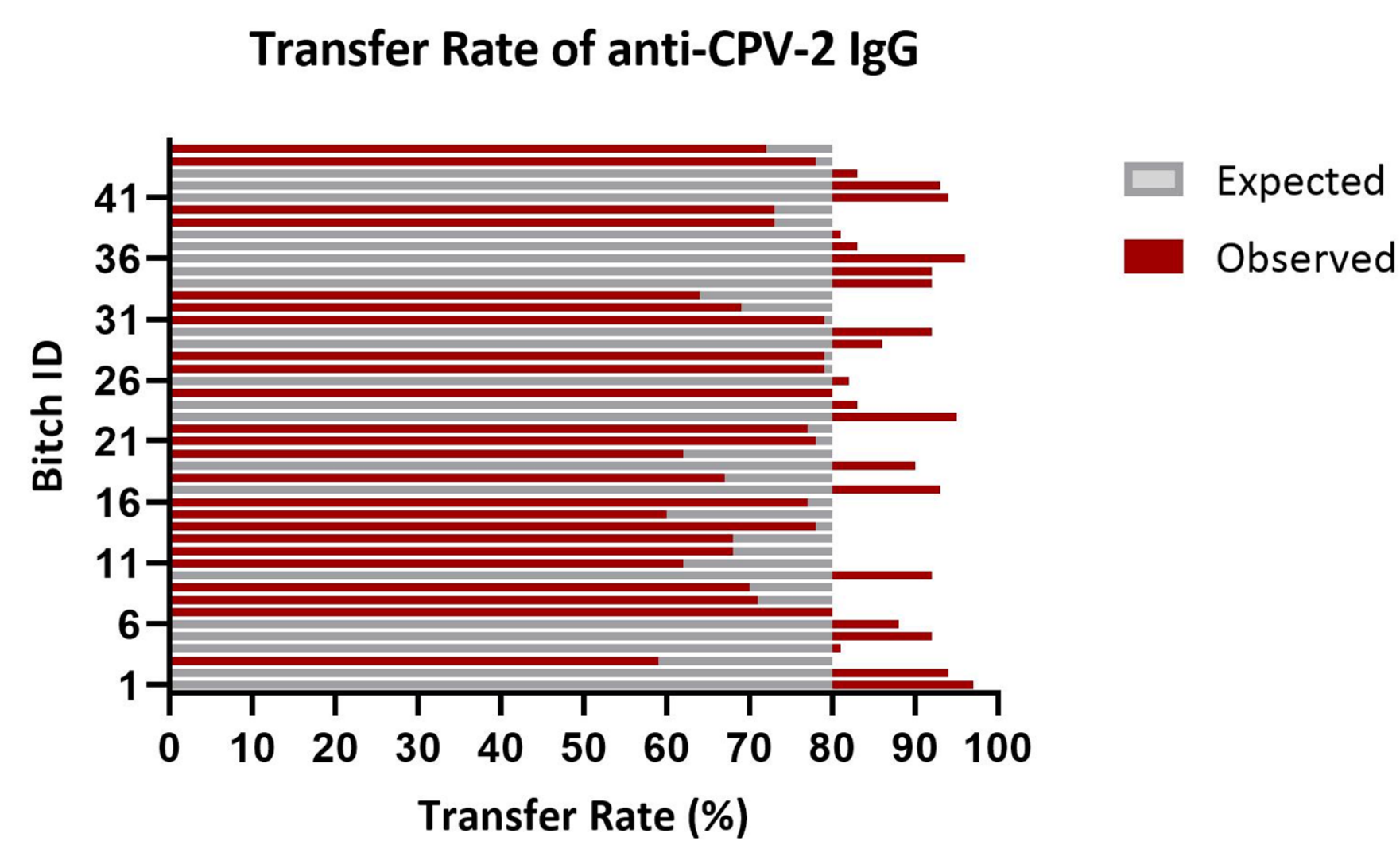


Figure 1. Trial 1- transfer rate of anti-CPV-2 IgG to 45 litters

- The mean transfer rate was 80% (range 59 to 97%)
- 13 (28.9%) bitches had transfer rates >90%
- Chi-square revealed difference between bitches was not significant with a *p-value* of 0.8901

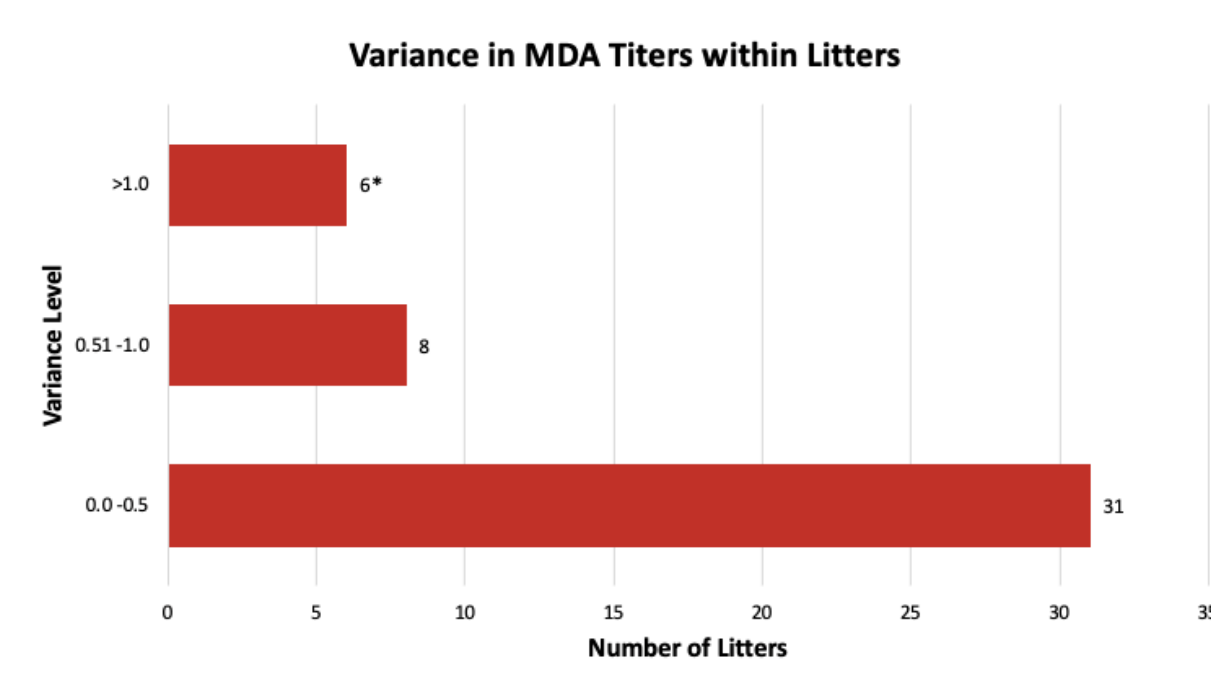


Figure 2. Sample variance in MDA titers within beagle litters

- 6 of 45 (13.3%) litters varied outside the inherent variability of the HI assay and experienced a variance above 1.0
- 39 of 45 (86.7%) litters experienced little to no variability

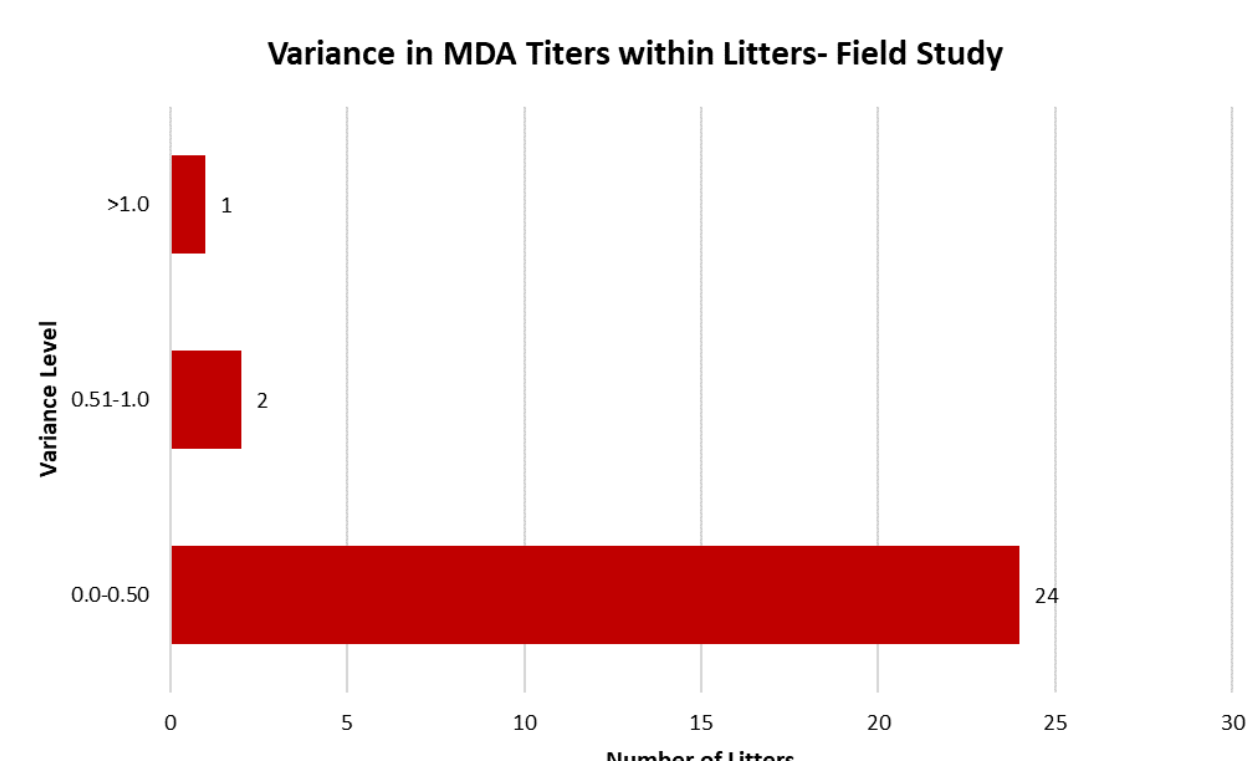


Figure 3. Sample variance in MDA titers within litters from the field

- One litter in 27 (3.7%) showed variance > 1.0

## References

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## Conclusions

- Individual bitch MDA transfer rate did not significantly differ from the expected transfer rate of 80% of maternal IgG levels
- The nomograph assumption of 100% transfer rate is valid and provides a conservative analysis.
- Pups of the same litter were found to have little variance in titer levels
- A nomograph generated vaccine schedule can be applied to an entire litter

## Discussion

- The standard puppy vaccination protocol is based on average bitch titers. However, the range of titers in adult dogs is wide and independent of time since last vaccination.<sup>6</sup> (data not shown)
- Litters born to bitches with high titer levels and high transfer rates may have MDA interference beyond the standard vaccination schedule, leaving pups unprotected. These litters benefit from an extended, tailored schedule.
- Litters born to bitches with low titers may be successfully immunized and follow-up tested earlier in life. Proven protection during critical early socialization provides peace of mind for owners and ultimately stronger human-animal bonds.
- Because the nomograph is geared to the highest possible level of MDA interference for a litter, pups with titers below their litter mean would be expected to be immunized before the final vaccine dose in the series.
- Follow-up titer testing of puppies at the end of the vaccination series is crucial to prove protection, whether a nomograph was completed or not.

## Disclosure

All authors are employed at the Companion Animal Vaccine and Immuno Diagnostics Service (CAVIDS) Laboratory at the University of Wisconsin-Madison School of Veterinary Medicine, which performs fee-for-service titer testing, nomograph analysis and puppy follow-up titer analysis.



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## Acknowledgements

The authors are abundantly grateful to the Winston's Challenge Fund Grant for supporting this work and to Ridglan Farms, Inc. for their contribution of serum samples to the study.

Further gratitude goes to Avidog International breeder members for serum samples from the field.