MERCK ANIMAL HEALTH
TECHNICAL SERVICES BULLETIN

Efficacy Evaluation of Infectious Bronchitis Virus Vaccines in Maternal Antibody Positive Broiler Chicks: Mildvac-Ma5® and Cevac IBron®

INTRODUCTION

Vaccination for the infectious bronchitis virus (IBV) in chickens is necessary to protect against challenge from different strains. IBV is ubiquitous in most poultry producing areas of the world, and it spreads rapidly in unprotected chickens (de Wit *et al.*, 1998). Successful immunization can be challenging at times, because of the many different antigenic or genotypic IBV types commonly referred to as variants.

The concept of cross-protection against a non-homologous IBV using Mildvac-Ma5® and Nobilis® IB 4-91 has been studied extensively (Cook, J.K.A., *et al*, 1999; Terregino, C., *et al.*, 2008). These two IBV vaccines are widely utilized in regions outside the United States with one in every three broilers in the world receiving Mildvac-Ma5® or Nobilis® IB 4-91 or a combination of the two. Cook, *et. al.* demonstrated cross-protection with Mildvac-Ma5®, but found the level of cross-protection variable, with strong cross-protection against some IBV isolates and little to no cross-protection against others.

With the current variant IBV challenges in the US, and lack of homologous commercial IBV vaccines, it is important to determine if a single vaccine cross-protective vaccination strategy is a viable option. Mildvac-Ma5® Mass type IBV vaccine from Merck Animal Health and the Cevac IBron® GA08 type vaccine from Ceva were tested against homologous and heterologous IBV challenges to evaluate protective ability of these single vaccines.

STUDY DESIGN

One-day old maternal antibody positive broiler chicks were vaccinated with a full dose of Mildvac-Ma5® and Cevac IBron® vaccine intraocularly and intranasally in this study to ensure application consistency, then placed into isolators. At 7, 10, 14, and 21 days of age, all chicks were swabbed and tested for vaccine virus using real time RT-PCR. At 28 days of age, 10 birds from each treatment group and 5 birds for each control group were challenged with a 1×10^4 EID_{50} dose of either a homologous (Mass/Mass41/41, GA08/

KEY POINTS

- Mildvac-Ma5® and Cevac IBron® demonstrated reduced clinical signs against all challenge IBV isolates tested.
- Mildvac-Ma5® demonstrated earlier decline in vaccine virus shedding compared to Cevac IBron®, correlating to field observations of a faster resolution of vaccination reaction.
- Single vaccine cross-protection was not effective in reducing viral shed following challenge with DMV 1639 in this trial using maternal antibody derived chicks.

GA08/08), or heterologous (GA/13384/2013 or DMV/1639/11) IBV, respectively.

The DMV 1639 strain (GA DMV_1639_TR) used for challenge in this study was isolated from a Georgia broiler clinical respiratory case in 2019. This DMV 1639 strain represents the current circulating respiratory strain impacting the US poultry industry and has shown sequence and phenotype differences compared to the original nephropathogenic isolates from 2015 (Figure 1). Post-challenge evaluations included clinical respiratory signs associated with IBV infection, virus load (Ct value), and virus isolation.

RESULTS

Seven days after vaccination, infection and replication dynamics of both vaccines were assessed to ensure that all chicks were adequately vaccinated. Viral loads, represented by Ct values, were similar for birds in both groups and all chicks were positive for their respective vaccines. A decline of virus shedding (percent positives) was observed in the Mildvac-Ma5® birds compared to the Cevac IBron® birds at 21 days post-vaccination (Figure 2). This correlates to field observations that vaccination reaction declines sharply after 2 weeks in birds vaccinated with Mildvac-Ma5® at the hatchery. A previous study with Mildvac-Ma5®, demonstrated the vaccine's rapid replication and early onset of immunity measured by RT-PCR (de Wit 2011).

Mildvac-Ma5® and Cevac IBron® reduced the severity of clinical presentations against every IBV challenge group compared to controls. Mildvac-Ma5® demonstrated no clinical signs for all challenge groups, while Cevac iBron® demonstrated no clinical signs for all challenge groups except Mass/Mass41/41, which demonstrated a reduction in clinical signs (Table 1).

Mildvac-Ma5® and Cevac IBron® protected well against their respective homologous challenges. When assessing Mildvac-Ma5® protection against GA08 challenge and Cevac iBron® protection against Mass challenge, a reduction in viral load was seen as compared to the non-vaccinated

Figure 1. Phylogenetic tree

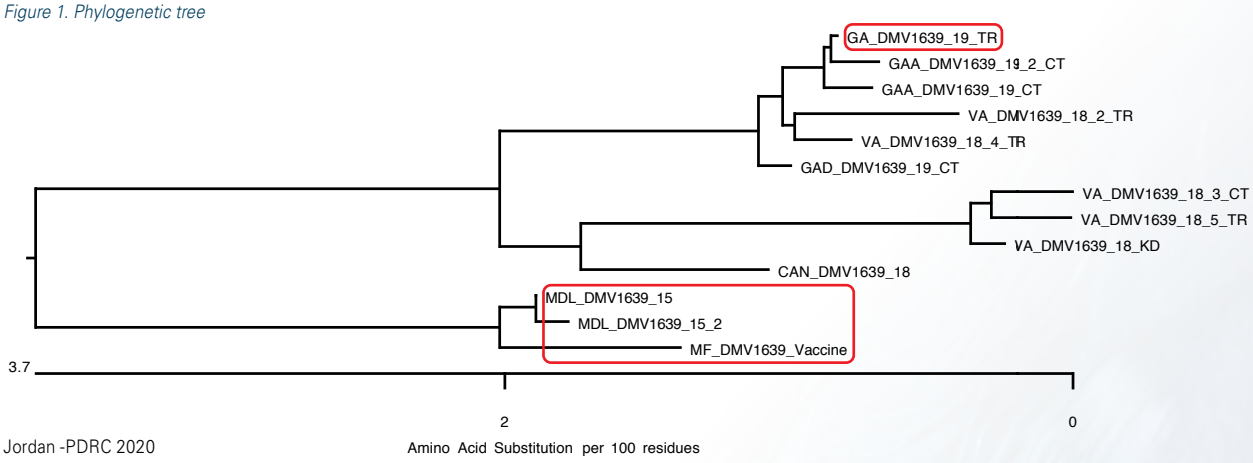
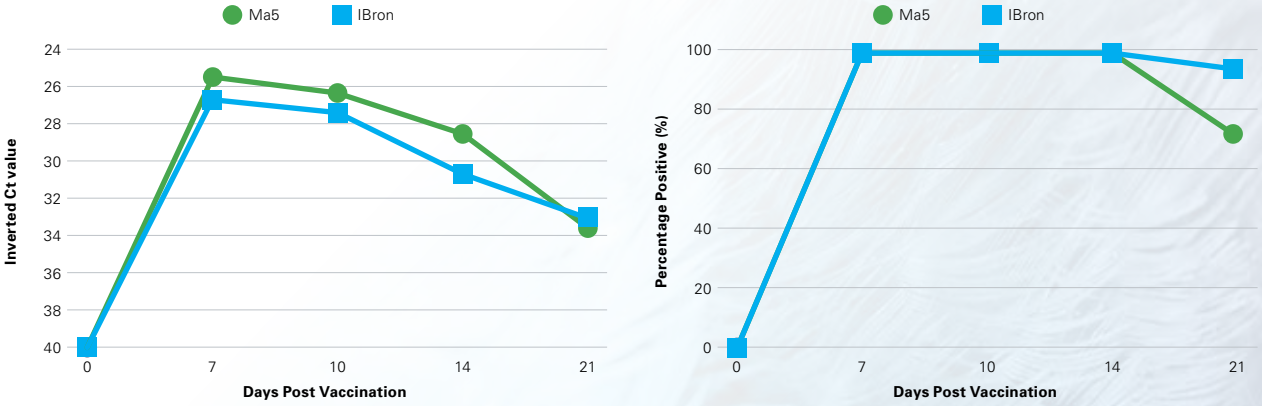


Figure 2. Inverted Ct Value of the vaccine virus and percent of positive birds (vaccine virus) post vaccination



groups. However, these groups were still 100% positive for IBV lesions in embryos (Table 2), suggesting the vaccines did not stop the infection cycle or reduce the viral load to the point where it would not transmit. In this study, the number of positive samples based on virus isolation in embryos, challenged by the variant IBVs GA13 and DMV 1639, was reduced by both vaccines compared to the nonvaccinated/challenge groups.

The Mildvac-Ma5® group was 60% positive verses 100% for controls, compared to 70% positive for the Cevac IBron® group (Figure 3). In this study, using these vaccines against GA13 and DMV 1639 demonstrated some protection against viral shedding and transmission.

Figure 3. Percent positive by virus isolation for DMV 1639 challenge

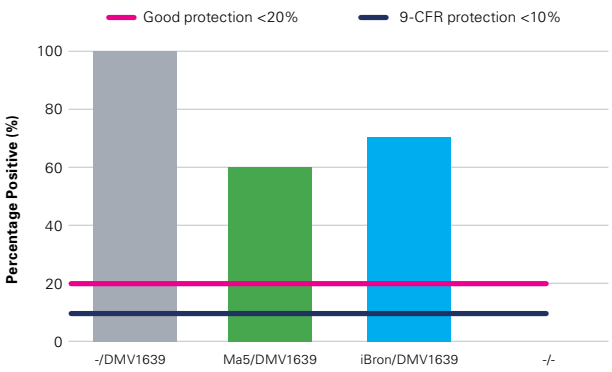


Table 1. Clinical signs score following high-dose challenge

No clinical signs | Mild clinical signs | Severe clinical signs

Vaccine	Challenge Virus			
	Mass	GA08	GA13	DMV 1639
Mildvac-Ma5®				
Cevac IBron®				
Unvaccinated				

Table 2. Percent positive with the challenge strain (Virus isolation in embryos)

<20% | 20-80% | >80%

Vaccine	Challenge Virus			
	Mass	GA08	GA13	DMV 1639
Mildvac-Ma5®				
Cevac IBron®				
Unvaccinated				

CONCLUSION

In this study, Mildvac-Ma5® and Cevac IBron® were equally able to control clinical signs in birds challenged with GA 13 and DMV 1639 IBV strains.

References:

Cook, J.K.A., Orbell, S. J., Woods, M. A. & Huggins, M. B. 1999. Breadth of protection of respiratory tract provided by different live-attenuated infectious bronchitis vaccines against challenge with infectious bronchitis viruses of heterologous serotypes. Avian Pathology, 28: 477-485.

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Terregino, C. Toffan, A. Beato, M.s., DeNardi, R., Vascellari, M., Meini, A., Ortali, G., Mancin, M., & Capua, I. 2008. Pathogenicity of a QX strain of infectious bronchitis virus in specific pathogen free and commercial broiler chickens, and evaluation of protection induced by a vaccination programme based on the Ma5 and 4/91 serotypes. Avian Pathology, 37: 487-493.

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