MERCK ANIMAL HEALTH
TECHNICAL SERVICES BULLETIN

Utility and Performance of Mildvac-Ma5® for IBV Vaccination of Broilers with DMV/1639 Field Challenge

INTRODUCTION

Poultry producers have long employed vaccines designed to limit losses associated with infectious bronchitis virus (IBV). Unfortunately, like most viral diseases, IBV continues to mutate into novel variants that present ongoing challenges for effective control. One of the more recent instances of this viral resiliency is the emergence of DMV/1639, which was isolated and named on the Delmarva Peninsula. In broilers, the DMV/1639 form of IBV started out as a nephropathogenic virus with a classic clinical presentation of huddled, lethargic chickens that failed to eat or drink normally.[1]

Unique to DMV/1639 was large amounts of wet litter, due to affected birds flushing non-concentrated urine. Over time, however, the virus mutated further and more flocks emerged with a classic respiratory presentation and fewer with the 'kidney' presentation. Infections with DMV/1639 eventually moved down the eastern US seaboard then west to Mississippi and Texas, and the clinical presentation in broilers changed almost exclusively to respiratory signs.

Since DMV/1639 is an IBV variant of growing concern in the US, poultry veterinarians and production manager need fresh information on potential options for adjustment of vaccination protocols. The utility and performance of Mildvac-Ma5 (Merck Animal Health) for vaccination of broilers under conditions of DMV/1639 exposure were explored in 2 field demonstration trials conducted at major commercial broiler producers in Texas and Alabama.[2]

KEY POINTS

- Incorporation of Mildvac-Ma5 (Merck Animal Health) into the IBV vaccination regimen of a Texas broiler complex harboring respiratory DMV/1639 substantially reduced mortalities, culls, and viral shedding while generally improving respiratory health.[2]
- In an Alabama field study evaluating clearance of IBV vaccines, broilers vaccinated with Mildvac-Ma5 were free of vaccine virus by the conclusion of grow-out, whereas, at the same timepoint, levels of vaccine virus were rapidly increasing in birds vaccinated with IBron® (Ceva).[2] Use of Mildvac-Ma5 also appeared to help improve growth performance and livability relative to IBron.
- Mildvac-Ma5 represents an excellent choice for managing IB in the presence of respiratory DMV/1639.

STUDY A – DESIGN

The first study involved a Texas broiler complex producing 4.20-lb (small) birds during an average 31- to 32-day growout. The complex had achieved good historical IB control with use of Newhatch-C2-MC® (Merck Animal Health) vaccine for more than a decade. Beginning in the summer of 2020, however, increasing severity of airsacculitis and general respiratory pressure (Elanco respiratory index, which is a component of the Elanco HTS database[3]) had been observed, coincident with isolation of DMV/1639, increasing mortality, and increasing culls. These concerns prompted managers to consider changes to the hatchery IB vaccination protocol.

Use of IBron (Ceva) was initially considered, but some characteristics of that vaccine (Table 1) prompted evaluation of other options. The managers decided to add Mildvac-Ma5 to their existing program, beginning 13 February 2021. Unfortunately, a severe winter storm started the next day, so early evaluations of vaccine performance may have been confounded by adverse production conditions. Still, health and productivity responses to the vaccine change were monitored for 5 months thereafter.

STUDY A – RESULTS

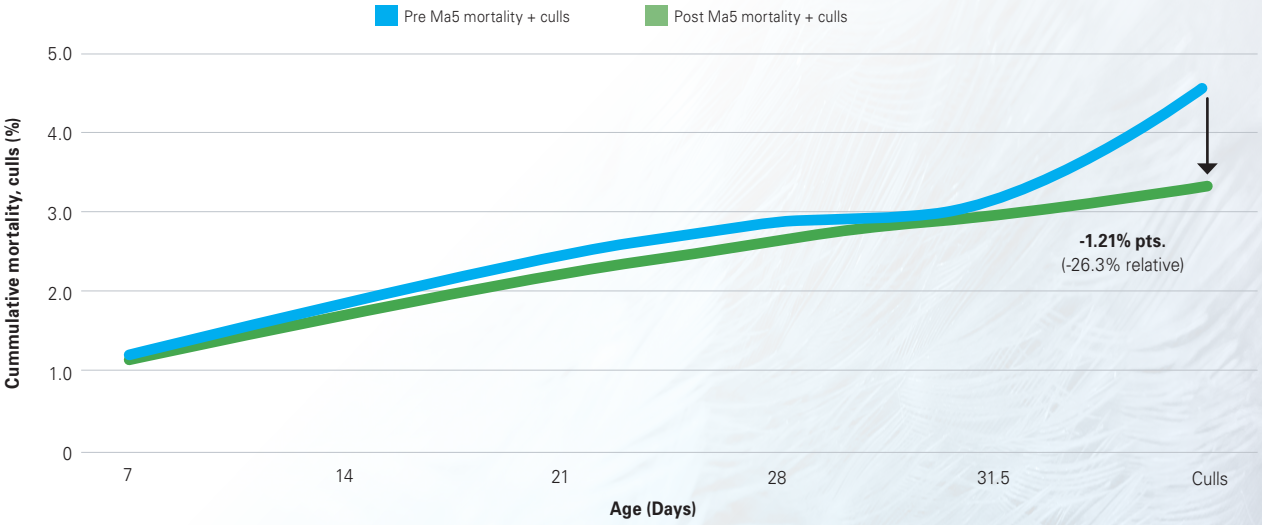
Mortality and Culls

Average cumulative mortalities that occurred with each vaccination program during 31.5-day growouts at the complex are summarized in Figure 1. Mortality rates before or after Mildvac-Ma5 introduction followed similar patterns during growout, even though the post-Mildvac-Ma5 data were negatively impacted by stresses associated with winter storm Uri of 2021 that brought rolling blackouts and record breaking cold to the region. Mortality did not rise as a result of the vaccine change, and the cumulative amount of culls was substantially lower for birds vaccinated with Mildvac-Ma5 (actual reduction of 1.21 percentage points, or a relative reduction of 26.3%). The

Table 1: General characteristics to consider for IB vaccination protocol.

Has the variant been isolated in the region? Carefully consider introduction of an unneeded serotype as it is not generally recommended. IBron (Ceva) is a GA08 serotype and Mildvac-Ma5 is a Mass serotype.
IBron (Ceva) was licensed several years ago (2015). During this time DMV/1639 showed the nephropathogenic form of IB, but has since further evolved to become a different and significant respiratory pathogen, the serotype of concern in these studies.
In general vaccine reactivity can affect performance during the critical growth phase.
As shown in Study B below, IBron (Ceva) vaccine virus does not fully clear from birds before going to market.
IBron (Ceva) is expensive, about twice the price of Mildvac-Ma5.

Figure 1: Cumulative average mortality and culls during 31.5-day growouts before and after start of Mildvac-Ma5.



elevated cull incidence associated with the previous protocol was avoided with use of Mildvac-Ma5, an outcome with sizable financial implications by:

1) dramatically increasing the number of marketable broilers (income).

2) avoiding the investment of feed and resources in birds that succumb to disease.

DMV/1639 Isolation

Serotype-specific reverse transcription polymerase chain reaction (RT-PCR) analyses were performed on samples collected at posting sessions throughout the study period, for the purpose of DMV/1639 surveillance. Average viral population dynamics during growouts presented in Figure 2 reveal that Mildvac-Ma5 reduced viral shedding in an environment with a previously uncontrolled and heavy viral load.

The initiation of Mildvac-Ma5 prompted a large decrease in viral shedding compared to the pre-Mildvac-Ma5 record, especially in younger birds, and a benefit persisted through growout.

Respiratory Index

A respiratory index metric that attempted to quantify overall respiratory 'pressure' on flocks (incidence of airsacculitis, suds, tracheitis, etc.) had been collected at the complex for many months. As summarized in Figure 3, the index was stable until late summer of 2020 when an increase in respiratory disease was noted. Tissues were collected in hope of deducing a cause, and the presence of DMV/1639 was thus confirmed by RT-PCR. However, neither airsacculitis nor condemnations were reported in excess at

Figure 2: Average DMV/1639 viral shedding during growout as determined by RT-PCR, before and after start of Mildvac-Ma5.

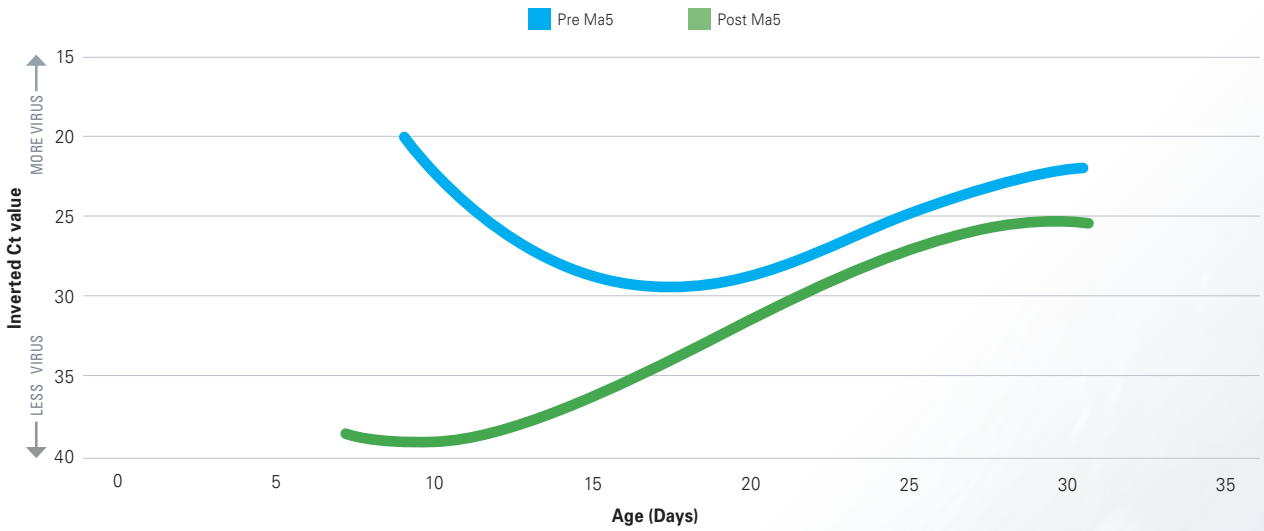
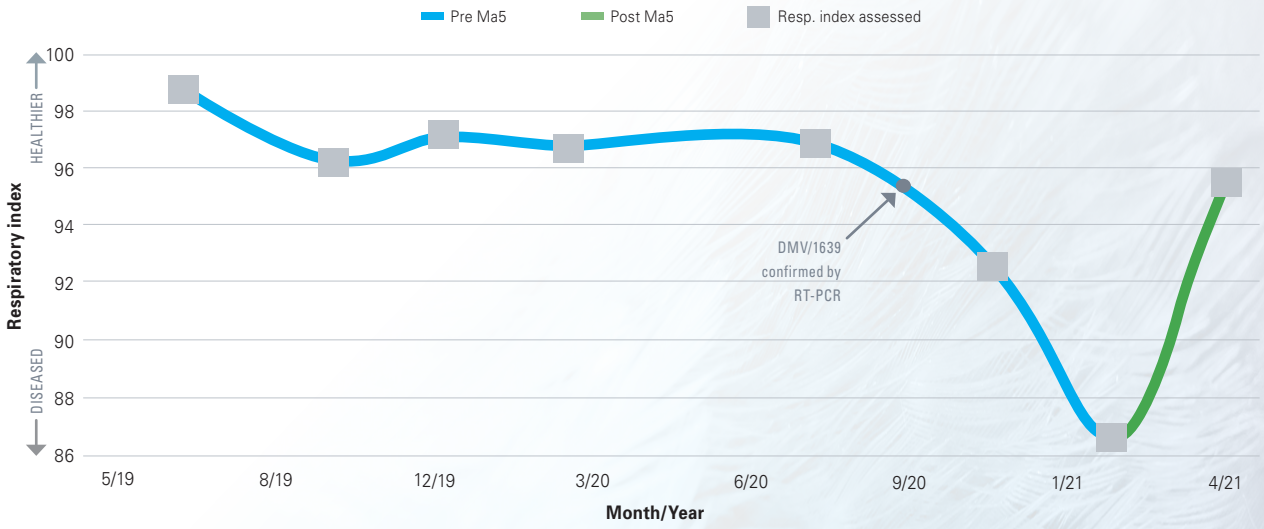


Figure 3: Two-year record of respiratory index values.



the processor, so no changes in the respiratory vaccination program were implemented.

The respiratory index subsequently fell further, helping prompt use of Mildvac-Ma5. An impressive rebound in the index was quickly detected after start of Mildvac-Ma5, further confirming the favorable performance and impact of Mildvac-Ma5 under commercial field conditions with active DMV/1639 exposure and pressure.

STUDY B – DESIGN

A second study involved 9 farms at a commercial broiler complex in Alabama with a known history of natural DMV/1639 field challenge. The study focused on PCR surveillance of vaccine and field viruses during growout, and general flock performance parameters. Four farms used IBron in their chick vaccination protocol, while another 5 farms used Mildvac-Ma5.

STUDY B –DESIGN

Virus Surveillance

Surveillance outcomes indicated that both vaccine programs controlled DMV/1639 well, with very little shedding of the pathogenic field virus (Figure 4, grey line). However, differences were detected in regard to the specific vaccine viruses introduced by the respective vaccines.

The GA08 virus that was introduced into the flock by IBron vaccination was persistent and never cleared from birds and was in fact growing in abundance at growout end, so birds were contending with vaccine virus all the way to market.

Figure 4: RT-PCR surveillance data quantifying clearance of field and vaccine viruses from broilers during growout.

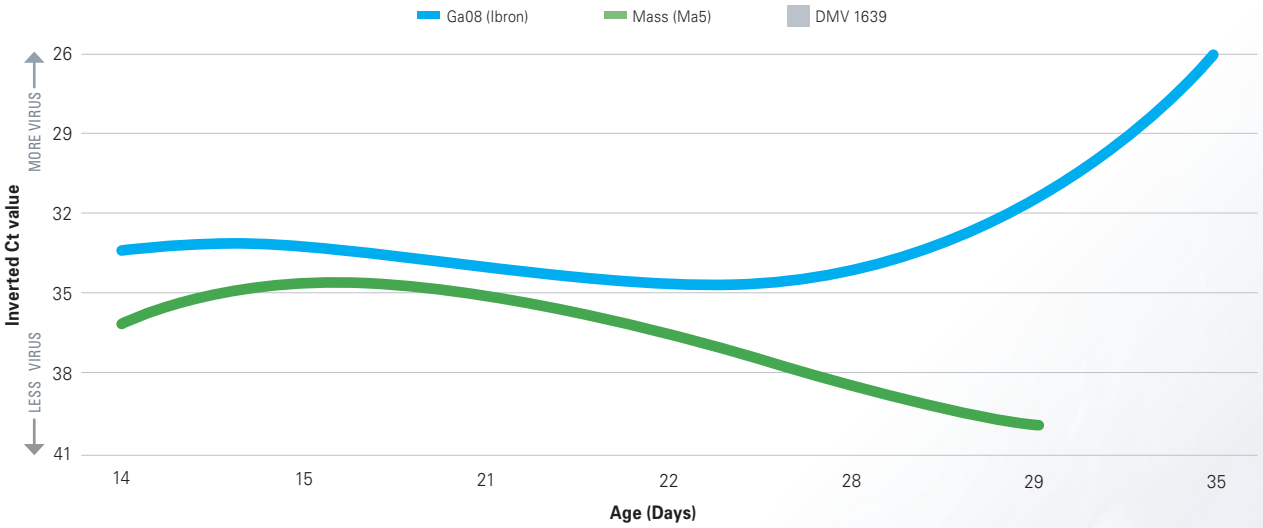
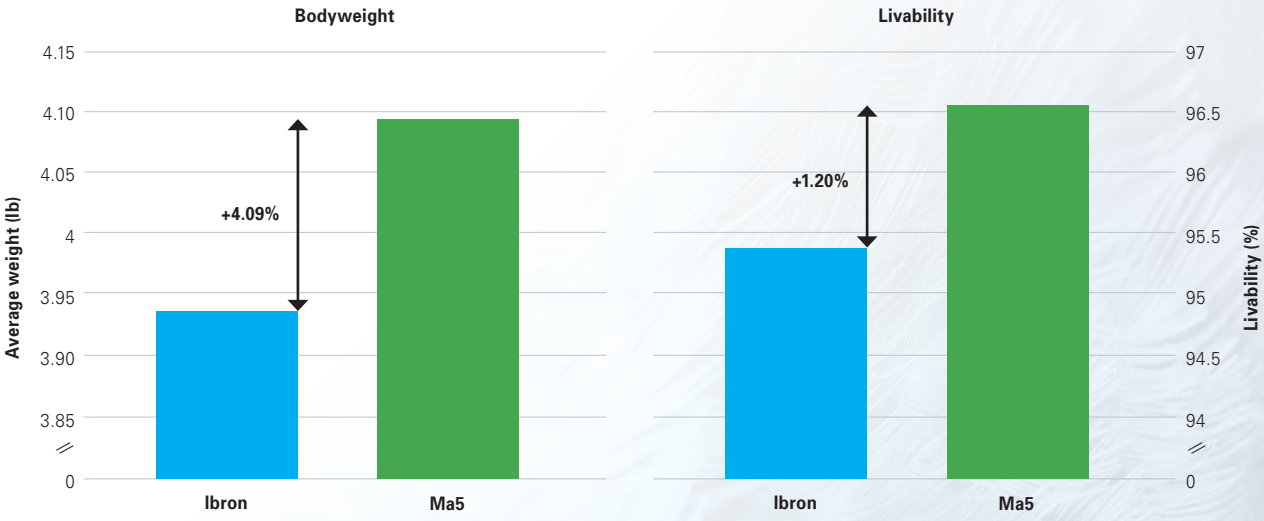


Figure 5: Favorable performance of broilers vaccinated with Mildvac-Ma5 vs IBron.



In contrast, the Mass virus that originated with Mildvac-Ma5 vaccination peaked before day 21 and was fully cleared from birds before 30 days. These outcomes suggest more favorable viral population dynamics for Mildvac-Ma5, with the potential for better performance due to less vaccine virus stress on the birds.

Performance

Substantial and economically significant improvements in body weight (and thus average daily gain) and livability were demonstrated for Mildvac-Ma5 vaccinates (Figure 5). Relative to birds vaccinated with IBron, Mildvac-Ma5 vaccinates achieved 4.09% heavier weights with 1.20% better survival. Thus, the production of more birds with more weight suggested direct financial benefit for the Mildvac-Ma5 program.

WHY MILDVAC-MA5®?

Mildvac-Ma5 is the popular IBV vaccine from Merck Animal Health that aids in the prevention of disease due to Massachusetts type bronchitis virus in chickens. This live virus, lyophilized (not frozen) vaccine, for administration to birds 1 day of age or older, generates cross-protecting antibodies that help provide wide coverage across multiple strains of IBV.[4]

As the name implies, Mildvac-Ma5 offers low reactivity in chickens, typically causing only mild reactions (if any) and/or minimal stress. This record of excellent safety and toleration is largely due to its developmental and production process. Mildvac-Ma5 is a *plaque-purified* Mass vaccine from the Holland strain, meaning it was adapted to chicken embryo kidney cell cultures and then plaque-purified. Mildvac-Ma5 is thus a 'cloned' or single-population vaccine without subpopulations (reactive agents) typically found in IB vaccines attenuated only by embryo-passage methods, such as Ark vaccines.

The excellent toleration of Mildvac-Ma5 does not sacrifice efficacy; rather, the vaccine was specifically developed for optimal immunogenicity. Unlike other IB vaccines, Mildvac-Ma5 is HA positive (hemagglutinates chicken red blood cells), a characteristic associated with higher immunogenicity. Further, the Mildvac-Ma5 genome possesses conformational changes in the structure of the viral spike protein that expose different surface epitopes compared to related vaccine serotypes (e.g., H120 or Mass 41).[5] As a result, Mildvac-Ma5 is highly immunogenic and demonstrates good cross-protection against many IBV variants. The fact that 1 in 3 commercial broilers placed globally are vaccinated with a dose of Mildvac-Ma5 stands as a testament to its unique ability to protect from multiple challenges while providing superior performance.

CONCLUSION

Two demonstration field studies confirmed the utility of Mildvac-Ma5 for IB control in the presence of respiratory DMV/1639. Incorporation of Mildvac-Ma5 into the vaccination regimen of a Texas broiler complex substantially reduced mortalities, culls, and DMV/1639 shedding while generally improving respiratory health. A second Alabama study verified clearance of IBV from broilers vaccinated with Mildvac-Ma5 by the conclusion of growout, but vaccine virus failed to clear from birds vaccinated with IBron. Further, use of Mildvac-Ma5 appeared to help improve growth performance and livability by 4% and 1.2%, respectively, relative to IBron.

Study outcomes provide valuable insight for veterinarians and productions managers tasked with IB vaccine selection. Mildvac-Ma5 represents an excellent choice for managing IB in the presence of respiratory DMV/1639 at a far lower cost.

Reference.

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