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EFFICACY OF A NEW IMMUNE-COMPLEX IBDV VACCINE AGAINST AN EXPERIMENTAL INFECTION WITH THE DD1 STRAIN IN BROILER CHICKEN

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INTRODUCTION

GUMBOHATCH® is a new immune-complex vaccine against Infectious Bursal Disease (IBD) developed by HIPRA. This new immune-complex vaccine has introduced a different formulation (IgY egg origin) and control parameters to ensure the complete coating of the vaccine virus and the maintenance of the maximum potency, even in the presence of high levels of maternal antibodies (MDAs). The intended use of the vaccine is to protect chicks as soon as the MDA levels start to drop. DD1 strain is a very virulent infectious bursal disease virus (vIBDV) strain isolated in 2016 from broiler chickens in the Volgograd region of Russia (Shirokov et al., 2018). The objective of this trial was to assess the efficacy of GUMBOHATCH® in broiler chickens after an experimental challenge with the DD1 strain.

MATERIALS & METHODS

A randomized trial to assess the efficacy of GUMBOHATCH® vaccine was performed in broiler chickens. Forty animals were included in the study, either vaccinated with GUMBOHATCH® or mock vaccinated with PBS. The administration of the vaccine was carried out subcutaneously to 1-day-old chicks. Each chick was administered with one dose of the vaccine. The trial involved a challenge with the DD1 strain at 28 days of age. Some birds were necropsied before challenge in order to check the vaccine virus replication. The rest of the animals were challenged and necropsied at day 5 after infection. To assess the protection several variables were studied. The primary variable was the presence of external oedema in the Bursa of Fabricius (BF) after challenge. Secondary variables were macroscopic lesions on the BF and the relative weight of the BF and spleen. Serological response and presence of viral RNA at the bursa of Fabricius before and after infection were also monitored. All continuous variables were described and compared between groups, using the Mann-Whitney test or t-tests depending on the data. Proportions were compared using the Fisher exact test.

RESULTS

Seroconversion to IBDV was observed in GUMBOHATCH® vaccinated birds before challenge (Table 1). Vaccinated animals showed a reduction in the macroscopic lesions (Table 2), including oedema of the bursa of Fabricius, compared to mock-vaccinated animals. Moreover, splenomegaly was only observed in the mock-vaccinated and infected group.

Challenge	Day of study	Treatment	n	Serological response				
				S/P ¹		Titre ²		% positive
				Mean	SD	Mean	SD	
Not receiving a challenge	0	NA	15	2.495	0.975	6327	2695	100.0%
	14	A1 (GUMBOHATCH®)	5	0.515	0.236	1118	553	100.0%
		A3 (PBS)	5	0.262	0.131	532	295	60.0%
	19	A2 (GUMBOHATCH®)	5	0.131	0.054	248	101	0.0%
		A4 (PBS)	10	0.167	0.050	328	266	40.0%
	25	B1 (GUMBOHATCH®)	5	0.054	0.021	93	39	0.0%
		B3 (PBS)	5	0.050	0.029	86	54	0.0%
	28	C1 (GUMBOHATCH®)	5	1.077	1.523	2688	4022	6.0%
		C3 (PBS)	3	0.069	0.028	122	54	0.0%
	33	C2 (GUMBOHATCH®)	15	3.167	0.898	8190	2543	100.0%
		C4 (PBS)	10	0.033	0.017	55	32	0.0%
After DDI challenge	33 (28+5)	C1 (GUMBOHATCH®)	15	3.536	0.688	9233	1929	100.0%
		C3 (PBS)	15	1.596	0.340	3849	897	100.0%

Table 1. Mean serological response of each group (BioChek).

$$^1 S/P = \frac{OD_{405} \text{ Sample} - \text{Mean } OD_{405} \text{ Negative Control}}{\text{Mean } OD_{405} \text{ Positive Control} - \text{Mean } OD_{405} \text{ Negative Control}}$$

$$^2 \text{Titre calculation: } \text{Log10 Titre} = 1.1 \times \text{Log10 S/P} + 3.361. \text{Titre} = \text{Antilog}(\log_{10} \text{Titre})$$

Group		Sum of macroscopic scores					
Day of necropsy		n	Min	Median	Max	Mean	P-value ¹
33 (5 days after challenge)	C1 (GUMBOHATCH® infected)	15	0	0	2	0.3	<0.001*
	C3 (PBS infected)	15	0	3	6	2.93	
Day of necropsy		Group		External oedema			
				Proportion		P-value ¹	
33 (5 days after challenge)		C1 (GUMBOHATCH® infected)		1/15 (6.7%)		<0.001*	
		C3 (PBS infected)		9/15 (60.0%)			
Day of necropsy		Group		Spleen: BW ratio			
				n	Mean	SD	P-value ¹
33 (5 days after challenge)		C1 (GUMBOHATCH® infected)		15	1.03	0.07	<0.001*
		C3 (PBS infected)		15	1.88	0.56	

Table 2. Summary and comparison of sum of bursa of Fabricius macroscopic lesions, external oedema and mean Spleen: BW ratios of each group at 5 days after challenge.

¹ P-value of the Mann-Whitney test. Differences were considered significant when p < 0.05 (*).

CONCLUSIONS

The results of this study demonstrate the efficacy of GUMBOHATCH® vaccine in broiler chickens against an infection with the DD1 strain.