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COMPARATIVE EFFICACY OF DIFFERENT VACCINATION PROGRAMS AGAINST NEWCASTLE DISEASE IN COMMERCIAL LAYER-TYPE CHICKENS

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INTRODUCTION

Newcastle disease (ND) is a highly contagious viral disease characterized by great variability of morbidity, mortality, clinical signs and characteristic lesions. It mainly affects domestic poultry, hens, chickens and turkeys. At least 236 avian species have a record of NDV isolation, Kaleta and Baldauf (1988). Chickens are considered the most susceptible poultry species. It is caused by a virus from paramyxoviruses family, *Avian paramyxovirus* serotype 1 (APMV-1) Miller *et al.* (2010). It is possible to control the Newcastle disease (ND) using different vaccination programmes, depending on the pressure of infection and the biosecurity standards. The Newcastle disease (ND) diagnosis is based on serology, clinical signs of the disease and molecular methods. The objective of this study was to determine the serological differences after 14 weeks of age in laying chickens using four different vaccination programs against Newcastle disease and a control non-vaccinated group against ND, using a commercial ELISA Kit (CIVTEST® AVI NDV).

MATERIALS & METHODS

200 healthy bb Hy-Line laying chickens showing antibodies against Newcastle disease and Infectious Bronchitis were used. They were divided into 4 groups of 24 birds each and the control group (T5) of 30 birds which were not vaccinated. This study was performed at the experimental unit of the Pathology laboratory of the Universidad Nacional Mayor de San Marcos.

Five groups divided randomly were named T1, T2, T3, T4 and T5. The 4 groups (T1, T2, T3 and T4) were vaccinated at the same ages: 2, 8 and 11 weeks using live Newcastle vaccines. T1 and T2 were vaccinated using Hipraviar® S/H120 (combination of Newcastle LaSota Strain with minimum titer of $10^{6.5}$ and Infectious Bronquitis H120 Strain with minimum titer of 10^{3}). In the second week, a local manufactured vaccine (LaSota Strain/ H120) in the eight week and eleventh week the Hipraviar® Clon/H120 (combination of Newcastle CL/79 Clon Strain with minimum titer of $10^{6.5}$ and Infectious Bronquitis H120 Strain with minimum titer of 10^{3}). T3 was vaccinated using Hipraviar® Clon/H120 in the second, eight and eleventh week. T4 was vaccinated using a local manufactured combination LaSota/ IB vaccine in the second week, eight week and eleventh week. The complete programme is shown in the table below.

Table 1 – Vaccination programme for the different groups

Group	T1	T2	T3	T4	T5(CONTROL)
1º day	Vector IBD HVT Vaccine	HVT-LT + Rispens	HVT-LT + Rispens	HVT-LT + Rispens A	HVT-LT + Rispens
2º week	Hipraviar®S/H120	Hipraviar®S/H120	Hipraviar®Clon/H120	Lasota/Bronchitis	Gumboro 1
		Gumboro 1	Gumboro 1	Gumboro 1	
3º week	Inactivated ND Vaccine	Inactivated ND Vaccine	Inactivated ND Vaccine	Inactivated ND Vaccine	
	Life SHS Vaccine	Gumboro 2	Gumboro 2	Gumboro 2	Gumboro 2
		Life SHS Vaccine	Life SHS Vaccine	Life SHS Vaccine	Life SHS Vaccine
4º week	Debeaking	Debeaking	Debeaking	Debeaking	Debeaking
		Gumboro 3	Gumboro 3	Gumboro 3	Gumboro 3
8º week	Live ND IB	Live ND IB	Hipraviar®Clon/H120	LaSota/Bronchitis	Coryza Inactivated
	Coryza Inactivated	Coryza Inactivated	Coryza Inactivated	Coryza Inactivated	
11º week	Inactivated ND Vaccine	Inactivated ND Vaccine	Inactivated ND Vaccine	Inactivated ND Vaccine	SG live vaccine
	SG live vaccine	SG live vaccine	SG live vaccine	SG live vaccine	SHS
	Hipraviar®Clon/H120 + SHS	Hipraviar®Clon/H120 + SHS	Hipraviar®Clon/H120 + SHS	Lasota/Bronchitis +SHS	

*The inactivated vaccines for Newcastle disease were the same in all 4 groups.

ELISA

Antibodies against Newcastle disease were detected using the CIVTEST® AVI NDV kit. The samples were analysed at the Hipra Laboratory in Lima, Peru and followed all the manufacturer's procedures. Twenty samples per group were taken at 14 weeks of age, using the CIVTEST® AVI NDV kit at the Hipra Laboratory in Lima, Peru following all the manufacturer's procedures. The results for each group were analysed based on the arithmetic titre. The results were statistically compared using ANOVA (Analysis of Variance).

RESULTS

The cut-off for the CIVTEST® AVI NDV is ≥ 317. The serological results are shown in the table below (Table 2).

The arithmetic mean titre for T5 (control group) was 911.6. Groups T1, T2 and T3 had the titres shown below, with no statistical difference between the three groups (T1, T2 and T3). As per graphic one, the different letters show statistical difference, a, b and c. Group T4 had an arithmetic mean titre of 14673.85 and was statistically different to the other groups, as per graphic one. The Coefficient of Variation (C.V.%) in the Groups T1, T2 and T3 was lower than 13% and the (C.V.%) in T4 is 23% and T5 is 118%. The T5 showed a low titer and high C.V.

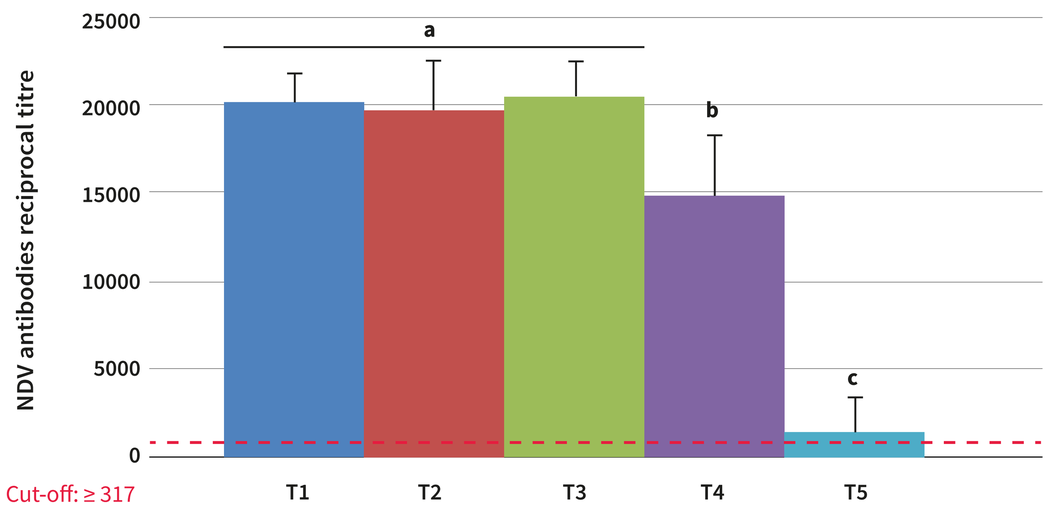
DISCUSSION

The results showed higher antibody levels in T1, T2 and T3 (T1 20.183, T2 19.663 and T3 20.494) compared to T4 (14.674). The Arithmetic Mean Titer didn´t showed statistical difference between those three groups (T1, T2 and T3) as per Graphic 1. The Groups T1 and T2 were vaccinated using Hipraviar® S/H120 vaccine (combination of Newcastle LaSota Strain with minimum titer of $10^{6.5}$ and Infectious Bronquitis H120 Strain with minimum titer of 10^{3}) in the second week vaccination and in the eight week a local NCD LaSota/H120 vaccine. T3 was vaccinated using Hipraviar® Clon/H120 (combination of Newcastle CL/79 Clon Strain with minimum titer of $10^{6.5}$ and Infectious Bronquitis H120 Strain with minimum titer of 10^{3}) in all live Newcastle vaccination. The Groups T1, T2 and T3 showed lower C.V. % as per table 2 compared to T4 and T5. Those three groups were vaccinated using Hipra live vaccines and generic inactivated vaccines in the same ages. T5, as expected as control non-vaccinated group against Newcastle disease, had lower antibody levels and higher C.V. Group T4 was vaccinated using a local manufactured LaSota strain and had an arithmetic mean titre of 14673.85 and was statically lower than T1, T2 and T3 also had a higher C.V. % of 23%. T1, T2, T3 and T4 had the same local manufactured inactivated ND vaccine in the third and eleventh week. The live vaccines in the vaccination programme are essential to local immunity but also important to humoral immunity, Kaczynski et al. (2013). It is important to have high levels of antibodies to protect the flock against the disease and reduce the shedding of the virus, Miller et al. (2013).

Table 2 – Serological results for the different groups using CIVTEST® AVI NDV

Group	T1	T2	T3	T4	T5
Arithm. Mean	20.183	19.663	20.494	14.674	912
Geom. Mean	20.143	19.481	20.445	14.231	474
SD	1.309	2.522	1466	3.358	1.071
CV%	6%	13%	7%	23%	118%
Min	18.376	11.602	17.301	7.349	31
Max	22.620	24.427	24.581	19.084	3.641

Graphic 1 – Arithmetic mean titre graphic using ANOVA



CONCLUSIONS

The results of this study showed a higher level of antibodies with statistically significance in the groups T1, T2 and T3 compared to T4. The T1, T2 and T3 had a maximum C.V.% of 13% and T4 had a C.V. of 23%, as the inactivated vaccines was the same, the live vaccines interfered in the seroconversion, been higher and with lower C.V.% in the Hipra vaccines. The Arithmetic Mean Titer between the Groups T1, T2 and T3 didn´t showed statistical difference. In the group T3, the Newcastle vaccine used was Hipraviar® Clon/H120 (CL/79 Clon strain combined with H120) and showed similar response with T1 and T2, the vaccine used was Hipraviar® S/H120 (LaSota strain combined with H120) in the second and eleventh weeks. The results of this trial show the importance of the live vaccines in the vaccination programme, not just because of the cellular immunity but also as a primer to the humoral response. The Hipraviar® S/H120 and the Hipraviar® Clon/H120 have a minimum titre of $10^{6.5}$ EID50, the higher vaccine titres made a difference in the levels of antibodies.

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