Area Pneumovirus

COMPARISON OF SEROLOGICAL RESULTS FROM 3 DIFFERENT VACCINATION PROGRAMMES WITH INACTIVATED VACCINE AGAINST AVIAN METAPNEUMOVIRUS (aMPV) IN COLOMBIA.

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1 INTRODUCTION

The avian pneumovirus or avian metapneumovirus (aMPV) is a single-stranded, non-segmented, negative sense RNA virus and a member of the Pneumovirinae subfamily, which is included in the Paramyxoviridae family (4). It is a causal agent of infectious turkey rhinotracheitis (TRT) and Swollen Head Syndrome (SHS) in broilers, layers and breeders.

The avian metapneumovirus is replicated in the upper respiratory tract in birds of any age from birth (5;3) and in the reproductive tract after a viraemic phase (8).
Currently in Colombia, only inactivated vaccines against aMPV can be marketed, although their use and vaccine programmes vary among different producers.
Inactivated vaccines against aMPV are very important for long-cycle birds, and essential in situations where the use of live vaccines is prohibited, since they are the only method of control. The main functions of inactivated vaccines are:

- Reducing the excretion of field viruses in case of infection (1;6)
- Preventing replication of the field virus in the reproductive tract by protecting the quantity and quality of eggs. (2;3;7)

The objective of the study was to determine significant differences in the levels of antibodies against the disease caused by aMPV between unvaccinated batches (G0), batches vaccinated with one dose of inactivated vaccine (G1), and batches vaccinated with two doses of inactivated vaccine (G2) as recommended in countries where the use of live vaccines is not permitted.

2 MATERIALS AND METHODS

This study was carried out in Colombia between 2015 and 2016, where a total of 1,009 sera from 48 batches of birds corresponding to 3 different vaccine plans (G0, G1 and G2) were passively collected and analysed.
The birds were commercial layers and broiler breeders, usually vaccinated during the rearing phase and/or susceptible to aMPV infection in Colombia. They received one dose (G1) or two doses (G2) of a commercial product, HIPRAVIAR® TRT /AVISAN® TRT, an inactivated vaccine against aMPV subtype B, chicken origin, strain 1062, in emulsion for injection.

Monitoring was conducted on egg-producing birds in the production phase, in different age ranges: 20-29 weeks, 30-39 weeks and 40-55 weeks.
Antibody titres against aMPV were evaluated by means of an indirect commercial ELISA kit (CIVTEST AVI TRT, HIPRA, S.A.).

S/P VALUE	TRT TITRE	TRT ANTIBODY STATUS
Less than or equal to 0,121	0 - 90	NEGATIVE
Greater than 0,121 and less than 0,195	91-195	SUSPECT
Greater than or equal to 0,195	196 or greater	POSITIVE

A statistical analysis of these mean levels of antibodies to aMPV was then conducted between groups of vaccine plans for each age range using the Mann-Whitney U test.

3 RESULTS

The statistical analysis revealed that:

- **In batches of birds between 20-29 weeks of age:** G1 and G2 showed significant differences compared to unvaccinated batches (G0) (p-value <0.05), showing a higher mean titre at the beginning of productive life, minimising the presence of birds with no antibodies or with low aMPV titres at the time of going into peak.

- **In batches of birds between 30-39 weeks of age:** G2 birds showed a significantly lower mean titre than G1 and G0 birds (p-value <0.05), which suggests greater challenge control in this productive phase, with obvious challenges for high antibody titres in G0 and G1 birds.

- **In batches of birds between 40-55 weeks of age:** G1 birds showed a significantly higher mean titre than G0 birds (p-value <0.05) and G2 birds (p-value <0.05), and G0 birds showed a significantly higher titre than the G2 group (p-value <0.05), suggesting a lower challenge impact in batches vaccinated with 2 doses of HIPRAVIAR® TRT / AVISAN® TRT.

Table 1. Mean antibody titres against aMPV, standard deviation (SD) and coefficient of variation (CV%) of groups G0, G1 and G2, in the three age ranges that were compared.

		20-29 weeks of age	30-39 weeks of age	40-55 weeks of age
GROUP 0 (Not vaccinated)	Mean titre	4.413[a]	19.736[a]	7.340[a]
	SD*	6.919	21.581	7.006
	CV %**	157	109	95
GROUP 1 Vaccinated 1 dose HIPRAVIAR® TRT /AVISAN® TRT	Mean titre	10.764[b]	15.588[a]	10.838[b]
	SD	7.512	8.140	5.817
	CV (%)	70	52	54
GROUP 2 Vaccinated 2 doses HIPRAVIAR® TRT /AVISAN® TRT	Mean titre	9.278[b]	6.174[b]	4.531[c]
	SD	7.889	5827	5.327
	CV (%)	85	94	118

*SD: Standard deviation
**CV %: Coefficient of variation %
The values with distinct superscripts are significantly different at p value ≤ 0.05 by Mann Whitney U test.

As shown in Table 1, the **unvaccinated group (G0)** showed lower seroconversion than the vaccinated groups (G1 and G2), although the mean titre was compatible with infection in unvaccinated birds (4,413 ELISA units between 20 and 29 weeks of age). This assumption of infection can be confirmed by the evolution of titres in birds between **30 and 39 weeks** of age with very high mean titres (19,736 ELISA units). Birds ranging between **40 and 55 weeks** of age also showed titres compatible with infection. However, in the birds that were sampled at this age, there were farms that could be declared as negative or with very slight contact at that age.

The vaccinated groups (G1 and G2) showed better performance in the mean titre during the first production phase between **20 and 29 weeks. The unvaccinated group (G0)** had a lower average titre due to the presence of negative birds and positive birds within the same group, an especially dangerous situation for birds that have not received any type of immunisation against aMPV.

However, the **group vaccinated with a single dose (G1)** showed a serological behaviour in birds of different ages that was very similar to that of the unvaccinated group. See Figure 1.

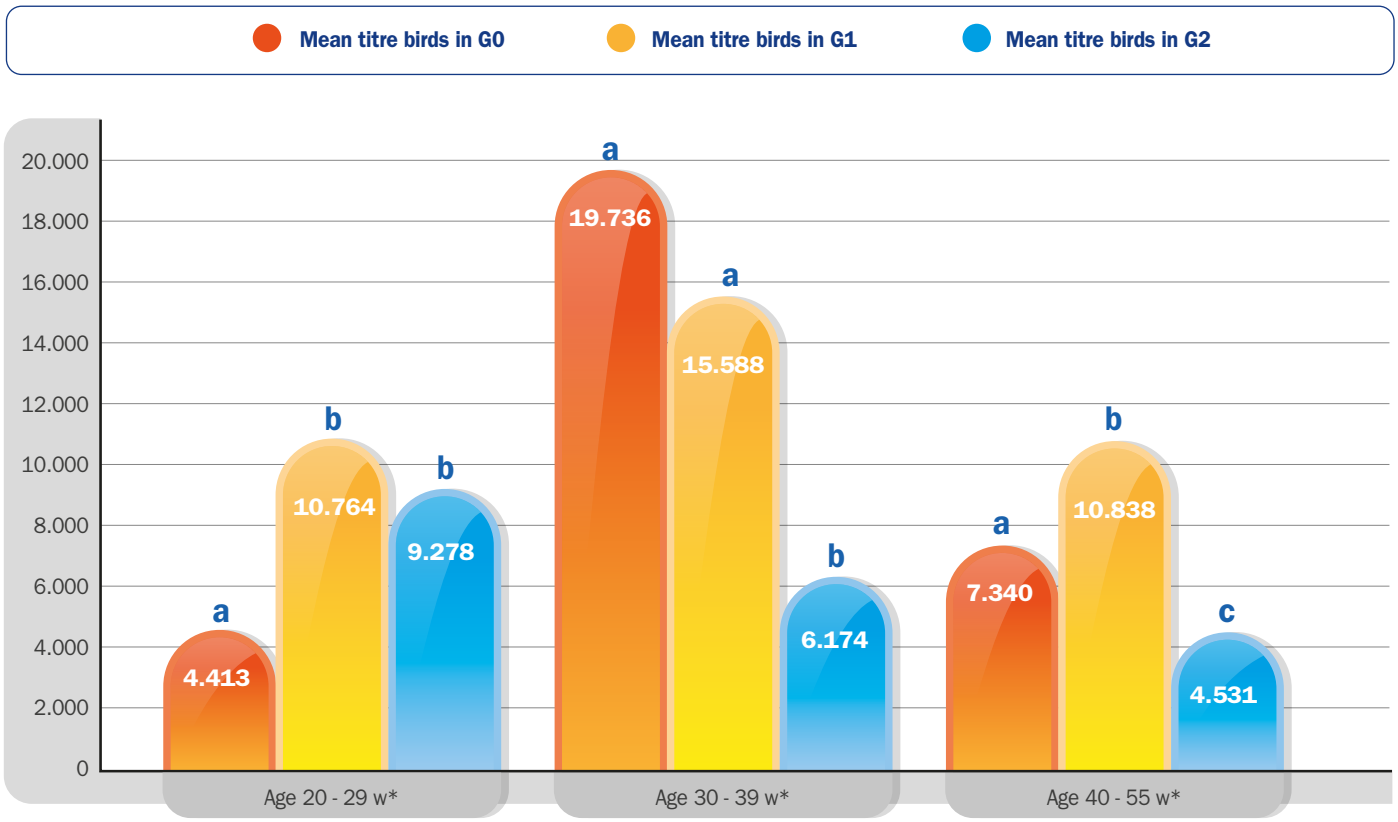

Figure 1. Average titre of antibodies against aMPV in different study groups in different age ranges. Different superscripts indicate significant differences using the Mann-Whitney U test with p-value <0.05.
* - Weeks

4 CONCLUSIONS

The mean titre of the group receiving the two doses of HIPRAVIAR® TRT /AVISAN® TRT (G2) is a common behaviour for birds where the challenge is under control, showing the maximum (9,278 ELISA units) around 6 to 8 weeks after the last dose of inactivated vaccine, and with decreased mean titre over the lifetime of the birds (6,174 ELISA units between 30 and 39 weeks, 4,531 ELISA units between 40-55 weeks of age).

We can conclude that in countries where live vaccines against aMPV cannot be used, the serological behaviour against aMPV in birds vaccinated with 2 doses of HIPRAVIAR® TRT /AVISAN® TRT (G2) is more predictable and less conditioned by the field challenge than in unvaccinated birds (G0) or in those vaccinated with a single dose (G1).

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