EFFICACY EVALUATION OF VACCINE PROGRAMS CONTAINING LIVE AND INACTIVATED SALMONELLA VACCINES AGAINST CHALLENGE BY SALMONELLA GALLINARUM IN BROWN LAYING HENS



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Introduction

Poultry farming in Brazil and other countries in Latin America and Asia are constantly affected by outbreaks of avian typhus, a disease caused by the *Salmonella enterica* subsp. enterica serovar Gallinarum biovar Gallinarum, a host-specific bacterium of birds. Avian typhus brings losses to the sector due to the mortality of affected birds, including adult birds with a long cycle and, therefore, with greater individual value, such as commercial laying birds and breeding birds. The control of these bacteria by vaccination is currently a high priority demand, both within the scope of the poultry production industry, as well as by the vaccine industry, international animal protein trade, retailers and consumers. The aim of this study was to evaluate the effectiveness of vaccine programs using combinations of live vaccine and inactivated vaccine against *Salmonella* Gallinarum (SG), in the face of an experimental challenge in brown laying hens

Materials and Methods

Onde hundred and twenty one-day-old Lohmann Brown laying hens were randomly housed, divided into 4 isolated negative pressure rooms. Three groups of birds were evaluated using different vaccine schedules: GT1 – Live vaccine (Vaxxon® SG 9R) at 7 and 10 weeks; GT2 – Live vaccine (Vaxxon® SG 9R) at 7 and 10 weeks + Inactivated vaccine (Vaxxon® SE SG) at 14 weeks; GT3 – Inactivated vaccine (Vaxxon® SE SG) at 9 and 14 weeks; as well as a Positive Control group (PCG) was performed. All groups were challenged with *Salmonella* Gallinarum (287/91 strain) at 18 weeks of age, and birds were evaluated up to 22 weeks. At 18 weeks of age, blood sera were collected from the birds to perform ELISA analysis with a commercial Salmonella Group D kit (Biocheck). After challenge, birds were assessed daily for general health observations. Data on mortality of infected birds were analyzed using the non-parametric Chi-square test, with a significance level of less than 5% (P<0.05). All procedures and animal care followed the basic principles of animal experimentation, recommended by the Ethics Committee on the Use of Animals (Protocol 012/2021).

Table 1: Experimental design and vaccinations.

			VACCINATIO	ON		CHALLENGE + SEROLOGY	HEALTH OBSERVATIONS
	N	7 WEEKS	9 WEEKS	10 WEEKS	14 WEEKS	18 WEEKS	18 - 22 WEEKS
PCG	30	_	_	_	_	SG 287/91 ELISA SALM D	Clinical signs and mortality
GT1	30	Vaxxon SG 9R (SC)		Vaxxon SG 9R (SC)		SG 287/91 ELISA SALM D	Clinical signs and mortality
GT2	30	Vaxxon SG 9R (SC)	_	Vaxxon SG 9R (SC)	Vaxxon SE SG (IM)	SG 287/91 ELISA SALM D	Clinical signs and mortality
GT3	30	_	Vaxxon SE SG (IM)	_	Vaxxon SE SG (IM)	SG 287/91 ELISA SALM D	Clinical signs and mortality

Results and Discussion

ELISA results showed good seroconversion at 18 weeks of age for the 3 vaccinated groups: 5496, 5680 and 6307 of GMean for GT1, GT2 and GT3 groups respectively, and 100% of the birds positive according to the specification of the "cut off" of the kit (654) (Table2). Five days after infection, characteristic clinical signs of avian typhus began to be observed, such as the presence of apathetic birds, with ruffled feathers and reduced feed and water consumption. From 9 dpc onwards, in the GT2 group, the birds showed remission of clinical signs, which did not return until the end of the evaluation, while in groups GT1 and GT3, it was possible to verify some birds with some degree of clinical sign throughout the evaluation period. The mortality that occurred in the groups after challenge with SG was 7% in GT1, 3% in GT2 and 10% in GT3, differing significantly from the positive control group that did not receive vaccine, that had a mortality rate of 47%. The use of combined live and inactivated vaccines demonstrated to be more effective in controlling avian typhus than the exclusive use of live or inactivated vaccine, based on the obtained results of mortality and clinical signs observed in the birds after the experimental infection.

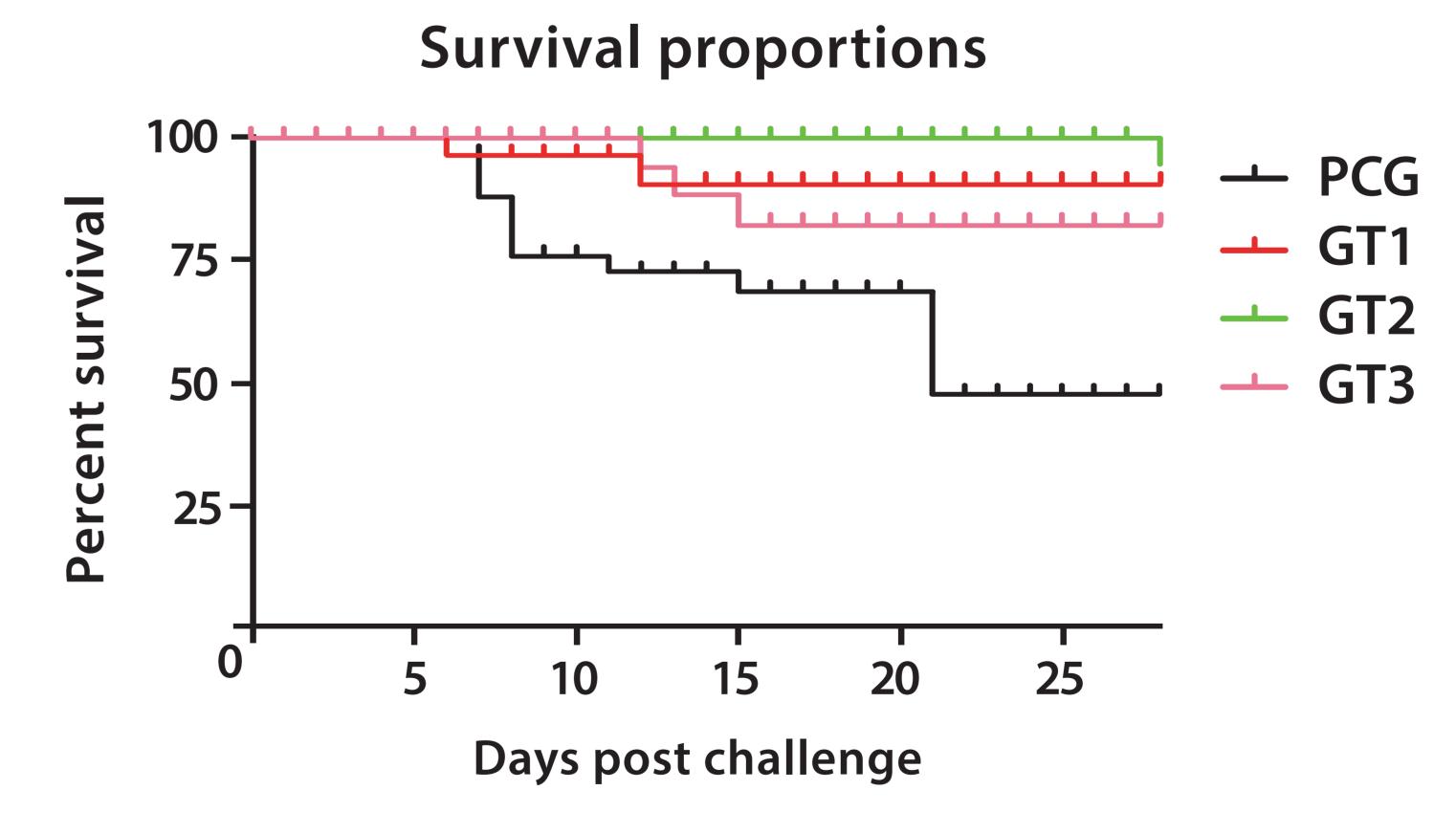
Table 2. Geometric means of anti-Salmonella group

Treatment	GMT	% Pos.*
PCG	178	0
GT1	5496	100
GT2	5680	100
GT3	6307	100

Table 3: Monitoring of daily mortality and total mortality rate, in groups of vaccinated and unvaccinated birds during 28 dpc.

Days post	Mortality (number of dead birds)						
challenge	PCG	GT1	GT2	GT3			
5	1	0	0	0			
6	0	1	0	0			
7	3	0	0	0			
8	4	0	0	0			
10	0	0	0	0			
11	1	0	0	0			
12	0	1 0	0	1 1			
13	0						
15	1	0	0	1			
21	4	0	0	0			
28	0	0	1	0			
TOTAL	14/30	2/30	1/30	3/30			
%Mort.	47% ^a	7 % ^b	3% ^b	10% ^b			

Figure 1. Survival rate of brown laying hens, in vaccinated (GT1, GT2 and GT3) and non-vaccinated (PCG) groups, after challenge by a pathogenic strain of Salmonella Gallinarum.



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