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Efficacy in the field of two anticoccidial vaccines for broilers

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ABSTRACT

We compared two attenuated anticoccidial vaccines, administered to broilers by spray into the incubator (88,000 males and 210,100 females). Vaccine A container five species of *Eimeria* and vaccine B three. Zootechnical performance was similar in the two groups, with mean lesion scores no higher than 1; vaccine A caused only duodenal lesions, while vaccine B also caused typhlitis. Maximum oocyst count was 23,000/g feces at age 28 days with vaccine A and 38,000 at 21 days with vaccine B. Broilers vaccinated with vaccine B had more frequent enteric symptoms, and *C. perfringens* isolation.

Key Words: Broilers, Coccidiosis, Vaccine, Field trial.

RIASSUNTO

EFFICACIA IN CAMPO DI DUE VACCINI ANTICOCCIDICI PER BROILERS

Sono stati confrontati due vaccini anticoccidici attenuati in broilers (88.000 maschi e 210.000 femmine) somministrati per spray in incubatoio. Il vaccino A conteneva 5 specie di Eimeria e il vaccino B 3 specie. Le performance zootecniche sono state simili nei due gruppi, lo score delle lesioni mediamente non superava il valore 1, anche se A dava lesioni solo duodenali, mentre con B era presente anche tiflite. L'emissione massima di oocisti era di 23.000 per grammo di feci (OPG) a 28 gg di vita in A e 38.000 OPG a 21 gg per B. Nei broilers vaccinati con B erano più frequenti sintomi enterici con isolamento di C. perfringens*, che ha richiesto terapia specifica per arginare la mortalità.*

Parole chiave: *Pollo da carne, Coccidiosi, Vaccinazione, Prova di campo.*

Introduction

Attenuated anticoccidial vaccines containing various species of *Eimeria* pathogenic for poultry are the only alternative to anticoccidial drugs (Chapman *et al.*, 2002). Live attenuated vaccines have been under investigation for several years now (Shirley, 1989). Most of these consist of a stabilized suspension of sporulated oocysts of *Eimeria* species from chickens, selected from precocious lines (shorter cycle, reduced reproductive potential, maintenance of the immunogenic capacity). Another method of attenuation is to produce lines of coccidia, especially *Eimeria tenella*, by passages in embryonated hen's eggs (Shirley and Bedrník, 1997). The *Eimeria* lines in commercial vaccines, even though attenuated, can cause some lesions to the intestinal mucosa (Williams and Andrews, 2001) and, in less than optimal breeding conditions, these can interact with other intestinal

pathogens, such as *Clostridium perfringens*, facilitating the onset of pathologies such as necrotic enteritis (NE) (Waldenstedt *et al.*, 1999).

This study compared the efficacy of two anticoccidial vaccines in eight commercial broiler farms.

Material and methods

Vaccines

We used two commercial vaccines, indicated here as A and B. Vaccine A contained five species of a precocious line of *Eimeria (E. acervulina, E. maxima* (two lines), *E. mitis and E. tenella)*. Vaccine B container two precocious lines, *E. acervulina* and *E. maxima*, and one egg-adapted line, *E. tenella*. Both were administered using a spray machine (Breuil model), following the manufacturer's instructions, directly into the incubator where all the chicks for controlled breeding were hatched.

Breeding establishments

Eight commercial chicken farms (numbered 1-8) were checked; four only bred males, and four only females, for a total of 298,100 broilers (hybrid ROSS 508). Vaccine A was given to the chicks in farms nos.1 (26,000 males), 2 (24,000 males), 3 (75,600 females), and 4 (46,000 females). Vaccine B was given to the chicks in farms nos. 5 (9000 males), 6 (29,000 males), 7 (37,500 females) and 8 (51,000 females). Chicks were housed between 31/05/04 and 10/06/04; the breeding density (male: 10; female: 16 chicks/sq.m) and feed were comparable in all eight farms.

Laboratory tests

From each shed we took 50 individual samples of feces, and counted the oocysts according to McMaster's method on days 7, 14, 21, 28 and 35 for males and females, and on days 42 and 49 as well for males. At the ages of 21, 28, 35 days for females and 21, 28, 35, 42, 49 days for males, we sampled ten chicks per farm to check for coccidial lesions, using the method of Johnson and Reid (1970). From six chicks for each age group we also removed samples of the intestine (duodenum, jejunum/ileus and cecum), which were fixed in 10% iso-osmotic formalin and examined histologically, according to routine methods. Semi-quantitative bacteriological counts were also done on the same animals, as recommended by Elanco Animal Health (Anonymous, 2002).

Results and discussion

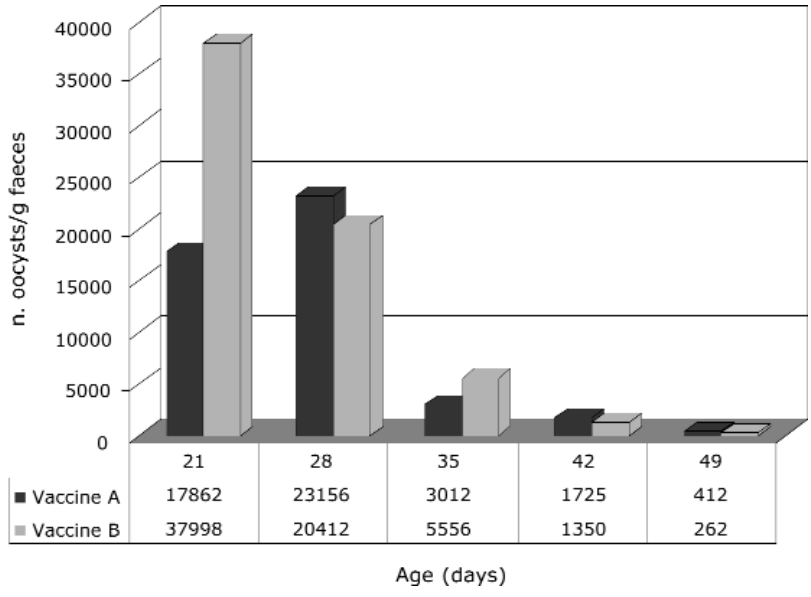
In the farms where chicks had been given vaccine A we found no clinical symptoms of intestinal pathology, and bedding remained in good condition. Table 1 shows the scores for lesions. Chicks vaccinated with A had few lesions due to *E. acervulina* and *E. maxima* and only very few to *E. tenella*, in accordance with the report by Williams and Andrews (2001). Semi-quantitative examination of the intestinal flora showed initial mild abnormality with a prevalence of Gram-negative microorganisms up to day 28; from then onwards until slaughter there was an increase in *C. perfringens*, but no gross or microscopic lesions due NE.

There are, however, reports of interactions between field coccidia or attenuated anticoccidial

Table 1. Mean lesion scores.

Age	*E. acervulina*		*E. maxima*		*E. tenella*	
days	Vacc. A	Vacc. B	Vacc. A	Vacc. B	Vacc. A	Vacc. B
21	0.725	0.65	0.35	0.15	0.1	0.125
28	0.75	0.25	0.55	0.45	0.1	0.575
35	0.15	0	0.45	0	0.2	0.05
42	0	0	0	0	0.02	0.05
49	0	0.15	0	0	0	0

Figure 1. Mean oocyst output in eight broiler breeding farms.



vaccines and NE (Williams *et al.*, 2003). Output of oocysts was near-nil in the first two weeks but peaked at 28 days, as already reported by Williams and Gobbi (2002), declining steeply thereafter (Figure 1).

In three of the breeding farms (nos. 6, 7 and 8) the broilers vaccinated with B had intestinal symptoms (catarrhal enteritis), with a rise in mortality, between the third and fifth weeks. The symptoms stopped only after repeated antibiotic treatments. Bacteriological tests in these B-vaccinated chicks showed a rise in *C. perfringens* already from the third week, when oocyst output was maximum – much higher than in the groups given vaccine A (Figure 1). The lesion score for vaccine B was not very different from A, except for the constant finding of lesions due to *E. tenella*, unlike in the report by Rois *et al.* (2002) in similar settings.

Histological lesions in the various segments of the intestine were correlated to the lesion scores, subjects B showing more marked cecal lesions, typical of *E. tenella* infection.

The productive performances of the two groups were in line with the specific literature for this cross. Male and female broilers given vaccine A were slaughtered respectively at 56.7 and 40.85 days, at average weights of 3.719 kg and 1.676 kg, with feed conversion ratio (FCR) 1.87 and 1.74, and mortality 4.05% and 2.46%. Male and female broilers given vaccine B were slaughtered respectively at 52 and 40.3 days, when average weights were 3.244 and 1.676 kg, FCR 2.00 and 1.81, and mortality 6.25 % and 1.78%.

The European Efficiency Index for broilers was 336,54 for group A males and 229,98 for females, and respectively 292,43 and 225,68 in group B.

Conclusions

Attenuated anticoccidial vaccines are the only alternatives to the drug prophylaxis that has for decades permitted the expansion of poultry breeding. These vaccines have been used increasingly in Italy in recent years. Commercial products are safe but must obviously be coupled with good breeding practice for maximum efficiency. The abolition of growth promoter additives, which controlled the anaerobic intestinal flora, particularly *C. perfringens* (Waldenstedt *et al.*, 1999), calls for care in selecting the right vaccine.

In this comparison both vaccines effectively controlled coccidiosis in a field setting. Vaccine A, given the same breeding conditions and feed, seemed to interact less on the chicken's intestinal microbial flora, without inducing NE, meaning there was less need for specific antibiotics. Zootechnical indices were better in Group A, especially for the males.

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