Area **Coccidia**

EVALUATION OF THE COMBINED EFFECT OF PROBIOTICS AND COCCIDIA VACCINE IN COCCIDIA-CHALLENGED BROILERS

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1 INTRODUCTION

Coccidiosis is a significant ubiquitous disease in poultry with a huge economic impact on the poultry industry. The use of chemotherapeutics to control the disease has been successful in many parts of the world. However, there is increased pressure on the industry to reduce the dependence on these compounds due to their erratic effectiveness and the growing demand for poultry products free from any chemotherapeutics. Vaccines and probiotics are considered two of the novel methods to control the disease without dependence on anticoccidial drugs. Live attenuated (1) coccidiosis vaccines have the advantage of providing good and long-lasting protection against coccidian invasion, together with a known capability of restoring sensitivity against coccidiostats. Probiotics have been used extensively in poultry production for their benefits in terms of performance, protection against enteric diseases and immunity of the birds (2). Through their multiple modes of action comprising pathogen antagonism, competitive exclusion and stimulation of the immune system, probiotics help to maintain a healthy balance of the gut microorganisms (3). In this research, the added protective effect of the synbiotic (synergistic combination of probiotics plus one prebiotic), PoultryStar® (PoultryStar, BIOMIN GmbH, Austria) containing *Enterococcus sp.*, *Bifidobacterium sp.*, and *Lactobacillus sp.*, plus fructooligosaccharide (FOS) derived from inulin was assessed in broilers vaccinated against coccidiosis with a live attenuated vaccine, HIPRACOX® (marketed by HIPRA and containing precocious sporulated oocysts of *Eimeria acervulina* 003, *E. maxima* 013, *E. mitis* 006, *E. praecox* 007 and *E. tenella* 004) immediately after hatching and challenged with a coccidia species mixture at day 15.

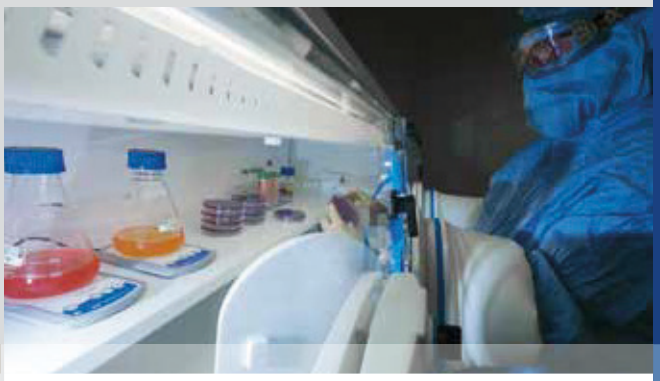
2 MATERIALS AND METHODS

456 day-old (DOC) male broilers of the ROSS 308 breed were housed for a 35-days grow-out in floor pens covered with wood shavings. Ventilation and heating were regulated automatically. Pelleted feed and water were provided *ad libitum*. Commercial feed contained neither antimicrobials nor anticoccidial additives. The animals were divided into 3 treatment groups of 152 animals with 8 replicates per group (Table 1).

Table 1. Trial Groups

Groups	Description
UUC (Uninfected untreated control)	No HIPRACOX® No PoultryStar® Unchallenged
IUC (Infected untreated control)	No HIPRACOX® No PoultryStar® Challenged
HCPS	**HIPRACOX® PoultryStar®** (water +feed) Challenged

The HCPS group received a HIPRACOX® vaccination on the farm on arrival day via drinking water in bell drinkers and PoultryStar® sol (20 mg/bird/day) via drinking water with bell drinkers for the first 3 days. Moreover, PoultryStar® me was applied via feed 1 kg/ton during the starter phase (1-14) and 0.5 kg/ton during the grower phase (15-35).



On day 15 birds of the IUC and HCPS groups where challenge with *Eimeria* pathogenic strains isolated in Germany at 1ml/bird. On days 21 and 22 (6 and 7 days post-challenge) 2 birds per pen were randomly selected, individually weighed and humanely euthanized. Lesion scores were assessed for *E. acervulina*, *E. maxima* and *E. tenella* by the method of Johnson & Reid (4). The total lesion score was calculated as the sum of lesion scores in the three intestinal segments (duodenum, mid-intestine, caecum). Feces samples were collected from each group for the oocyst count per gram (OPG) on days 6 and 7 post-vaccination and 7 and 14 days post-challenge. Productive parameters were recorded as shown in Table 2.

Table 2. Summary of recorded productive parameters

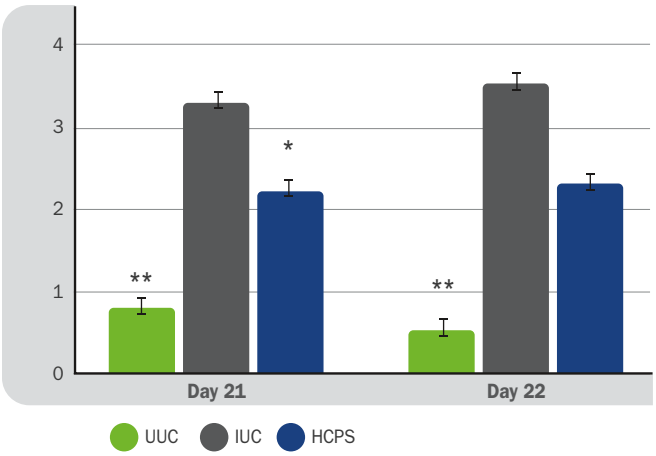
Parameters	Days post vaccination (dpv)				
	1	8	15	22	35
Mortality	Daily				
Body weight, Feed Intake, Feed Conversion	X	X	X	X	X

3 RESULTS

Lesion scores

Figure 1 shows the total mean coccidiosis score per study day and group. On day 21, a significant difference in lesion score was detected between the IUC and the HCPS group, in fact the HCPS birds showed significantly lower lesion scores compared to the IUC (*P* 0.01). Whereas, on day 22, the lesion score of the HCPS group was numerically lower compared to the IUC group, but with no statistical significance.

Figure 1. Total Mean Coccidiosis Score: Day 21, Day 22.

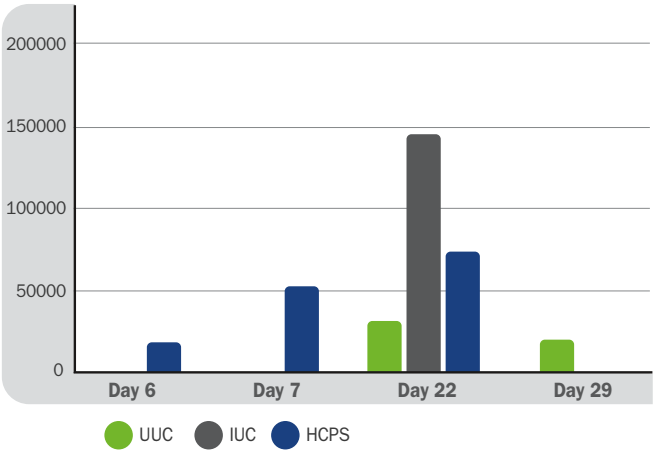


P < 0.05; * Significance 0.01; ** High significance <0.001

OPG

Figure 2 shows the OPG in oocysts per gram per group and study day. The IUC group shows zero OPG counts on days 6 and 7 with a pronounced increase on day 22 (143,000), as this was the untreated challenge group. Similarly, the UUC group showed zero oocyst output on days 6 and 7 together with some levels of OPGs on days 22 and 29, revealing that -after the challenge- likewise a cross-contamination occurred in the untreated unchallenged birds. Finally, the HCPS group shows, as expected, vaccine replication OPG levels on days 6 and 7. Then, on day 22, oocyst output is less than half (67,600) of the level shown by the IUC group, revealing that birds were already immunized and well protected at the time of the challenge, and on day 29 the OPG level was as low as that of a flock that is no longer shedding oocysts thanks to immunization.

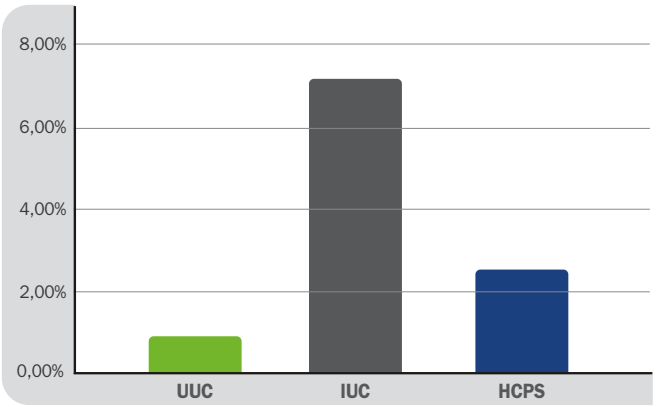
Figure 2. Total OPG



Performances

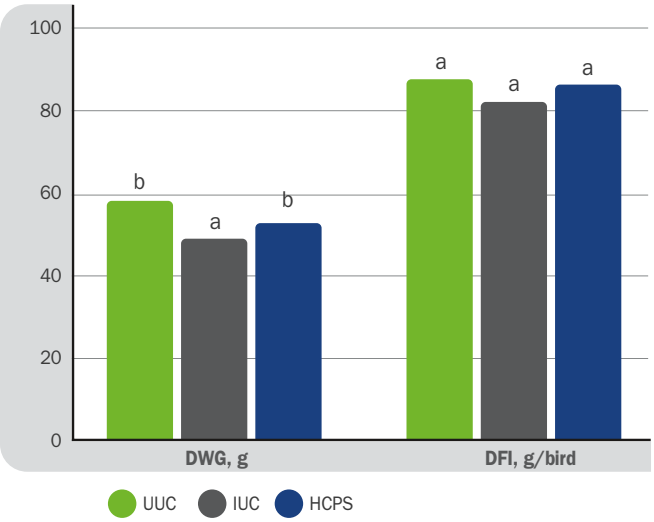
Even if there is no statistically significant difference, mortality in the HCPS group was numerically far lower compared to the IUC group *(Figure 3)*.

Figure 3. Mortality



No significant differences were observed amongst the three groups with regard to daily feed intake. However, daily weight gain was significantly better in UUC and HCPS groups *(Figure 4)*.

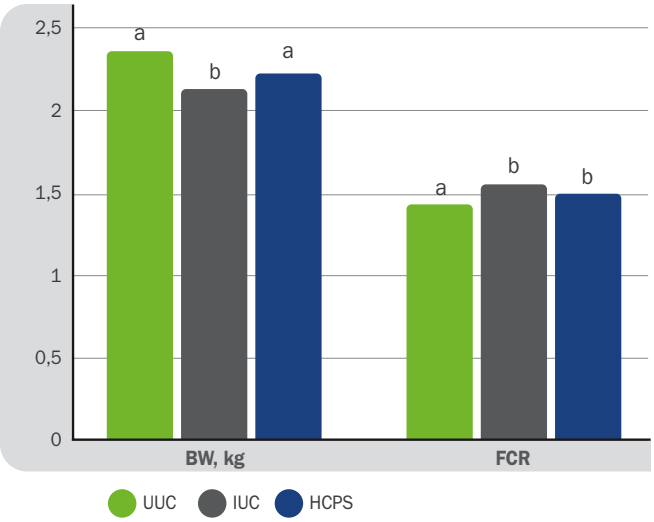
Figure 4. DWG (g), DFI (g/bird)



a-b Means within rows that do not have the same superscript as the IUC group differ significantly *(P* ≤ 0.05) from this reference group.

Birds from the UUC group performed significantly better compared to birds from the IUC group regarding body weight and FCR. Birds treated with HIPRACOX® + PoultryStar® performed better compared to birds from the IUC groups regarding FCR (UUC 1.43, IUC 1.58, HCPS 1.52). Overall, the HCPS group and the UUC group gained significantly more weight compared to birds from the IUC group *(Figure 5)*.

Figure 5. Body Weight (Kg), Feed Conversion Ratio



a-b Means within rows that do not have the same superscript as the IUC group differ significantly (*P* ≤ 0.05) from this reference group.

4 DISCUSSION

In this research, the added protective effect of a synbiotic was noticeable in broilers vaccinated against coccidiosis immediately after hatching and challenged with a mixed coccidia challenge infection at day 15:

1. On days 21 and 22, the lesion scores in birds from the HCPS group were lower compared to the IUC group;

2. The birds treated with HCPS could suppress the oocyst shedding more than the IUC birds;

3. When comparing performance parameters, birds treated with HIPRACOX® + PoultryStar® performed better compared to birds from the IUC groups regarding mortality and FCR and significantly better regarding body weight and daily weight gain.

In conclusion, results from the present study showed that the combination of HIPRACOX® and PoultryStar® had a positive impact on the zootechnical performance of the birds and on the coccidiosis lesion scoring after experimental induction of coccidiosis. This suggests a beneficial effect of the combination of HIPRACOX® and PoultryStar® on digestion and overall gut health.

5 REFERENCES

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